"INTERNATIONAL AERONAUTICAL USER CHARGES", by Amedeo R. Odoni, February 1985

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INTERNATIONAL AERONAUTICAL USER CHARGES

Amedeo R. Odoni
Flight Transportation Laboratory
Massachusetts Institute of Technology

February 1985

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While I have used material from these two theses in this report (in Chapters 2 and parts of 4 from Ch'ng, and in parts of Chapter 3 from Lippera), there has been no attempt to summarize here these two works. Instead they should be viewed as complementary, and indeed companion reports to this one and should be reviewed by those interested in their respective subjects.

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Amedeo R. Odoni, February 1985

Chapter 1

INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

Very few issues relating to the international air transportation industry are today as divisive as those pertaining to user charges imposed at international airports and enroute air navigation facilities. In recent years, this general subject has led to acrimonious arguments, heated confrontations and even legal proceedings involving airlines (and the entire airport user community), airport authorities and national and local governments. Moreover, the end is nowhere in sight: should the current economic difficulties of many of the world's international airlines persist -- as well they might -- it is possible that disputes related to user charges will intensify further and reach critical proportions at some future time.

The general label "user charges" comprises a variety of fees which are employed by providers of aeronautical facilities and services as a means of recovering (partially, fully, or more-than-fully) the costs that they incur. A listing of the various kinds of user charges in existence is given in Table 1.1. Any given Airport Authority or organization that offers air navigation and aeronautical services may impose some or all of these charges.

It is possible to state several facts that help explain why the subject of user charges is such a controversial one. At the same time, these facts provide the motivation for studies such as the one reported here:

<u>Fact 1: User charges have gone through a period of rapid increases in absolute and, in many cases, relative terms as well, over the last decade.</u>

A confluence of factors have contributed to these increases. Perhaps the foremost among them is that, during the 1970's, the aviation industry

Table 1.1

TYPES OF USER CHARGES

AIRPORT CHARGES

Aeronautical Charges

Landing and/or take-off charges
Parking and hangar charges
Passenger service charges
Security charges
Airport noise charges
Ground (ramp and traffic) handling charges
Concession fees for aviation fuel and oil*
Rentals of air terminal space, premises and equipment

Non-Aeronautical Charges

Rentals of airport land, premises and equipment (for purposes other than servicing traffic)
Concession fees for commercial concerns catering to the public
Fees derived from airport's own operation of shops and services
Fees charged for tours, admission to reserved areas, etc.

ENROUTE CHARGES

Air navigation charges

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* The International Civil Aviation Organization (ICAO) recommends that where fuel charges are imposed, they should be recognized by airport authorities as being concession charges of an aeronautical nature and that fuel concessionaires should not add them automatically to the price of fuel to aircraft operator [ICAO, 1981d].

began to be treated as a "mature" one, in most of the world. Until then, many countries were content to subsidize the industry through provision of aeronautical facilities and services at no cost or at much-below cost. (It is a remarkable fact, for instance, that no enroute air navigation charges were collected by someWest European nations until 1971, the year when Eurocontrol began collecting charges designed to recover only 15% of costs.) However, as the industry grew "above critical size" and stabilized during the 1960's and 1970's, government attitudes toward it generally changed and a "users-pay" principle was increasingly being applied to the setting of user charges by the 1970's. (By 1981, Eurocontrol was recovering 100% of enroute air navigation costs on behalf of its 11 member states.) A second factor is that, during this period, some new types of charges, notably security charges and noise charges, have been added for the first time to the array of other charges that airlines traditionally faced. The fact that many aeronautical services are labor-intensive ones -- notably ground handling, enroute and terminal-area air navigation and security -- was a third contributing factor, as labor costs are particularly sensitive to inflationary pressures such as those experienced worldwide during the period in question. Yet another factor is that since the mid-1960's many countries have been investing large amounts of capital toward improving their aeronautical infrastructures (new or improved airports, modernization of ATC systems). As these new or improved facilities came into service, the cost-base on which user charges are computed grew rapidly.

While one can expand this list of factors considerably, the point is that airlines and users of aviation facilities have felt the impact of such rapid increases. This, moreover, happened at a time when many of them were experiencing significant economic pressures. For example, IATA contends that, during the period of the dramatic fuel-price increases (1973-1981), the only other component of their costs that grew nearly as rapidly as fuel costs were aeronautical user charges (see Table 1.2).

Fact 2: There are large differences from country to country and from location to location in the ways user charges are computed and in the magnitude of user charges.

This is amply demonstrated by Table 1.3, which shows the size of typical landing fees and passenger service charges in a number of selected countries for three important aircraft types. Similar or even larger differences exist in the magnitudes of other charges imposed (especially for ground handling and enroute air navigation services), as will be shown in many parts of this report. Such differences — coupled with the unfortunate tendency of many aeronautical authorities to provide inadequate or minimal documentation in explaining their user charges — have led to accusations of "unfairness", "predatory behavior", or "discrimination" against several specific countries or airports[1] (e.g., London/Heathrow, Tokyo/Narita, Australia). It is not surprising that such accusations are usually directed toward those that impose the highest charges. However, locations that impose much-lower charges, but have the benefit of a lower cost-base as well, are just as susceptible to adopting such practices.

Fact 3: In many cases, user charges may absorb a sizable fraction of an international commercial flight's gross revenues.

This is illustrated in Tables 1.4 and 1.5 for the case of flights by a real, but anonymous, Airline X between its home base (XXX) and New York (JFK International), London/Heathrow and Amsterdam. Table 1.4 shows all the charges imposed for each route/equipment combination for load factors of 100%,

[1]We do not imply here that such accusations are necessarily justified.

Table 1.2

USER CHARGES DEVELOPMENT 1974 - 1980

IATA AIRLINES' INTERNATIONAL SCHEDULED SERVICES

in US$ 000

Source : Cost Committee

	1974	1975	1976	1977	1978	1979	1980	Growth 1974-1980 in %
En Route Charges	116,620	160,446	224,658	311,703	441,630	560,089	707,024	506
Index	100	138	193	267	379	480	606	
Landing Charges	477,841	562,104	616,709	695,628	881,213	942,903	1,094,415	129
Index	100	118	129	146	184	197	229	
Passenger Service Charges	192,068	224,882	259,941	304,222	386,446	434,059	537,594	180
Index	100	117	135	158	201	226	280	
Total User Charges *	786,529	947,432	1,101,308	1,311,553	1,709,289	1,937,051	2,339,033	197
Index	100	120	140	167	217	246	297	
Total Operating Costs	14,535,774	16,228,319	17,464,458	20,105,698	24,605,714	28,270,618	36,103,341	148
Index	100	112	120	138	169	194	248	

* excl. Security Charges, Fuel Throughput Charges, Ticket Taxes, Handling Charges and Space Rentals

Table 1.3

REPRESENTATIVE LANDING, TAKE-OFF AND PASSENGER CHARGES FOR SELECTED COUNTRIES AND AIRCRAFT TYPES

Country	Daytime Landing and Take-off Charges ($US)			Charges Related to Passengers Carried ($US)			Total ($US)		
	DC9	B707	B747	DC9	B707	B747	DC9	B707	B747
Algeria	139	773	1,938	307	614	1,382	446	1,387	3,320
Australia	750	2,796	6,078	--	--	--	750	2,796	6,078
Belgium	201	665	1,441	310	620	1,394	511	1,285	2,835
Brazil	139	459	994	251	501	1,128	390	960	2,122
Denmark	255	419	1,826	84	168	378	339	587	2,204
France	158	728	1,831	--	--	--	158	728	1,831
West Germany	313	1,003	2,173	204	407	915	517	1,410	3,088
Greece	67	272	637	83	167	374	150	439	1,011
Ireland	225	745	1,615	324	809	1,821	549	1,554	3,436
Israel	328	1,087	2,355	659	1,318	2,966	987	2,405	5,321
Italy	128	460	1,014	184	368	827	312	828	1,841
Japan	423	1,400	3,035	319	632	1,415	742	2,032	4,450
Netherlands	193	711	1,578	235	469	1,056	428	1,180	2,634

(continued)

Table 1.3 (continued)

REPRESENTATIVE LANDING, TAKE-OFF AND PASSENGER CHARGES FOR SELECTED COUNTRIES AND AIRCRAFT TYPES (continued)

Country	Daytime Landing and Take-off Charges ($US)			Charges Related to Passengers Carried ($US)			Total ($US)		
Singapore	148	579	1,361	278	556	1,250	426	1,135	2,611
Spain	92	341	738	102	203	457	194	544	1,195
Sweden	227	895	2,094	383	765	1,721	610	1,660	3,815
Switzerland	201	735	1,633	235	470	1,057	436	1,205	2,690
U.K.†	445	2,028	5,120	936	1,871	4,209	1,381	3,899	9,329
USA (N.Y.)**	141	301	569	605	955	1,830	746	1,256	2,399
U.S.S.R.	178	589	1,275	395	264	593	573	853	1,868

* Includes air navigation facility charges.

** No air navigation facility charge for airport services exists in USA.

† Peak period (10:00 - 14:59 GMT) 1st April - 31st October.

Assumptions: DC-9-30: 44,500 kg or 98,000 lbs; 75 seats; 50 passengers.
B707-320B: 148,300 kg or 327,000 lbs; 150 seats; 100 passengers.
B747-100: 322,050 kg or 710,000 lbs.; 375 seats; 225 passengers.

Source: ICAO Doc. 7100-AT/707 (1981 Edition).

Table 1.4

AIRLINE X: USER CHARGES FOR TYPICAL ROUND-TRIP FLIGHTS
(Home Base = XXX; 1983 U.S. $)

Charges	XXX-NYC-XXX (B747) 100% L.F.	75%	50%	XXX-LON-XXX (A300) 100% L.F.	75%	50%	XXX-AMS-XXX (A300) 100% L.F.	75%	50%	XXX-AMS-XXX (B727) 100% L.F.	75%	50%
Passenger Departure Fees at XXX	1,081	811	541	703	527	352	703	527	352	378	284	189
One-Way Air Navigation Fees	2,678	2,678	2,678	1,653	1,653	1,653	1,316	1,316	1,316	939	939	939
Landing Fee	721	721	721	2,639	2,639	2,639	863	863	863	418	418	418
Passenger Arrival and Departure Fees	1,200	900	600	4,863	3,647	2,432	1,220	915	610	657	492	329
Handling Fees	9,355	9,355	9,355	2,430	2,430	2,430	2,130	2,130	2,130	1,040	1,040	1,040
Takeoff Fee												
One-Way Air Navigation Fee	2,678	2,678	2,678	1,653	1,653	1,653	1,316	1,316	1,316	939	939	939
Landing Fee at XXX	665	665	665	278	278	278	278	278	278	128	128	128
TOTAL	18,378	17,808	17,238	14,219	12,827	11,437	7,826	7,345	6,865	4,499	4,240	3,982

Table 1.4 (continued)

AIRLINE X: USER CHARGES FOR TYPICAL ROUND TRIP FLIGHTS (continued)

Assumptions:

a) B747: 350 tonnes, 400 seats
   A300: 155 tonnes, 260 seats
   B727: 78 tonnes, 140 seats

b) Landing Fee at destination includes parking charge

c) 4-hour stay-over in NYC; 2-hour in LON, AMS

d) Peak-hour use in summer

Table 1.5

AIRLINE X: USER CHARGE AS % OF GROSS REVENUE

A. FLIGHT: XXX-NYC-XXX (B747)

-- Revenue per seat (including cargo and mail revenue): $400

--	100% load factor:	5.74%	($320,000 revenue)
	75% load factor:	7.42%	($240,000 ")
	50% load factor:	10.78%	($160,000 ")

B. FLIGHT: XXX-LON-XXX (A300)

-- Revenue per seat (including cargo and mail): $200

--	100% load factor:	13.67%	($104,000 revenue)
	75% load factor:	16.44%	($ 78,000 ")
	50% load factor:	21.99%	($ 52,000 ")

C. FLIGHT: XXX-AMS-XXX (A300 and B727)

-- Revenue per seat (including cargo and mail): $200

--	For A300:	100% load factor:	7.53%	($104,000 revenue)
		75% load factor:	9.42%	($ 78,000 ")
		50% load factor:	13.20%	($ 52,000 ")
--	For B727:	100% load factor:	8.03%	($ 56,000 ")
		75% load factor:	10.09%	($ 42,000 ")
		50% load factor:	14.22%	($ 28,000 ")

75%, and 50%. The specific assumptions made are listed at the bottom of Table 1.4. Table 1.5 estimates what percentage of total revenues (true one-way yields on the routes were provided by Airline X) is absorbed by user charges. (For example, for a B747 flight to NYC at 100% load factor, the total user charges of $18,378 -- see Table 1.4 -- amount to 5.74% of the round-trip revenues of $320,000). It can be seen that user charges in these examples vary from 6% to 22% of gross revenues, depending on destination, aircraft involved and load factor. It is also important to note that the total user charges (last line of Table 1.4) are largely determined by the type of aircraft flown on any given route and are quite insensitive to the load factor -- a characteristic that is quite vexing to the airlines.

While this example is given for illustrative purposes only, the range of percentages it indicates in Table 1.5 is not atypical. IATA estimates that the sum of enroute charges and landing and other airport fees (<u>not including</u> ground handling charges and passenger service costs at airports) amount to approximately 6% of the <u>total</u> (direct and indirect) costs of the international scheduled services of its members. West European airlines contend that these same charges amount to 11.2% of their total costs for intra-European services and an even-higher percentage for airlines specializing in short-haul routes. The Association of European Airlines (AEA), in fact, often blames high user charges in Europe as one of the main reasons for the higher European operating costs and therefore higher fares per mile.[2] Most of the recent complaints of AEA carriers have centered in particular on enroute air navigation charges collected through the Eurocontrol agency. Pan Am has reported that whereas user charges of various kinds accounted for 4% of its costs on international routes in 1970, they now account for 9%. For domestic trunk carriers in the

[2]This view is not necessarily endorsed here.

United States, user fees account for 4.2% of their costs. However, this percentage does not include the 8% tax on domestic fares, which is collected on behalf of the Aviation Trust Fund and which can be viewed as an aeronautical user charge.

Up to a few years ago, U.S. airlines were among those most vocal in protesting the magnitude of and lack of uniformity in international user charges. Partially as a result, the International Air Transportation Fair Competitve Practices Act that became law in the United States on January 3, 1975 directs the Secretary of Transportation

> to survey foreign user charges and to report to the Secretary of State and the Civil Aeronautics Board any charges that unreasonably exceed comparable U.S. charges or are otherwise discriminatory. The latter are then to negotiate with the foreign country involved to reduce such charges or eliminate such discrimination [Pogue and Davison, 1979].

The Act also gives to the Secretary of Transportation, in consultation with the Secretary of State, the right to impose compensatory charges on foreign carriers, should such negotiations fail.

It should be noted that, as a result of the rapid increase of the exchange value of the U.S. dollar during the 1981-1984 period, U.S. international carriers have been protected, to a large extent, from "internalizing" the further increases in international user charges that have taken place during these years. [For example, although the costs, as computed in local currencies, of enroute air navigation in Western Europe (Eurocontrol) nearly doubled between 1980 and 1983, the cost to U.S. carriers when computed in U.S. dollars has not changed appreciably.) Should however, the current trend concerning exchange rates be reversed, it is likely that the international-user-charges issue will receive renewed prominence in the United States.

<u>Fact 4: Limited guidance on setting user charges is provided by multilateral or bilateral international agreements and by the International Civil Aviation Organization.</u>

The multilateral Convention on International Civil Aviation (Chicago, Decemer 7, 1944) which provides the legal framework for many aspects of international air transportation is vague on the subject of user charges. The relevant provision of the Convention is contained in Article 15 of Chapter II, which calls for non-discriminatory charges for international aviation, without being more specific on what this means. Bilateral agreements, e.g. Bermuda II, are equally non-specific, usually calling for: "just and reasonable" charges; equal treatment for the contracting states' carriers with regard to user charges; user charges that "may reflect, but should not exceed, the full cost" of providing facilities and services "including a reasonable rate of return on assets, after depreciation"; and continuing consultations and exchange of information between "the competent charging authorities" and airline representatives.

The ICAO has also struggled repeatedly with the issue of user charges, notably in special conferences on the subject held in 1967, 1973 and 1981, all of which met with limited success. The principles and recommendations endorsed by the ICAO on the assessment and allocation of user charges are contained in ICAO Doc. 9082-C/1015 (<u>Statements by the Council to Contracting States on Charges for Airports and Route Air Navigation Facilities</u>). The ICAO Statements are not binding on member countries, but offer guidelines that charging authorities are encouraged to follow. The Statements are reproduced here as Appendix 1A, because they will be repeatedly referred to and discussed in Chapters 2-6. (The reader who is unfamiliar with them is encouraged to review them.) For now, two points need to be made: First, that the ICAO

Statements do endorse the concept that, in principle, international users should bear the full and fair share of costs of the aeronautical facilities and services they use. And, second, that, as is natural for a document that attempts to establish a common ground among many conflicting views and interests, the Statements are often ambiguous, subject to conflicting interpretations and, in a number of instances, even self-contradictory, as will be pointed out later in this report.

As noted earlier, Facts 1-4 in addition to providing a background on the problem of international user charges, also constitute motivations for this report. Indeed the aim here is to attempt to present a systematic and integrated discussion of relevant issues and to contribute to an improved understanding of the range of options and approaches that exist worldwide with regard to setting user charges.

1.2. OUTLINE OF THIS REPORT

We now present an outline of the contents of Chapters 2-6.

Chapter 2 contains a brief survey of most types of aeronautical charges: landing fees; parking and hangar charges; passenger service charges; fuel throughput charges; noise and nuisance charges; security charges; and enroute air navigation charges. Discussion of ground handling charges is left to Chapter 6. For each one of the types of charges covered, the following are addressed:

(i) Ways in which the charges are specified, as well as typical magnitudes and ranges of the charges

(ii) Principal issues concerning the charges, including the positions of users (mostly the airlines)

(iii) Summaries of the findings of recent ICAO surveys on the charges, as well as tabulations of charges in individual countries based on information collected by these surveys.

Chapter 3 deals with the approach needed to determine whether, _in the context of the conditions under which an aeronautical service or facility is provided_, the resulting user charges are reasonable and fair. The emphasis in the preceding sentence is intended to underscore the point that comparisons among user charges in different countries or locations should not be undertaken without a full understanding of the particular circumstances and assumptions that underlie each of the systems of charges being compared. In fact, it is believed here that such comparisons should normally be avoided and that user charges at international airports and enroute air navigation facilities should be reviewed individually on a case-by-case basis.

Chapter 3 presents what could be described as a "normative model" for conducting such a review. Specifically, on the basis of the insights gained during this research, we shall review the steps that must be carried out by a provider of aeronautical services in order to determine and specify a system of user charges. These steps include:

(a) Postulating the policy guidelines that should be followed

(b) Developing a cost base

(c) Allocating costs in the cost base among the various cost and revenue centers of the aeronautical facility

(d) Allocating costs associated with each center among the users of that center

(e) Arriving at a methodology for computing charges to be paid by each specific user

(f) Setting up a framework for interacting with users and soliciting user comments and general inputs.

Each of the above steps is discussed in Chapter 3 in some detail, with emphasis on:

(i) Identifying the range of practices that exist around the world with respect to each of these steps

(ii) Discussing some of the principal options available at each step

(iii) Highlighting a few important points that the prospective reviewer of user charges should be aware of, including common pitfalls

(iv) Identifying certain areas where there may exist some room for improvement in prevailing international practices

(v) Illustrating the discussion through a number of brief examples.

In Chapter 4, four selected case studies are reviewed. Each of the cases has been selected for two reasons:

(1) It helps illustrate one or more of the principal concepts that were discussed in Chapter 3

(2) In itself, the case offers one or more interesting aspects (important airport, innovative approach, controversy, etc.).

The first example discussed is Boston's Logan International Airport. We examine in detail the procedure used to determine the unit-rate (charge per thousand pounds) for computing landing fees at this major United States airport. This, in turn, offers an opportunity to explain why <u>airside</u> user charges at U.S. international airports are usually considerably lower than those elsewhere in the world.

The controversial case of Tokyo/Narita International Airport is brought up next. It illustrates how a combination of poor site and planning choices and of often-unreasonable cost-allocation practices has led to what seems to be a system of unfair and excessive user charges.

A study aimed at helping the Board of Civil Aviation of Sweden ("Swedish CAA") determine an appropriate system of user charges is summarized next. This study is especially important, because of the several innovative concepts that it contains, principally regarding the practical application of short- and long-term marginal-cost approaches to the setting of user charges.

Finally, cost allocation in the Commonwealth of Australia is reviewed. User charges in Australia have become a matter of considerable controversy in recent years. Moreover, the Australian cost-allocation approach is quite typical of the "traditional" kind of rationale and methodology generally used in efforts of this type.

Chapter 5 deals in its entirety with the Eurocontrol system of user charges. This represents the principal case study reported herein. In its first part, Chapter 5 examines in detail the distribution of Eurocontrol charges among users. The second part concentrates on the cost-base which these charges are designed to cover. Some of the points which are addressed include:

(a) The extent to which the Eurocontrol "formula" for computing user charges truly reflects the costs that individual users impose on facilities and services

(b) The effects of changes in this formula on the distribution of costs among the various types of users: much quantitative evidence is provided in this respect

(c) The composition of the cost-base and differences among member-states in this respect

(d) Possible explanations for the large differences in the unit rates that the eleven individual member-states specify for computing user charges.

Chapter 6 represents a first attempt to examine in a systematic way the subject of costs of ground handling services at international airports. It is noted that, due (i) to vast differences among airports as to who the provider of these services is, and (ii) to lack of uniformity in the type and quality of services provided, it is difficult to develop general conclusions in this area. Nevertheless, several preliminary but highly-interesting observations are made on the basis of previously-unpublished data provided to the author by the International Civil Airports Association (ICAA) and by a major U.S. trunk carrier. The data in question deal with ground handling costs at many European and a few U.S. airports.

An extensive list of references on the subjects of airport economics and of airport user charges is also provided at the end of this report.

Finally, as already indicated in the Foreword, two companion reports, based on the thesis work of D. Lippera and E. Ch'ng, cover much related ground, especially with regard to a more-formal analysis of alternative cost-allocation methodologies. These two reports also include many additional examples, especially several concerning the British Airports Authority and the setting of user charges at London/Heathrow Airport.

Chapter 2

Brief Survey of International Aeronautical Charges

2.1 Introduction

This chapter presents a brief survey of the following types of aeronautical charges as they apply to international aviation:

- Landing fees
- Parking and hangar charges
- Passenger service charges
- Fuel throughput charges
- Noise and nuisance charges
- Security charges
- Enroute air navigation charges

A survey of charges for ground-handling services has not been included because it is very difficult to make any generalizations concerning these charges, as the manner of administering ground-handling services and the types of services provided vary greatly from location to location. The reader is referred to Chapter 6, which is exclusively devoted to a detailed discussion of issues related to ground-handling services and associated charges.

For each one of the types of charges covered, the following are briefly indicated:

(i) Ways in which the charges are specified, as well as typical magnitudes and ranges of the charges

(ii) Principal issues concerning the charges, including the positions of users (mostly the airlines)

(iii) Summaries of the findings of recent ICAO surveys on the charges, as well as tabulations of charges in individual countries based on information collected by these surveys.

This material will serve as background for the topics that will be discussed in detail in Chapters 3-6.

2.2 Landing Fees

Among the many types of airport charges, the landing fee is the oldest and most common of all. It is believed that the landing fee was first introduced in Britain under the Air Navigation Act signed on 30 April 1919 by Winston S. Churchill, who was then Secretary of State for Air (Table 2.1). The Act set the accommodation charge and the landing fee due at Royal Air Force aerodromes open to civil traffic [Plaignaud, 1977]. Until today, the landing fee remains the most universal and basic airport charge.

The level of the landing fee and the method by which it is computed can vary greatly from one country to another and, within a country from one airport to another. Generally, however, the landing fee is based on the aircraft's weight and is levied on operators for use of the aircraft maneuvering area. In a few instances (e.g. Australia) the landing fee includes enroute air navigation charges as well.

There are usually two ways of specifying the amount of landing charges based on the aircraft's weight: either as an "accumulative charge" or as a "straight charge". These charging formulas are usually of the form given in Table 2.2. Two examples, one of an accumulative-charge specification (Japan) and the other of a straight-charge specification, are given in Table 2.3.

The landing fee is sometimes accompanied by a variable surcharge, particularly for night landings or for cenrtain peak periods of the year or for peak traffic hours. The surcharge can be viewed as an incentive for reducing or even eliminating night traffic for environmental reasons or, in

Table 2.1

ORIGIN OF AERONAUTICAL CHARGES

Date	Country
30 April 1919	Britain
31 March 1920	Germany
September 1920	Belgium
November 1920	Netherlands
1 November 1920	France
19 November 1921	Italy

Source: [Plaignaud, 1977]

Table 2.2

LANDING FEE FORMULAS

Accumulative Charge

First A tonnes, rate = B per tonne (or fixed rate)

Next C tonnes, rate = D per tonne

Remainder, rate = E per tonne

Total charge is the total of charges in separate weight ranges until total aircraft weight is reached.

Straight Charge

Up to A tonnes, rate = B pertonne (or fixed rate)

Over C tonnes, rate = D per tonne

Over E tonnes, rate = F per tonne

Total charge is the product of total aircraft weight and the rate per tonne for that weight range.

Table 2.3

LANDING RATES LEVIED IN JAPAN AND THE UNITED ARAB EMIRATES

AIRCRAFT WEIGHT	CHARGE
JAPAN (Accumulative Charge)	
The rates given are applicable to international flights at airports other than Tokyo-Narita Airport. Lighting and noise-related charges have not been included. The amount is based on the maximum take-off weight in the Certificate of Airworthiness (MTOW).	
	Charge in Yen
	Up to 25 tonnes 600 per tonne (or part thereof)
Next 75 tonnes	900 per tonne
Next 100 tonnes	1,100 per tonne
Remainder	1,200 per tonne

UNITED ARAB EMIRATES (Straight Charge)	
	Charge in Dirhams (DH)
A. Emirates of Abu Dhabi, Ras Ali Khaimah and Sharjah	
Up to 5,000 kg	4 per 500 kg (or part thereof)
5,001 to 50,000 kg	5 per 500 kg
Greater than 50,000 kg	6 per kg
B. Emirate of Dubai	
Not exceeding 10,000 lbs	4 per 1,000 lbs (or part thereof)
10,001 to 100,000 lbs	5 per 1,000 lbs
Greater than 100,000 lbs	5.5 per 1,000 lbs

the case of peak-period surcharges, for avoiding daytime congestion of airport and air traffic control facilities. The surcharge may also reflect the additional costs imposed by airport users during night-time or during peak traffic hours. For example, in Japan, each landing and each take-off at night is charged 5% more to cover the cost of lighting the airfield [ICAO, 1982a].

Certain types of flights are usually exempted from landing fee payment. These are generally the following:

- Royal, head-of-state, diplomatic and state aircraft
- Aircraft engaged in search-and-rescue operations
- Approved test flights or calibration flights
- Military and police aircraft
- Operations necessitated by mechanical problems on board or forced under threat of violence

Many airports also offer discounts on landing fees. For example, Turkey offers a 50% reduction in charges "for international aircraft for tourism or sports aircraft provided that no additional passenger or cargo is embarked or disembarked" [ICAO, 1982a]. The Emirate of Sharjah offers a similar reduction on landing fees for aircraft operating scheduled services originating from a recognized point less than 40 nautical miles away from the airport. In the United States, San Francisco Airport offers a volume discount based on the monthly gross aircraft landing weight of revenue flights of each carrier: an airline with a total flight gross landing weight between 40 and 80 million pounds per month receives a 10% discount; with between 80 and 120 million pounds, a 20% discount; and with more than 120 million pounds, a 30% discount.

2.3 Parking and Hangar Charges

Most airports grant free parking to aircraft for a limited amount of time after landing. Beyond that time, aircraft are charged for the amount of time they stay at an airport. For example, apron parking is free for the first three hours after landing in Brazil and thereafter, aircraft are charged 20% of the landing fee per hour or part thereof.

It is common practice among airports to base parking charges on aircraft weight and/or the space occupied by the aircraft. Prima facie Brazil, in this case, would seem to be an exception to this rule in that the parking fees are not based on weight. However, because the parking fees depend on the landing fees, the parking fees are in fact indirectly based on aircraft weight too. Where a "space-occupied" approach is used, the space occupied by the aircraft is defined to be the aircraft length multiplied by the wing span.

The parking charges may also consider the type of parking area, the time period and other factors. At some airports, the charges for parking on the apron, at a gate position and in the hangar, differ significantly. Time-of-day differentiation may also exist. At London-Heathrow Airport, parking during the peak period costs four times more than off-peak parking [AD, 1983]. San Francisco Airport offers long-term parking at a reduced rate. Charges are also sometimes imposed for removing fuel or oil stains from the ground, e.g. in Paris.

2.4 Passenger-Service Charges

Passenger-service charges were initially conceived as a means of supplementing aircraft revenues and alleviating the magnitude of user charges paid directly by the airlines. Over the years, however, passenger-service charges have become increasingly associated with the recovery of costs of terminal buildings and of passenger facilities and services (such as immigration, passport control and customs). They are now accepted as the fees levied for the use of embarkation, disembarkation and reception facilities by passengers.

During the early years of aviation and even until recently, these charges were paid by the passengers (in addition to the fare) before embarkation in most countries. The collection was either undertaken by the airport authority or relegated to the airline and/or to a collection agent. This practice, however, has become increasingly cumbersom at busy airports, and is unsatisfactory from the facilitation viewpoint.

Airport authorities, tourist organizations and such bodies as the Council of Europe and the European Civil Aviation Conference (ECAC) have repeatedly demanded that passenger-service charges be included in the passenger fare. The airlines have objected strongly to this idea. This is because it is not quite so simple to include passenger-service charges in the price of tickets. International fare structures are too complex to make an automatic arrangement of this sort. Moreover, it is generally not recognized that passengers may pay less through a separate collection at the airport than they would if such a charge is collected through the fare structure. This is because any increase in fares attracts agents' commissions. There are also administrative costs associated with passing through the amount to passengers in the fare structure [IATA, 1981f]. Table 2.4 gives a summary of the advantages and disadvantages of the various collection methods, as suggested by IATA.

In July 1970, ECAC issued a recommendation which was accepted by practically all European countries and was implemented in April 1971 [Plaignaud, 1977]. Since then in Europe, the passenger charge has been levied

Table 2.4

Source: [IATA, 1981f]

ADVANTAGES AND DISADVANTAGES OF VARIOUS
COLLECTION METHODS OF PASSENGER SERVICE CHARGE

	SEPARATE COLLECTION AT AIRPORT				
	By Airport Authority				
	1. At Counter	2. Vending Machine	3. By Airline	4. By Third Party	5. Incorporated in Fare
ADVANTAGES	• Immediate cash to the Airport • Authority requiring money keeps responsibility of collection • No intermediary = collection costs low	• Immediate cash to the Airport • Authority requiring money keeps responsibility of collection • Administration costs low • Saves personnel • No intermediary = collection costs low	• Administration costs low • Saves personnel • More convenient to airport • Collection point more convenient to passengers	• Most convenient to airport and airline	• Avoids delays at airport • Most convenient for passenger and airport
DISADVANTAGES	• Currency problems • Increased check-in time	• Currency problems • Maintenance reliability	• Currency problems • Increased administration costs and commission • Increased check-in time	• Currency problems • Increased administration costs • Increased check-in time	• Increased administration costs and commission • Difficulty of taking into account possible stopovers

on the airline and the charge is considered as part of the fare. The airlines are not authorized to recover it from the passenger through separate payment. The charge is paid to the airport by the airlines on presentation of a bill.

When the passenger-service charge is collected through them, airlines generally take the attitude that it should not be considered a passenger-service charge but a variable addition to the landing fee. This view is shared by the German Airport Authority (ADV) and, since November 1968, the landing fee at West German airports has been split into two parts: a fixed part which is related to aircraft weight (the original landing fee) and a variable part which is related to the number of passengers (the passenger service charge) [Plaignaud, 1977].

In some countries, the amount of passenger charge payable depends on the flight destination. For example in Singapore, passengers going to Malaysia and Brunei pay S$5 per departure. Passengers bound for other countries pay S$12. Transit passengers are exempted from payment. Appendix 2A gives a summary of the amount of passenger service charges and the collection methods used in various International Civil Aviation Organization (ICAO) contracting states.

The passenger-service charge was introduced in the United States by certain municipalities such as Evansville (Indiana), Philadelphia (Pennsylvania), Richmond (Virginia), Mobile (Alabama), Sarasota (Florida) and Saginaw (Michigan). It was commonly referred to as the "airport tax". This charge was net with vigorous protest by airlines and passengers. In 1973, the U.S. Federal Aviation Act of 1958 was amended to prohibit the collection of any such charges from passengers [Fromme, 1974; Plaignaud, 1977]. Under current law, with the exception of a $3 passenger "head tax" on international travelers, only the airlines' fare and the federal government's user tax can be allowed to impact directly on the U.S. traveler. Airports in the United States must then attempt to recover passenger-related costs indirectly through rentals, concessions, and landing and other fees.

Passenger-service charges are currently imposed in 127 nations out of the 141 countries for which data are available. Eight years ago, only 90 nations imposed such charges [AOCI, 1982].

2.5 Fuel Throughput Charges

At some airports, the authorities concerned are responsible for fuel facilities such as underground fuel hydrant systems. The cost of financing, operating and maintaining these facilities may be recovered through what is known as fuel throughput charges. Fuel throughput charges are tariffs levied on airline fuel purchases and they are normally collected from the airline operator according to the amount (as opposed to the value) of fuel uplifted. The amounts collected vary from airport to airport.

In the United States, fuel throughput charges are often collected from general-aviation operators in lieu of landing fees [Levine, 1969]. The amount is about US $0.05 per gallon of fuel uplifted [Lim, 1980]. Few air carrier airports charge air carriers for fuel uplifted. The few which do include Honolulu International and Anchorage International.

Some authorities impose fuel throughput charges as part of the rental or concession arrangements made by the airports with fuel suppliers who provide their own installations at the airports. Under this type of arrangement, fuel throughput charges are actually fees collected by airport operators from the fuel suppliers for granting rights to perform refueling within the airport boundaries. The fees are therefore not classified as aeronautical charges and are justified on the grounds that the revenue goes directly or indirectly to support the aviation facilities at the airport. However, the fuel concessionaires often consider these charges as a component of their costs. Thus, the fees are often passed on to the airlines as an add-on to their normal invoices for fuel. As concession fees, by definition, do not necessarily have to be related to any airport operator's cost, they can be quite substantial. Airlines, individually and through their associations, have expressed strong concern over this matter. It is argued, in addition, that, if airlines are already paying landing and parking fees based on maximum certified take-off weight which assumes maximum fuel capacity, the fuel element is taken into account thrice in applying airport charges.

Airports like Copenhagen, Casablanca, Buenos Aires, Manila, Tenerife and Caracas have recognized fuel charges as aeronautical revenues [Denmark, 1981a]. In 1969, the Danish Government decided to abolish fuel throughput charges for international flights from Danish state-owned airports. In 1971, the charges were abolished for domestic flights as well. The revenue formerly derived from the fuel charge was substituted by an appropriate increase in landing rates [Denmark, 1981b]. The replacement of fuel throughput charges by an increase in landing rates was welcomed by the airlines. It has also proved to be advantageous to the airport authority in Copenhagen. Such advantages and disadvantages, and the reasons which led to the Danish Government's decision to replace the fuel charges, are discussed in detail in a paper presented by Denmark at the 1981 ICAO Conference on Airport and Route Facilities Economics [Denmark, 1981b].

2.6 Noise or Nuisance Charges

Measures aimed at mitigating the effects of noise pollution may be adopted at airports where noise is a major problem. These measures include noise curfews, land-use planning around airports, operational measures for noise abatement, construction of new airports or runways and sound-proofing/acoustical installation. Table 2.5 gives a summary of the types of noise-alleviation measures and the number of countries in each ICAO region that have adopted the measures.

Noise or nuisance charges may be levied to pay for a particular noise-reduction program or to provide once-only compensation to affected residents, as well as to dissuade airlines from using airports at certain times of night, or to encourage them to acquire quieter aircraft. Appendix 2B gives a list of noise-alleviation measures which involve costs to an airport.

In France, a levy for the purpose of reducing nuisance to communities around Orly, Charles de Gaulle and Le Bourget Airports was introduced in February 1973. The levy (3 French francs per passenger on international flights, 1 French franc per passenger on domestic flights) is collected by Aeroport de Paris, which administers the resources in a special, independent, extra-budgetary account [Plaignaud, 1977]. A plan calls for replacement of this fee at these airports with a charge to be calculated by applying a progressive percentage in relation to the noise caused by the aircraft to the landing fees due [ICAO, 1981e].

The government of the Netherlands introduced noise-related charges based on aircraft noise levels according to the standards of ICAO Annex 16 and FAR part 36. The charge is computed using the following formula:

$$H = C \times n \times W^{2/3} \qquad (2.1)$$

where W is the maximum allowable take-off weight in metric tonnes, n is a factor depending on the aircraft noise category, and C is a monetary factor. The derivation of this charging formula is given in Appendix 2C.

Table 2.5

TYPES OF NOISE ALLEVIATION MEASURES AND THE NUMBER OF COUNTRIES ADOPTING THEM

TYPES OF MEASURE	REGIONS					WORLD	
	AFRICA (AFI)	EUROPE (EUR)	CARIBBEAN AND SOUTH AMERICA (CAR/SAM)	MIDDLE EAST/ SOUTH EAST ASIA (MID/SEA)	NORTH ATLANTIC/ NORTH AMERICA AND PACIFIC (NAT/NAM/PAC)	Number of States	%
1. Noise curfews	-	15	2	4	3	24	30
2. Land use planning around airports	5	16	9	10	3	43	54
3. Operational measures for noise abatement	2	21	6	14	2	45	57
4. Construction of new airports or runways	5	8	5	10	2	30	38
5. Compensation and other payments for aircraft noise including sound proofing/ accoustical installations	-	9	1	3	1	14	18
6. Noise related charges	-	9	-	1	-	10	13
7. Other measures	1	17	6	9	3	36	46
Total number of States responding	15	24	15	21	4	79	100%
Total number of States in Region	48	27	26	38	4	143	-

Source: Report on Measures adopted or planned to deal with Noise Problems at Airports (State Letter EC 2/46-79/25, 22 February 1979).

Other countries which levy noise charges include Japan, Switzerland, the Federal Republic of Germany and the United Kingdom. In the United Kingdom, the British Airports Authority (BAA) scheme involves rebates rather than additional charges. Noise-abatement measures are financed out of general airport revenues.

One can then identify three categories of noise or nuisance charges:

-- "Redistributive" charges, which are charges collected to finance a noise-exposure reduction program. (An example of this is the levy introduced in France.)

-- "Punitive" charges, i.e. those designed to penalize noisy aircraft. (An example of this is the noise charges introduced by the government of the Netherlands.)

-- "Incentive" charges, i.e. those designed to induce airlines to use less-noisy aircraft or retrofit aircraft. (An example is the BAA's scheme which involves a rebate.)

Many airlines object to paying "redistributive" noise-related charges and feel that government agencies concerned must also meet their share of the burden. This is because, it is argued, airlines over the years have spent large sums of money on noise-abatement measures such as buying quieter aircraft, suffering fuel and payload penalties by carrying noise-suppressive hardware, operating on noise-preferential runways, and flying minimum-noise routes that avoid populated areas, which often increase route mileage and fuel consumption. In addition, airlines must adhere to noise-abatement procedures on landing and take-off, and purchase ground equipment to reduce noise during ground running. Furthermore, airlines are subject to curfew restrictions at numerous airports.

Some airlines have also been required to meet regulations covering the noise of older in-service aircraft at significant cost. This is especially true if the compliance date requires aircraft to be retired and replaced earlier than in the absence of such regulations.

Airlines thus feel that federal and local governments are jointly responsible with other parties (including the airlines) for the existence of the noise problem. After all, this argument goes, it is the governments which select sites for airports and control use around them, certificate the aircraft flown by the airlines, and have final authority regarding international agreements and national policies under which airlines operate. In some cases, governments have adopted policies which have the effect of delaying introduction of quieter wide-bodied aircraft at their airports. Some governments have also encouraged expansion of air traffic to benefit the community to which they are answerable.

Airlines also feel that they have made strenuous efforts to fulfill their responsibilities in contributing to the solution and will continue to do so. Further action on the part of airlines to reduce noise depends on advances in technology and available finances. It is said that "incentive" charges will not have the effects anticipated by their proponents. In fact, "incentive" charges may have the opposite effect. Airlines are anxious to introduce quieter aircraft as soon as possible, and any noise-related charges can, according to them, only delay their financial ability to do so [IATA, 1981c].

"Punitive" charges are viewed by the airlines as a form of taxation. Penalties collected are added either to the general tax revenues of the country or the capital reserves of the airports concerned. The International Air Transport Association (IATA) is strongly opposed to such charges. IATA reasons that the charges contradict International Civil Aviation Organization (ICAO) policies on taxation in the field of International Air Transport [ICAO Document 8632-c/968] which call for aviation to be exempted from all taxes "regardless of the names attached to them" [IATA, 1981c].

2.7 Security Charges

Most international airports have taken exceptional security measures in recent years and are equipped with expensive means of control and surveillance for the protection of passengers and aircraft. The measures taken include inspection/screening of passengers and cabin baggage, security in arrival and departure lounges (including transit/transfer lounges), security of airside areas, and security of landing areas. Usually there are many parties involved in the provision of security at a single airport. The parties include the airport administration, airlines, local/municipal government and national government. Table 2.6 presents a summary of the results of an ICAO survey on the spread of responsibility among various parties for different security functions.

That survey conducted in 1980 indicated that airport security costs fluctuated widely among airports, both in absolute terms and on a per-passenger basis. The amounts ranged from a low of US $0.01 to a high of US $1.68 per passenger among the 23 airports responding to the survey. In most cases, however, the cost-per-passenger was in the US $0.10 - 1.00 range. It was also noted that these figures may not reflect the total airport security costs, but only those security costs incurred by airport administrations [ICAO, 1981g].

Table 2.6

AUTHORITIES INVOLVED IN THE PROVISION OF DIFFERENT SECURITY FUNCTIONS*

(Figures in brackets indicate number of States where the authority is solely responsible)

Function Provided / Authority	Inspection/ Screening of Passengers and Cabin Baggage	Security in Departure/ Arrival Lounges, Including Transfer/ Transit Lounges	Security of Airside Areas	Security of Landside Areas
	NUMBER OF STATES			
Airport Administration	14 (6)	22 (4)	21 (3)	23 (2)
Airline(s)	11 (6)	6 (1)	12 (1)	4 (1)
Local/Municipal Government (Local/municipal police, etc.)	5 (2)	7 (0)	6 (0)	13 (2)
National Government:				
- Military/police or other national security forces	31 (21)	36 (23)	36 (19)	37 (18)
- Civil Aviation Administration (functions not provided at airport administration level)	8 (3)	7 (2)	12 (2)	10 (1)

*A total of 51 states responded to the survey

Source: [ICAO, 1981g]

The considerable additional expenditures that have been necessitated by airport security measures have given rise to questions concerning the responsibility for the financing of these measures. Some governments claim that such security measures involve much more than simply maintaining law and order at airports. Moreover, only a relatively-small percentage of the population travel by air. Consequently, it is argued, the population at large should not be expected to pay through general taxation for security measures at airports which it does not use and cannot afford. The conclusion is that users should bear the cost.

At some airports, the costs of these security measures are indeed recovered through the usual passenger service charge or other regular sources of revenues. At other airports in countries like Canada, the Philippines, Switzerland and the United Kingdom, these costs are recovered through a separate charge known as the "security charge". Table 2.7 lists the airport security charges in these countries.

2.8 Enroute Charges

Enroute air navigation charges or airways charges are those fees paid by the airlines for the use of enroute navigation aids, air traffic control services, the supply of information on weather conditions, and the provision of ground-based communication services required in the identification and separation of air traffic. Some countries do not levy any airways charges. Some recover the entire cost of the services they provide, while others recover only a part. As mentioned earlier, in a few countries the air navigation charges are included in the landing fees.

Table 2.7

SECURITY CHARGES - 1980

Country	Levied by	Amount
Canada	Transport Canada	C$0.20 (US$0.11) per enplaned passenger
Phillipines	--	10 pesos (US$01.36) per departing international passenger 2 pesos (US$0.27) per domestic passenger
Switzerland	Airport operator	3 Swiss Franc (US$01.82) per passenger
United Kingdom	Department of Trade	1.60 (US$3.72) per arriving passenger on the airport authorities

Notes: Sri Lanka charged each airline a lump sum for the purchase of security equipment.

Source: [ICAO, 1981g]

In 1967, only 40 states levied route facility charges. In 1971, the number rose to 61 states, which included 10 states applying the charging scheme introduced by the European Organization for the Safety of Air Navigation (Eurocontrol). The number increased substantially in the following years, reaching 105 states by 1978 [ICAO, 1981f].

The methods used to compute air navigation tariffs or enroute charges differ substantially around the world. Some countries like Burma levy a single fixed charge and differentiate between overflying and landing flights. Such simple charges thus may disregard the aircraft weight and the distance flown within a country's airspace.

There are several specialized international organizations providing unified air traffic control services for their members and contracting states. The three main such organizations are Eurocontrol, the Corporacion Centroamericano de Servicio de Navegacion Aerea (COCESNA) and the Agence pour la Securite de la Navigation Aerienne en Afrique et a Madagascar (ASECNA). Tables 2.8, 2.9, and 2.10 list the members and contracting states of Eurocontrol, ASECNA and COCESNA, respectively. The charging systems used by the three agencies are very similar. The basic scheme was originally developed by Eurocontrol and has been endorsed by the International Civil Aviation Organization (ICAO). In this system, a single charge is invoiced for the enitre area served by the participating states. Whatever the number of states overflown, the single charge for any given flight is the sum of the individual charges calculated for each state overflown. The charge for each state, r_i, is calculated according to the formula:

$$r_i = t_i \times N \qquad (2.2)$$

Table 2.8

MEMBER AND CONTRACTING STATES OF THE EUROPEAN ORGANIZATION FOR THE SAFETY OF AIR NAVIGATION (EUROCONTROL)

Austria
Belgium
France
Germany, West
Ireland
Luxembourg
Netherlands
Portugal
Spain
Switzerland
United Kingdom

Table 2.9

MEMBER AND CONTRACTING STATES OF THE CORPORACION CENTROAMERICANO DE SERVICIO DE NAVEGACION AEREA (COCESNA)

Belize
Costa Rica
El Salvador
Gutemala
Honduras
Nicaragua

Table 2.10

MEMBER AND CONTRACTING STATES OF THE AGENCE POUR LA SECURITE DE LA NAVIGATION AERIENNE EN AFRIQUE ET A MADAGASCAR (ASECNA)

Benin
Cameroun
Chad
Congo
Gabon
Gambia
Ivory Coast
Madagascar
Mali
Mauritania
Niger
Senegal
Togo
Upper Volta
France

where t_i is the service unit rate for the state concerned. The service unit rate for each state is given in U.S. dollars. t_i is obtained by dividing the annual expenditures for the route air navigation facilities and services included in the basis of assessment by the number of service units generated in country i's airspace during the reference year. N is the number of service units generated by the user aircraft, as calculated according to the formula:

$$N = d \times p \qquad (2.3)$$

where d is the distance factor obtained by dividing the distances flown by 100 and p is the weight factor. The distance flown is the "great circle" distance in kilometers between the aerodrome of departure within, or the point of entry into the airspace of the given state, and the aerodrome of first destination within, or the point of exit from that airspace. A standard 20-kilometers deduction for each take-off and/or landing is taken into account as appropriate, so as to allow for the services provided by approach facilities.

The three organizations incorporate differing weight and distance factors in their charging formulas. The weight factor used by Eurocontrol is derived by means of the continuous functions

$$p = \sqrt{\frac{\text{maximum take-off weight (in metric tonnes)}}{50}} \qquad (2.4)$$

The charging formulas of ASECNA and COCESNA employ a stepped scale but different weight intervals. For the purpose of comparison, the effects of the weight factors applied in these three systems are shown in Table 2.11 and Figure 2.1. The effects of the distance factors used in the three charging systems are shown in Figure 2.2.

Table 2.11

RELATIVE VARIATION IN THE WEIGHT FACTORS
APPLIED IN PARTICULAR CHARGING SYSTEMS

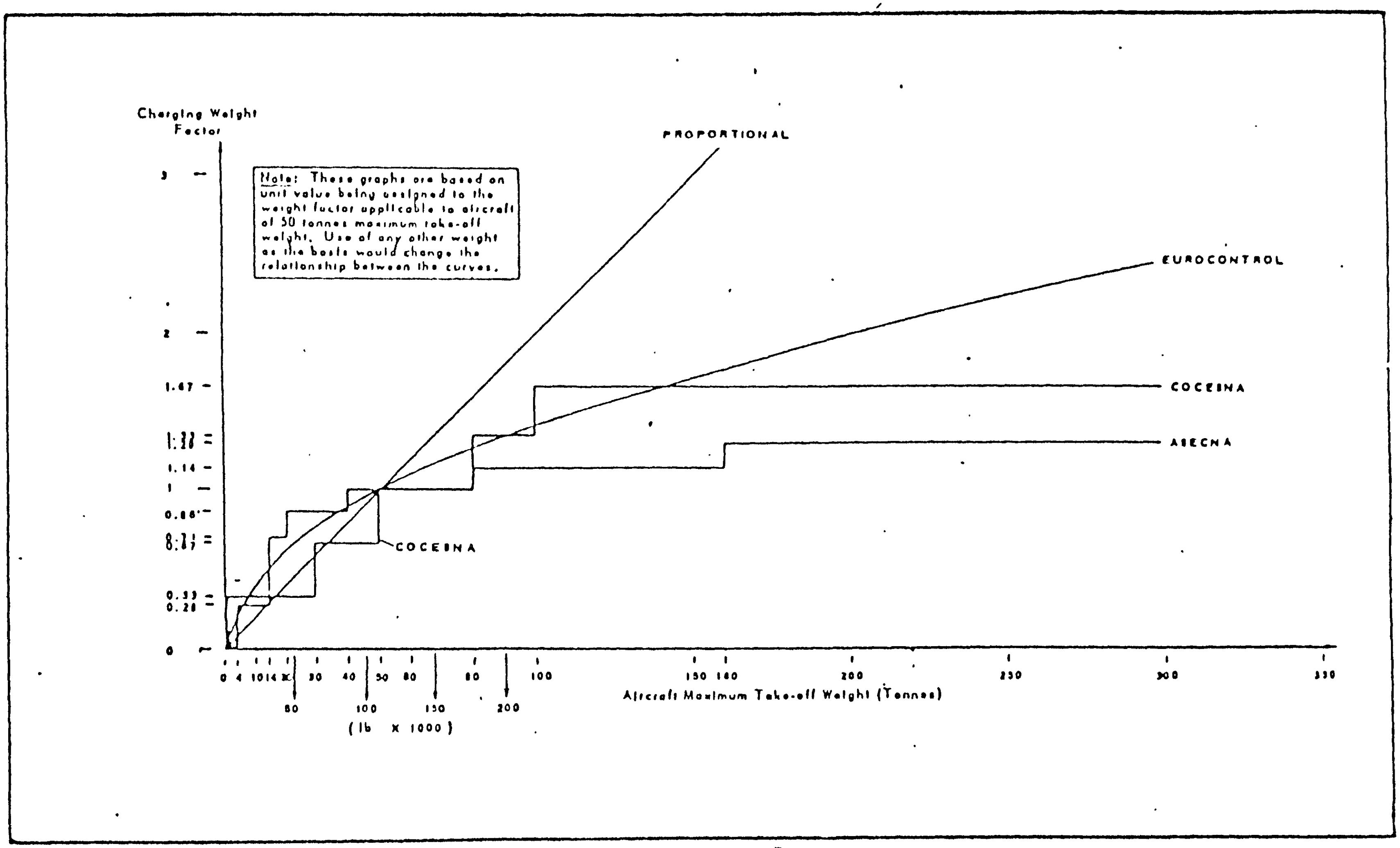
(Weight factors converted to a base of unit value)
(for a maximum take-off weight of 50 tonnes)

Aircraft Maximum Take-off Weight		Charging Weight Factor		
lb X 1000	tonnes	EUROCONTROL	ASECNA	COCESNA
	0	0	0	0
	4	0.28	0.28	0.33
	10	0.45	0.28	0.33
	14	0.53	0.71	0.33
	20	0.63	0.86	0.33
50				
	30	0.78	0.86	0.67
	40	0.89	1	0.67
100				
	50	1	1	1
	60	1.10	1	1
150				
	80	1.23	1.14	1.33
200				
	100	1.42	1.14	1.67
	150	1.73	1.14	1.67
	160	1.79	1.29	1.67
	200	2	1.29	1.67
	300	2.45	1.29	1.67
Weight Breakpoints		Continuous	4-14-20-40-80-160 (in tonnes)	50-100-150-200 (in lb)

Source: Manual of Airport and Air Navigation Facility Tariffs, Doc 7100-AT/707, 1975 Edition

Figure 2.1

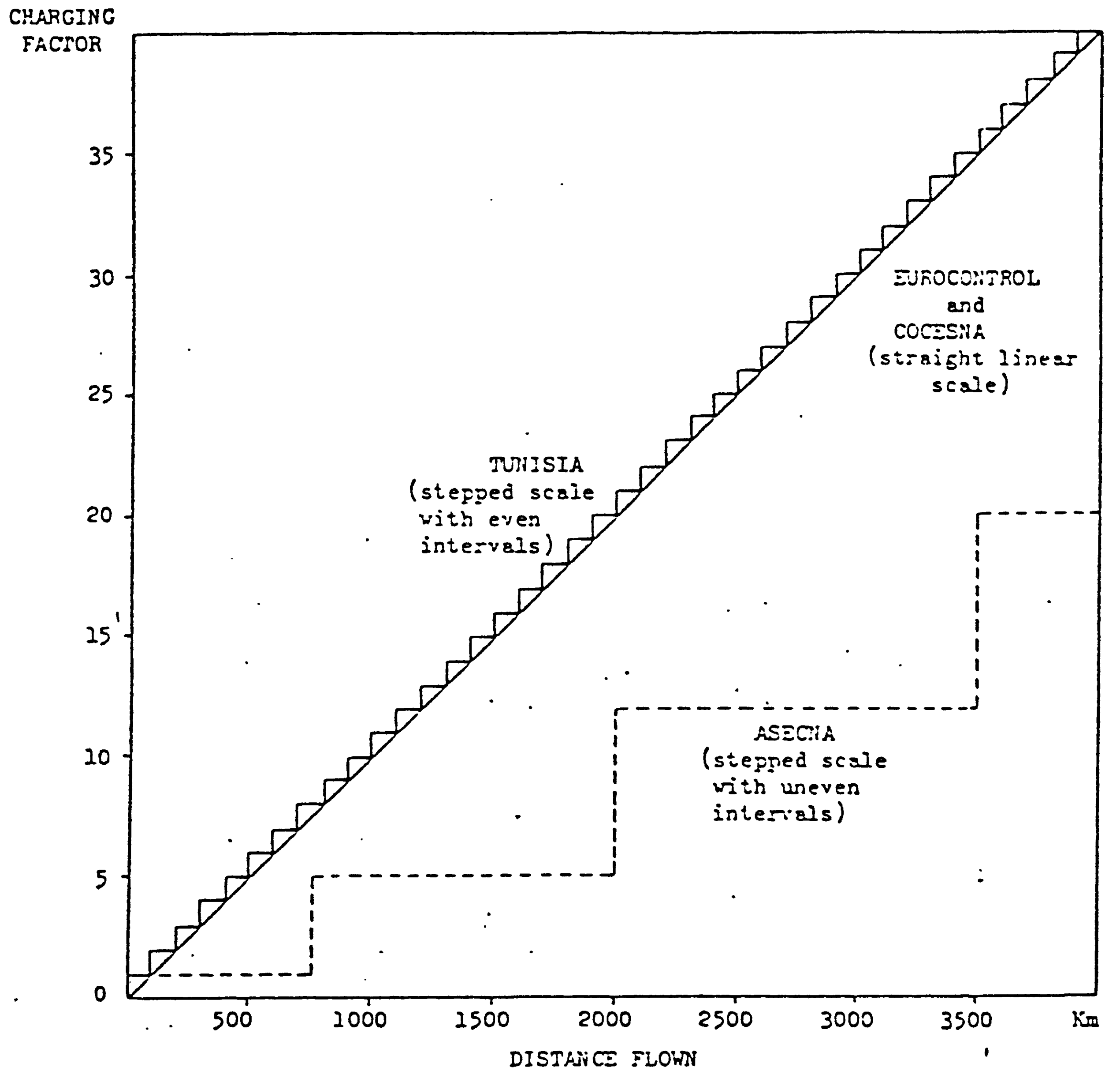
RELATIONSHIP BETWEEN AIRCRAFT WEIGHT AND THE CHARGING WEIGHT FACTOR



Source: [ICAO, 1976b]

Figure 2.2

EXAMPLES OF DISTANCE SCALES
USED IN CHARGING SYSTEMS



Source: Manual of Airport and Air Navigation Facility Tariffs, Doc 7100-AT/707, 1975 Edition

The service rate is the sum of two components: a national service rate and a regional administrative-unit rate. The former is used to cover enroute service of the given states and the latter is for recovering the costs of collecting enroute charges.

The charging system described above is currently used by many countries. The system is in full accordance with the ICAO recommendations and standards. However, many airlines have claimed that the system is "unfair". This is because of the use it makes of the weight factor. Airlines argue that weight should not be used as a factor in computing charges for enroute service, because some heavy aircraft such as the B747 actually require fewer enroute services than lighter ones. The service required by an aircraft depends on the air navigation technology available aboard the aircraft [Goodson, 1982]. Similarly, general-aviation aircraft may require more services than larger aircraft. Factors such as altitude, duration and frequency of flights have been suggested to replace the weight factor. However, none have been found satisfactory. This is because the exact influence of these factors on the costs that a given flight imposes on the air traffic control is not easily measurable [ICAO, 1976b]. Questions of this type will be addressed in detail in Chapter 5.

Chapter 3

A MODEL OF THE PROCESS OF COST ALLOCATION AND USER-CHARGE DETERMINATION

3.1 INTRODUCTION

It was indicated in Chapter 1 that comparisons among aeronautical user charges in various parts of the world continue to be attempted, perhaps with increasing frequency. As well, at its outset, one of the principal objectives of the research reported here was the performance of "systematic comparisons" among user charges at international airports.

It soon became clear, however, that this was an unrealistic goal. The fundamental reason for this is that the policy guidelines, legal and institutional environments, economic conditions and accounting practices that underlie the determination of aeronautical user charges, vary so widely around the world (often even within the same country) as to make meaningful direct comparisons nearly impossible. There may be excellent reasons, for example, why the landing fees paid by identical aircraft at two seemingly similar airports in two economically-similar countries may differ greatly from each other.

One of the principal conclusions of this work is then that direct comparisons of this type should be avoided: they are fraught with pitfalls and likely to be misleading. Instead, it is recommended that user charges at international airports and at enroute air navigation facilities be examined on a case-by-case basis. The aim should be to determine whether, in the context of the conditions under which the aeronautical service or facility is provided, the user charges imposed are "reasonable" and "fairly and thoughtfully computed". To address these issues, one must review carefully and systematically in each case the approach used to determine user charges and the assumptions and policies that underlie this approach.

The aim of Chapter 3 is to present what could be described as a "normative model" for conducting such a review. Specifically, on the basis of the insights gained during this research, we shall review the steps that must be carried out by a provider of aeronautical services in order to determine and specify a system of user charges. These steps include:

a. Postulating the policy guidelines that should be followed.

b. Developing a cost base.

c. Allocating costs in the cost base among the various cost and revenue centers of the aeronautical facility.

d. Allocating costs associated with each center among the users of that center.

e. Arriving at a methodology for computing charges on each specific user.

f. Setting up a framework for interacting with users and soliciting user comments and general inputs.

In the following sections, we shall discuss each of the above steps in some detail. The emphasis will be on:

(i) Identifying the range of practices that exist around the world with respect to each of these steps.

(ii) Discussing some of the principal options available at each step.

(iii) Highlighting a few important points that the prospective reviewer of user charges should be aware of, including some common pitfalls.

(iv) Identifying certain areas where there may exist some room for improvement in prevailing international practices.

(v) Illustrating the discussion through a number of brief examples.

In Chapters 4 and 5, we shall provide further elaboration on some of the above items through a number of more detailed case reviews.

3.2 BASIC PREMISES

In evaluating systems of charges for airport and air navigation services, it is particularly important to understand at the outset the premises and objectives that underlie each such system. There are some fundamental choices that the airport organization or the government agency which sets these charges must make at an early stage. These choices, in turn, usually have a profound effect on the magnitude and allocation of user charges. We discuss here these fundamental choices:

3.2.1 Commercial Entity vs. Public Utility

A facility can be operated as a profit-seeking/profit-maximizing commercial entity; alternatively, it can be operated under the public utility concept that seeks to maximize "social benefits", however those are defined, subject to certain financial constraints and goals. "Breaking even" is not always a necessary condition ("constraint") under the public utility concept- although it may certainly be a goal.

Major international airports usually treat aeronautical and non-aeronautical services (see Chapter 1) differently on this account. Aeronautical services are almost always offered and priced in accordance to the public utility concept. By contrast, non-aeronautical services are increasingly being offered on a commercial basis. As noted in Chapter 2, however, the dividing line between what constitutes an aeronautical service and what does not is not well-defined in some instances, notably those of fuel-throughput charges, ground-handling charges and rents charged for various types of air terminal space occupied by airlines.

In the case of enroute air navigation services, the public utility concept seems to have been universally adopted around the world (or so it is claimed) although there has been some discussion recently in the United States and United Kingdom of the possibilities of privatizing some ATC services.

In the ICAO Statements, there is a clearly-implied endorsement of the public utility concept for aeronautical services (see §11, 12, 20, 27, 28 of Appendix 1A).

3.2.2 Residual vs. Compensatory Approach to Aeronautical Service Charges

One can identify two distinct approaches to the treatment of charges for aeronautical services at airports. (The issue does not arise in the case of enroute air navigation charges since, in that case, all services provided are of an aeronautical nature.) Under the first approach, aeronautical users (airlines, general aviation) pay charges which, in the aggregate, are equal to the costs of the facilities they use. (The issue of how these costs are determined and how they are allocated to users will be discussed later in this chapter.) This first approach is the compensatory one.

Alternatively, under the residual cost approach, aeronautical users pay charges which are designed to cover the difference between total costs of the airport[1] (including, possibly, a desired return on investment) and total revenues from all non-aeronautical sources. Thus, under the residual cost approach, aeronautical users may end up paying more or less than the costs of the facilities they use, depending on whether revenues from non-aeronautical users fall short or exceed, respectively, the costs of facilities used by such non-aeronautical users. In practice, since non-aeronautical services are usually offered according to the commercial entity concept as noted above, it is often true that revenues from non-aeronautical services usually exceed the cost of providing these services, i.e. the airport makes a "profit" from such services. Under the residual approach this profit is then applied toward

1

In an airport which is externally subsidized, a recovery target of "total costs less the amount of the subsidy" will be set.

reducing charges to aeronautical users. Note that under the compensatory approach, this same profit would become a true profit for the airport, since aeronautical users would still cover the full cost of aeronautical services (or whatever portion of aeronautical costs is not covered by an external subsidy).

In conclusion, the residual approach gives rise to cross-subsidization of aeronautical users by non-aeronautical users (or, more rarely, the other way around) and/or of some cost centers (e.g., air terminals, cargo terminals) by other cost centers (e.g., industrial parks, landside facilities such as parking garages).

There are two principal reasons why airport or government authorities may opt for the residual approach which, as just noted, often results in lower charges to aeronautical users. First, because users are often requested to offer certain "facilitations", in exchange, to the airports. Examples of those, often encountered in the United States, include guarantees by the airlines of loans secured by the airports (which facilitate raising of capital and reduce interest costs) and signing by the airlines of long-term lease agreements (which are beneficial to the stability of the airport in the long run). The second reason is more simple: by raising the possibility of reduced charges because of use of the residual approach, the airport may be able to attract more aeronautical users or a higher volume of aeronautical uses which, in the end, is also likely to lead to increased non-aeronautical revenues as well.

As §20 of the <u>ICAO Statements</u> make clear, the use of the residual approach is by no means rejected and, in fact, may be the one preferred by most of ICAO's members.

3.2.3 Self-Sufficiency vs. Subsidies from General Funds

A third fundamental *a priori* choice is the extent to which local, state or national governments are willing to provide (direct or indirect) subsidies for an airport or enroute air navigation organization or whether these governmental entities require or expect, instead, that users fully cover all airport or air navigation costs (including capital investment costs, interest costs and, possibly, a "fair return on investment"). For example, many countries still charge nothing or very little for enroute air navigation services over their territories. Others, recover only a pre-specified part of air navigation costs from users, paying for the rest through general funds. Finally, a third group of countries opts for full recovery of air navigation costs from users. The Eurocontrol system, to be discussed in detail in Chapter 5, provides a good illustration of all these possibilities: until 1971, enroute air navigation was a free service in Eurocontrol airspace; between 1971 and 1981, Eurocontrol participant states subsidized by agreement (increasingly smaller) fractions of service costs; and, since 1981, Eurocontrol has sought and achieved full-cost recovery through user charges (with the exception of the costs of some categories of exempted flights which are recovered through government subsidies).

In the case of airports, subsidies can take many forms. An obvious example is the practice followed in many countries, especially less-developed ones, of including airport capital expenditures in the program of national infrastructure investments and thus paying for those with general funds. In other cases, it is recognized that the volume of traffic at a particular airport is so low as to make it unrealistic to expect recovery of costs through user charges, thus necessitating a subsidy. In a less-obvious case, the issuing (by municipal and other governments) of general obligation bonds to finance capital investments in airports (a very common practice in the United States) is a form of indirect subsidy to airport users, since this practice reduces capital costs for airports (as well as reducing the potential for borrowing for other purposes by the governments involved).

The ICAO Statements on this subject, while recognizing that "under favorable circumstances" airports may be able to achieve full recovery of costs through user charges (§12 (vii) of Appendix 1A), also make a special plea to member-countries to consider the "broader economic impact" of airports and enroute air navigation facilities on national economies, and (by implication) to consider providing subsidies to aeronautical users (§9 and, especially, 29 of Appendix 1A) in recognition of such national benefits.

To summarize the main point of this section, consider two airports A and B which are identical in every respect (same costs, same demand volume and characteristics) but the following: Airport A, to take an extreme example, is operated under the public-utility concept for aeronautical services and under the commercial-entity concept for non-aeronautical services, takes a residual-cost approach toward determining charges on aeronautical users and receives a number of indirect and direct subsidies from various governmental entities; by contrast, Airport B -- while also using the public- and commercial-entity concepts for aeronautical and non-aeronautical services, respectively -- has actually done little to develop non-aeronautical activities on its premises, uses a compensatory approach in computing aeronautical user charges and receives no external subsidies. Under such circumstances, it is reasonable to expect that aeronautical user charges will be (perhaps substantially) lower at

Airport A than at B, despite the fact that the true total airport costs are about the same in both cases.

3.3 THE COST BASE

The second step in evaluating systems of aeronautical charges is concerned with examining and gaining an understanding of the cost base that such charges are designed to cover. In this section the various items that comprise such cost bases will be reviewed to varying degrees of detail, with particular emphasis on capital- and interest-related costs. The discussion, for the most part, applies equally well to airports and to air navigation facilities.

ICAO recommends that airport and air navigation facility expenses be classified by item according to the breakdown shown in Table 3.1. For airports, ICAO recommends that expenses be also classified by area of service according to the scheme shown in Table 3.1. Classification by area of service requires development of a cost-allocation system, a topic which will be discussed in the next section.

We now turn to the various expense items at the top half of Table 3.1.

3.3.1 Salaries

This item, according to the ICAO definition, is intended to cover not only direct remuneration to personnel but also such other costs as social and medical insurance, pension contributions, all other employee benefits, "remuneration in kind" (e.g. board and accommodations), travel subsistence allowances, etc.

In the case of airports, one is likely to encounter large differences with respect to this item from location to location and from country to

Table 3.1

CLASSIFICATION OF AIRPORT EXPENSES

ICAO Recommendation

A. Expenses by Item

1. Salaries
2. Supplies and services
3. Depreciation/amortization
4. Interest
5. Administrative overheads
6. Taxes
7. Other expenses

B. Expenses by Area of Service

1. Aircraft movement areas and associated lighting
2. Passenger and cargo terminal facilities
3. Hangar and maintenance areas
4. Firefighting, ambulance and security services
5. Air traffic control (including communications)
6. Meteorological services
7. Other expenses

country. Aside from the obvious fact that pay scales and employee benefits vary dramatically around the world, a second important area of differences concerns the number of individuals who are employed by airport organizations. These latter differences in the number of personnel stem: (i) from differences in the productivities achieved "per employee" at different airports and (ii), perhaps more importantly, from the fact that airport organizations do not all offer the same services to users. For example, U.S. airport authorities, as a rule, do not offer any ground handling services themselves, leaving it up to the airlines to either self-provide these services or to contract with specialized contractors/agents for this purpose. By contrast, many European airport organizations support a full slate of such services themselves through their own personnel and, in fact, are often required to do so by national law. As ground-handling is usually very labor-intensive, this practice results in some European airport organizations employing several thousand personnel while, at most U.S. international airports (that often serve many more passengers per aircraft than their European counterparts) the number of airport authority employees rarely exceeds a few hundred. (This point is discussed in considerable detail in Chapter 6.) For another example, terminal area ATC personnel in some countries are treated as airport authority employees and their salary costs are included in the list of airport expenses (this is consistent with ICAO recommendations) whereas, in other countries, including the United States, the costs of these individuals are allocated to the national ATC organizations which also provide enroute air traffic control services.

In reviewing an airport's cost base, it is then extremely important to inquire on the number and functions of personnel covered, as this is likely to vary widely by location and country.

3.3.2 Supplies and Services

This rather-obvious item covers, according to the ICAO definition,

> "the costs of spare parts and consumable materials incorporated or expended in providing all airport facilities and services and in operating and maintaining fixed assets (including durable equipment such as vehicles, machinery, furniture and fixtures, tools, etc.). Included also are the costs of supplies and services required for heating, air-conditioning, lighting, water, sanitation, postage, etc. Payments made to other agencies or enterprises for provision of airport facilities and services should also be included under this item." [ICAO, 1977]

3.3.3 Depreciation and/or Amortization

3.3.3.1 Definition and Approaches

Depreciation and amortization refer to "the amount by which the value of assets has decreased during a year due to physical deterioration, obsolescence and such other factors as limit their productive life" [ICAO, 1977]. Also, to be included under this item are "amounts by which intangible assets (e.g. developmental and training costs) have been written off during a year" [ICAO, 1977]. In practice, these expenses relate to long-lived assets, such as plant and equipment, buildings, runways, taxiways, etc. It should be noted, however, that land is not depreciated in accounting practice because its useful life is unlimited. In contrast, the service life of runways, buildings, equipment and the like is limited. Therefore, a fraction of their cost is chargeable as an expense in each of the accounting periods of their life.

Depreciation and amortization are computed as a fraction of the value of the initial assets which are being depreciated. It is, therefore, crucial to understand well how this initial value has been computed. The correct approach is as follows:

Let V_0 denote the value of an asset (facility, equipment, etc.) at the time when this asset is commissioned. Let that time be indicated by i_0. In most cases, in order to develop that asset, capital costs have been incurred 1,2,3, ... years before the commissioning of the asset. Let then C_{-1}, C_{-2}, C_{-3}, ... indicate these capital costs 1,2,3, ... year before the commissioning and similarly, i_{-1}, i_{-2}, i_{-3}, ... the interest rates 1,2,3, ... years before the commissioning. We then have for the sought value V_0:

$$V_0 = C_{-1}\ (1+i_{-1}) + C_{-2}\ (1+i_{-2})\ (1+i_{-1}) + C_{-3}\ (1+i_{-3})\ (1+i_{-2})\ (1+i_{-1}) + \ldots \quad (3.1)$$

This equation gives the correct expression for V_0. Note that when the interest rates are constant from year to year, i.e. $i=i_{-1}=i_{-2}=i_{-3}=\ldots$, then (3.1) reduces to the more familiar form

$$V_0 = C_{-1}\ (1+i) + C_{-2}\ (1+i)^2 + C_{-3}\ (1+i)^3 + \ldots \quad (3.1a)$$

The amount V_0 is sometimes referred to as the historical cost of an asset (see also the next subsection).

Once the amount V_0 has been computed, the depreciation expense for an accounting period depends on three factors which are determined either arbitrarily or by judgement:

1 - the useful life of the asset: runways, taxiways and aprons have usually a longer service life than electrical or control equipment or vehicles. As an example, Table 3.2 shows estimated useful lives of assets owned by the British Airports Authority in 1981.

2 - the residual (or salvage) value at the end of the useful life of the asset. This is usually small and uncertain and is often disregarded.

TABLE 3.2

USEFUL LIVES OF VARIOUS ASSETS OF
THE BRITISH AIRPORTS AUTHORITY (1981)

	Minimum Life in Years	Maximum Life in Years
Freehold Buildings		
Terminals and Other Operational Buildings and Installed Plant	15	40
Other	40	58
Runways, Taxiways and Aprons	23	59
Aerodrome Lighting	15	32
Main Services:		
Surface Car Parks and Fencing	10	45
Roads, Bridges, Tunnels, Drainage	30	55
Fixed Plant and Other Equipment:		
Electrical Control Equipment	7	7
Lifts, Lifting Equipment and Other Plant within Terminal Buildings	15	16
Electrical Distribution and Other Plant	25	54
Loading Bridges	15	17
Motor Vehicles and Mobile Equipment	4	22

3 - the method of depreciation. Three principal methods exist: (1) the Straight-Line Method, (2) the Double-Declining-Balance Method, and (3) the Sum-of-the-Year's-Digit Method. The first one is by far the most-often used in airport and air navigation services accounting. According to this method, an equal fraction of the net cost (acquisition cost less salvage value) is charged as expense during each year of the asset's useful life.

From the purely accounting point of view, depreciation is an expense and "accumulated" depreciation is the fraction of an asset's original cost that has been already matched against revenue. Thus, depreciation can be considered as "a process of allocation". It represents, to some extent, the amount of money that the company should set aside to purchase new assets. In the presence of high inflation, the replacement cost of an asset (in current prices) may be much higher than its historical cost, V_0. This consideration has given rise to a relatively-recent accounting practice called current cost accounting, which is discussed in the following subsection. It is worthy of examination because it is a departure from traditional practice and leads to radical changes in user charges.

3.3.3.2 Historical-Cost Accounting vs. Current Cost-Accounting

Traditional cost accounting is based on the concept of the historical cost of an asset, i.e., the price paid by a firm to acquire it (historical cost is also referred to as "acquisition cost". Thus, assume for example that an additional facility gets built at an airport and costs $2 million. The airport accountant will record this value on the balance sheet and, every year, subtract from it the accumulated depreciation. However, due to inflation, the price of replacing this facility 20 years from now will most likely exceed by a substantial margin the price originally paid for it. It may well be that this facility that cost $2 million in 1983 will cost $6 million (in current prices) to replace in the year 2000. The difference is due to the decreased purchasing power of the dollar over time. (It should be noted, however, that in deflated dollars, the replacement cost may be lower than the acquisition cost, due to technological advances.

Criticism of historical-cost accounting along the lines of the above example has existed since the early 1940's and some accountants have proposed a cost basis which would take inflation into account, namely replacement-cost accounting or current-cost accounting. This method was strongly resisted initially but, with the continued inflation of the 1970's, interest in current cost-accounting among aeronautical service-providers has grown. In effect, under historical-cost accounting, some items, such as runways and equipment, are stated in dollars reflecting purchasing power several years ago, whereas others such as current-expense items, are stated in dollars reflecting purchasing power of the present or the recent past. It is therefore argued that it does not make much sense to add these amounts together, since they are expressed in effectively-different monetary units.

This leads to the concept of current-cost accounting, on which much controversy has centered following the decision by the British Airports Authority to adopt such a system in 1981.

Under this procedure, certain assets and related expenses are restated so that they reflect the cost of replacing them. The valuation of such long-lived assets as land, runways, buildings and equipment, is made generally by professional appraisers. For other assets (e.g. vehicles, office machinery, etc.), the cost is adjusted using specific price-index numbers. Actually, value fixing of current assets depends largely on the assumptions that are made, and is much more art than science. "Current assets valuation is regarded as the main problem with current cost accounting, as it seeks to take into account inflation's real costs and distortions" (Carlson, 1982). In effect, prices may change for two reasons: inflation itself and technological progress. Simply converting historical cost to current dollars would not reflect the actual replacement cost of an asset if the current technology makes it easier and cheaper to develop this particular asset now. Thus, for example, it may well be that the replacement cost of a facility or equipment, such as a computer for an air traffic control system, is lower than the inflation-adjusted acquisition cost of this particular item, due to technical advances. Hypothetical figures which illustrate all of these ideas for a specific example are summarized in Table 3.3.

Thus, current-cost accounting takes into account changes in the prices of specific assets, whereas inflation-adjusted cost accounting, also called (paradoxically) Constant Dollar accounting[2] ("current dollar accounting" would be more appropriate) takes into account changes in the general purchasing power of the dollar, without reference to the nature of the assets.

3.3.3.3 Impact of Current-Cost Accounting

Whereas depreciation expenses remain constant under historical-cost accounting and a straight-line depreciation schedule, they increase from year to year under current-cost accounting (assuming that inflation will persist). The hypothetical example of Table 3.4 shows the depreciation expenses of a 20-year-service life-asset for 1982 (acquisition date), 1983 and 1984. As this example makes clear, the consequences of this new accounting system can be painful to airport and air navigation facility users. For example, partly as

[2]"Constant" means that all assets are stated in dollars reflecting the same purchasing power.

Table 3.3

Historical Cost and Current Cost of
a Computer Acquired in 1982 (Hypothetical Example)

Acquisition Cost in 1982	$10,000
Index of Inflation in 1982	100
Index of Inflation in 1983	120
Inflation-adjusted Acquistion Cost in 1983	$12,000
Replacement Cost in 1983 Dollars	$11,000

Depreciation Expense for 1983
(10 year-straight-line depreciation schedule)

Historical Cost	Current Cost	Inflation-Adjusted Cost
$1000	$1100	$1200

Table 3.4

Depreciation Expenses of a 20-year-service life-asset

Hypothetical Example (the figures are in dollars of the current year)

	Begin of 1982	End of 1982	End of 1983	End of 1984
Price Index	100	110	121	133.1
Replacement Cost	10,000	$11,000	$12,100	$13,310
Current year's Depreciation		550	605	665.5
Accumulated Depreciation		550	1,210	1,996.5
Net Book Value		$10,450	$10,890	11,313.5

(Note: Net Book Value in the n^{th} year = $(1.1)^n$ [$10,000 - n ($500)]. Therefore, it increases in the first years until n = E (20-1/log (1.1) = 9 (i.e. 1990) and then decreases until 2001 where it is equal to zero).

a result of adopting current-cost accounting, the British Airports Authority decided to raise user fees by some 40% in 1981. However, and despite the users' reluctance to accept this new approach, more international airports and air navigation organizations may in the future adopt current-cost accounting, especially if high inflation rates persist (as they have in many parts of the world).

3.3.4 Interest

This expense item refers to interest payable on debt during a year, as well as any interest computed on capital assets and working capital provided through internal sources, i.e., without borrowing.

While the former ("interest payable on debt") is unambiguous and requires no further explanation, some discussion is necessary on the second item, which refers to what is sometimes called "return on investment" or "notional interest". The rationale here is that, since there are opportunity costs associated with internal funds which are allocated toward the acquisition of capital assets for airports and enroute air navigation, it is justifiable and indeed appropriate to attempt to recover such opportunity costs. Hence the term "return on investment". (The term "notional interest" clearly refers to the fact that the interest charged in this case is one based on an estimate of opportunity costs, as opposed to an interest rate charged on borrowed funds.)

This second type of interest should be charged <u>only</u> on the undepreciated portion of capital assets. Specifically, let i_p be the (notional) interest rate in year p after a capital asset funded wholly through internal bonds was commissioned. Let V_0 be the value of the asset in the year when it was commissioned and let a_0, a_1, a_2, ..., a_{p-1} indicate the amounts by which this asset was depreciated during the zeroth, first, second, ..., (p-1)-th year after it was commissioned. Then, the correct amount of interest expense to charge in year p is:

$$C_p = i_p(V_0 - a_0 - a_1 - \dots - a_{p-1}) \qquad (3.2)$$

[A fine presentation and discussion of these points as they pertain to enroute air navigation facilities is contained in ICAO working paper RFCP/1-WP/7, "The Cost of Air Navigation Services in France", presented by the French delegate P.A. Varloud in March 1983.]

To illustrate this point further, we have prepared in Table 3.5 a hypothetical example that shows the depreciation costs (a_p) and interest costs (c_p) associated with an asset whose initial value V_0 is $1,000,000 and whose lifetime is 10 years.

3.3.5 Administrative Overheads

This item includes costs of common administrative services, to the extent that these have not yet been included already under the "Salaries" and/or the "Supplies and Services" items that were discussed earlier. For example, an independent airport authority that operates more than one airport (e.g. the British Airports Authority) will use this item to include the costs of its central staff -- that performs overall management, economic planning, airport systems planning, etc. -- to the cost base associated with each individual airport under its control. Clearly, a cost-allocation scheme is required for this purpose. An even-more-complicated allocation problem arises when such administrative entities operate a multi-modal set of transportation services (seaports, bridges, tunnels, etc.) in addition to airports, as in the

Table 3.5

ILLUSTRATION OF DEPRECIATION AND INTEREST COMPUTATION

Hypothetical Example: Assume that:

-- V_o = asset value = 1,000,000 FF

-- n = lifetime = 10 years

-- $i_1 = i_2 = ... = i_{10}$ = 10% (for simplicity)

-- The rate of inflation is 8% every year for the 10-year period.

It follows that:

(1) Year p	(2) Depreciation a_p	(3) Residual Value $r_p=V_o-a_o-...-a_{p-1}$	(4) Cost of Capital $c_p=(.1)(r_p)$	(5) Total Cost $C_p=a_p+c_p$
1	100,000	1,000,000	100,000	200,000
2	100,000	900,000	90,000	190,000
3	100,000	800,000	80,000	180,000
4	100,000	700,000	70,000	170,000
5	100,000	600,000	60,000	160,000
6	100,000	500,000	50,000	150,000
7	100,000	400,000	40,000	140,000
8	100,000	300,000	30,000	130,000
9	100,000	200,000	20,000	120,000
10	100,000	100,000	10,000	110,000

(Remark: The rate of inflation does not enter the calculations, except to the extent that it is reflected in the interest rates i_1, i_2, ...i_{10}.)

cases of the Port Authority of New York and New Jersey, and the Massachusetts Port Authority. Similar allocation problems arise when national organizations/agencies simultaneously operate airports and enroute air navigation facilities.

In general, costs for administrative overheads are often the object of considerable disputation and irritation on the part of aeronautical facility users.

3.3.3.6 Taxes

Under this item, ICAO includes

> "any national or other governmental taxes (e.g., property and income taxes) payable by an airport - or en route air navigation agency - as a taxable entity and not already reported elsewhere. Not to be included are any sales or other taxes collected from third parties on behalf of government taxing authorities (e.g., sales tax on goods and services sold in airport-operated shops and income tax deductions from staff salaries)" [ICAO, 1977].

In some cases, Airport Authorities that are by law exempt from taxes, choose nevertheless to make "voluntary" contributions to regional, state and/or local governments "in lieu of taxes". Such contributions are justified as necessary for community-relations purposes or as compensation for the noise and nuisance that airports inflict on their neighbors. Contributions in lieu of taxes can be included under the present item and, once again, are often the subject of disputes between airports and their users.

3.4 ALLOCATION AMONG COST CENTERS AND REVENUE CENTERS

The third and fourth steps in evaluating a system of aeronautical charges call for a review of the allocation of the cost base (whose compilation was described in the previous section) among "cost centers", first, and then, among "revenue centers". This is probably the one area where practices vary most widely from one international airport[3] to another (and, similarly, for enroute air navigation facilities). One encounters some airports where highly-sophisticated and detailed cost-allocation schemes are in place and others where a systematic cost-allocation approach hardly exists at all. Such extremes are graphically illustrated by variations in the quality of data reported in the ICAO Circular 162-AT/60, Airport and Route Facilities - Financial Data and Summary Traffic Data (published 5/81) which presents information for many airports and enroute air navigation facilities around the world.

3.4.1 Cost Centers and Revenue Centers

As already shown in Table 3.1, ICAO recommends that airport costs be classified by area of service (in addition to classification by item, which has already been discussed). These areas of service are listed at the bottom half of Table 3.1 and the costs associated with them are described by ICAO as follows [ICAO, 1977]:

1. Aircraft movement areas: All maintenance, administrative and operating costs attributable to these areas and their associated vehicles and equipment, including the expense of all labor (skilled and un-skilled), maintenance materials, power and fuels.

2. Passenger and cargo terminal facilities (owned by the airport): All maintenance, operating and administrative costs for terminal facilities, including, where applicable, such expenses as relate to any airport-operated shops and services located in the terminals (e.g. staff salaries, costs of stock sold and any spoilage, and the cost of utilities and general upkeep provided in such cases), but excluding any costs of work which, under particular leasing arrangements, are borne by lessees.

3. Hangar and maintenance areas (owned by the airport): All related maintenance, operating and administrative costs, excluding any costs of work which, under particular leasing arrangements, are borne by lessees (e.g. maintenance of hangars).

[3]Although similar problems and concerns arise with respect to enroute air navigation services, this section will refer primarily to cost allocation at international airports.

4. Fire-fighting, ambulance and security services: All operating, maintenance and administrative costs attributable to these services, including staff salaries and the expense of maintaining the associated vehicles and equipment.

5. Air traffic control (including communications i.e. fixed and mobile services and radio navaids): All related maintenance, operating and administrative costs, including in particular the expense of power and any spares consumed by radars, receiving and transmitting stations, NDBs, VORs, ILS, and other equipment employed.

6. Meteorological services: All operating, maintenance and administrative costs of any meteorological services provided by the airport itself.

In addition, all depreciation/amortization and interest costs associated with each of these areas of service should, of course, be included in the relevant accounts.

The areas of service listed in Table 3.1 constitute essentially the cost centers of an airport. These cost centers, in turn, can be classified into two categories as follows:

1. Production Cost Centers (or Revenue-Producing Centers)

These include the following:

- landing area: runways, taxiways, parking aprons
- approach traffic control and terminal air navigation
- passenger terminal building: facilities and services
- industrial and commercial
- terminal auto parking
- airline base areas: hangars and other base facilities
- other rentable land and buildings

2. Service Cost Centers (or Non-Revenue-Producing Centers)

These provide services to production and/or other service cost centers. They include:

- utility facilities
- security protection
- fire/rescue protection
- airport operational maintenance (e.g. snow plowing and removal)
- roadways
- fencing
- drainage system
- unusable land

By means of comparison, Table 3.6 gives the classification along these lines which is suggested by the Swedish Study on cost allocation for an entire system of aeronautical services (airports and enroute air navigation facilities), which will be described in more detail in Chapter 4.

The production cost centers will also be referred to as simply the revenue centers of an airport from now on. These revenue centers produce the operating revenues of the airport, which can be further subdivided into five major categories:

1. Airfield Area Revenues: these include landing fees, aircraft parking fees, fuel charges, noise and nuisance charges.

2. Hangar and Building Area Revenues: these are derived from rental or lease of hangars, aircraft maintenance facilities, cargo and freight forwarding agent facilities, aircraft and aircraft equipment manufacturing facilities, etc.

3. Terminal Area Revenues: these are derived from rental or lease of

Table 3.6

SERVICE AND PRODUCTION COST CENTERS: SWEDISH COST-ALLOCATION STUDY

Service Cost Centers

1. Central Administration

Group 1:
- Director General
- General Staff
- Central Administration

Group 2:
- Airport Department
- Air Navigation Services Department

2. Local Units

Group 3:
- Local Maintenance

Group 4:
- Operating and Administration Buildings
- Vehicle Workshops
- Store Services

Group 5:
- Airport Services
- Electrical Services
- Heating, Plumbing, Sanitation Services
- Building Services
- Security
- Avionics Maintenance

Production Cost Centers

Group 6:
- Runways including Lighting, ILS, VASIS
- Taxiways including Lighting
- Aprons including Lighting
- Fire Fighting and Rescue Services
- Air Bridges
- Terminal Buildings
- Information Systems
- Baggage Transport Systems

Group 7:
- Traffic Services
- General Passenger Services
- Ramp Services
- Marshalling Services

Group 8:
- ATS, Local, Activities, Equipment, Buildings
- ATS/COM, Local, Equipment
- MET, Local, Activities, Equipment, Buildings
- ATS/SAR, En route, Activities, Equipment, Buildings

Group 9:
- Car Parking
- Rentals
- Concessions

ticket counters, baggage facilities, boarding gates; rental of building and office space within the terminal; ground-handling services, etc.

4. Systems and Services Revenues: these include resale of electricity, gas, and water to airport lessees.

5. Concessions: these are revenues from all passenger-related facilities provided by the airport or by its concessionaires. They include car-parking facilities, auto-rental fees, food and beverage facilities, travel services and facilities, duty-free shops, hotels, etc.

Non-operating revenues are those not related to airport activity and include:

- the interest earned on investments
- revenues from leasing or selling of property (land or buildings) not related to airport activity
- subsidies

Other classifications of revenues exist. The Airport Operators Council International (AOCI; one of the largest airports' associations with member airports located on every continent and serving 75% of the world's total airline traffic) has classified airport revenues in a different way:

1. Landing Area:	Landing fees Parking ramp fees
2. Terminal Area (concessions):	Food and beverage Travel services and facilities Specialty stores and shops (banks, duty-free shops, etc.) Personal services (barber shops, beauty shops, etc.) Amusement (game rooms, observation decks, etc.) Terminal building facilities (office rentals, advertising stands, etc.)

	Outside terminal concession (auto parking, ground transportation, hotels, etc.)
3. <u>Airline Leased Areas</u>:	Ground rentals Cargo terminals Office rentals Ticket counters Operations and maintenance areas Hangars
4. <u>Other Leased Areas</u>:	Fixed base operations Ground rentals Cargo terminals Industrial areas Other buildings Fuel and servicing Agriculture
5. <u>Other Operating Revenues</u>:	Ground handling services Sale of utilities to airport users Equipment rentals Sale of insurance

ICAO has recommended yet a third classification including the following items.

1. <u>Air Traffic Operations</u>:	Handling charges and lighting charges Passenger and cargo charges Parking and hangar charges Other charges on air traffic operations
2. <u>Ground Handling Charges</u>	
3. <u>Ancillary Operations</u>	Aviation fuel and oil concessions Other concessions Rentals Other revenues from non-aeronautical activities
4. <u>Grants and Subsidies</u>	

No matter which classification scheme is finally selected, the important point here is that it is necessary to define an all-inclusive (comprehensive) set of <u>cost centers</u> as well as a corresponding set of <u>revenue centers</u> (or "production cost centers"). Once these two sets have been defined, one can then proceed with the cost-allocation process.

3.4.2 The Cost-Allocation Process

As noted in the beginning of this section, the cost-allocation process proceeds in two steps:

1. All item costs are assigned to cost centers, i.e. to service-cost centers and to production-cost centers. This step would not be much of a problem if all costs were "directly-assignable" costs, i.e. costs uniquely associated with a single cost center. Unfortunately many costs are "joint" costs, i.e. jointly associated with several cost centers. The principal problem in the first step in the cost-allocation process is thus the allocation of these joint costs. Such joint costs may include joint labor costs (salaries), as well as costs of services (police protection, fire, etc.) and costs of supplies and materials (electricity, heating, lighting, depreciation on machinery jointly used, etc.). This first step allocation is made separately for each joint cost item. For example, electricity costs are allocated among passenger terminal buildings, hangars, utility facilities, etc. Then another joint item's costs are allocated in a similar way, and so on until all indirect costs have been assigned.

The allocation basis used for thus allocating joint costs can vary from one airport to the other. The key allocation variable for activities can be the number of employees, and for facilities, the size of the facility measured through gross investment expenditures. Other factors can be used, such as the area or the volume of the facility involved (as regards to heating or lighting costs).

2. The second step of the cost-allocation process consists of reallocating the total costs accumulated in the service cost centers so that all such costs are shared among production cost centers (revenue centers). In

the process, service-center costs are directly assigned to the cost centers that receive the service. Again, some equitable allocation basis may be suggested which could be:

. payroll-related

. personnel-related

. material-related

. space-related

. activity-related

Robert K. Joerger (Howard, 1974) distinguishes four such principal allocation bases:

- the income-related (or revenue-related) basis
- the expense-related basis
- the income-plus-expense-related basis
- the arbitrary method (!)

None of these methods is fully satisfactory and the final decision on which one to use belongs to the airport's operator. The results can be quite different for each method. Thus, an income-related basis would make the airport terminals bear a substantial part of the overhead costs. The airport terminals area is in effect one of the highest revenue-producing cost centers and an income-related allocation basis would assign a significant part of service-center costs to it. The expense-related method would presumably decrease the burden borne by the terminals area and transfer it (or part of it) onto the airfield area since the expenses incurred on this area are usually higher than those of the terminals area.

In summary, at the conclusion of the first of the above steps, the entire cost base has been allocated among the cost centers, i.e. by area of service. This is illustrated in Table 3.7 for Los Angeles International Airport. At the conclusion of the second step, costs have been re-allocated

Table 3.7

ALLOCATION OF ITEM EXPENSES TO COST-CENTERS
(Los Angeles, F.Y. 1970)

Expenses by Airport Area of Service	Total Expenses	Expenses by Item						
		Salaries	Supplies and services	Deprecia-tion and/or amortiza-tion	Interest	Admini-strative overheads	Other	Taxes
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Aircraft movement areas	4 361 560	780 917	476 634	1 705 818	1 247 915	331 665	38 611	
Terminal facilities	12 396 109	6 078 822	1 815 616	1 801 968	1 330 229	1 024 641	344 833	
Hangar and maintenance areas	1 245 102	385 331	334 500	298 703	152 433	64 954	9 181	
Firefighting, ambulance and security services	6 034 326	3 154 478	2 387 675	33 061	52 335	531 631	75 346	
Air traffic control (including communications)	7 041 494	3 971 395 N/	589 085 N/	544 320 N/	514 335 N/	1 420 581 N/	1 778	
Share allocable to:								
5a. Airport utilization								
5b. En-route utilization								
Meteorological services	365 000	261 300	11 100	2 100	-	70 500	20 000	
Other	17 939 714	6 885 436	1 769 735	633 191	7 326 929	1 360 401	364 022	
TOTAL EXPENSES	49 183 305	21 517 679	7 384 345	5 019 161	10 624 176	4 404 373	433 571	-

further and have been apportioned among revenue (or production-cost) centers on the basis of some allocation scheme. Table 3.8 outlines a scheme of this type used by a large hub airport in the United States [Lim, 1980]. Table 3.9 shows the final percentages resulting from this scheme. The costs of service-cost centers are allocated among the revenue centers in accordance with these percentages. Table 3.10 gives the amount of operating expenses that are allocated to revenue centers according to these percentages in this particular case.

ICAO has offered minimal guidance to date regarding cost-allocation schemes. The existing lack of uniformity in accounting practices and recording systems should not then be surprising under the circumstances. Each airport feels entitled to use its own allocation rules, determined by its administrative setup and its financial structure. No overall agreement exists on even some fundamental rules in this area.

3.5 ALLOCATING COSTS AMONG USERS

Once the entire cost base has been allocated among cost centers/areas of service, it remains to distribute the costs associated with each such center among the users of the center. This constitutes another major building block in our normative "model". Once again, it is important for would-be reviewers of aeronautical charging systems to have a good understanding of the options available to and the assumptions made by service providers in this respect.

It is convenient to examine this last stage in the computation of user charges as consisting of three steps. These steps are not necessarily sequential, in the order given below, but must all be addressed at some point in the charge-setting process:

a. Adoption of general guidelines ("principles") on the basis of which

Table 3.8

METHOD FOR ALLOCATING SERVICE CENTER COSTS TO REVENUE COST CENTERS

1.	Electrical Distribution System	- Distributed to revenue and non-revenue areas based on actual usage
2.	Water and Sewage Systems	- Same as No. 1.
3.	Heating System	- Same as No. 1.
4.	Gas Distribution System	- Same as No. 1.
5.	Cooling System	- Same as No. 1.
6.	Industrial Waste System	- Distributed equally to zones.
7.	Storm Drainage System	- Minimum of 1% distributed to each facility in revenue areas (management discretion). Balance distributed on ratio of space in each area to total.
8.	Communication System	- Distributed on basis of maintenance personnel's man-hours spent on each facility to total.
9.	Perimeter Fence and Tree Belt	- Distributed 95% to landing area and 5% to terminal area (based on acreage)
10.	Warehouse (Store), Shops and Miscellaneous Structures (excludes Janitorial Costs)	- Distributed to revenue cost centers on basis of direct costs in each revenue cost center
11.	Utility Building	- Distributed to utility system based on ratio of costs
12.	Equipment Maintenance (General Equipment)	- Distributed to revenue cost centers on basis of direct costs in each center
13.	Roads and Grounds	- Distributed to revenue cost centers on basis of revenue in each center
14.	Fire/Crash Protection	- Distributed 92% to landing area and balance equally to other revenue cost centers (proportion based on statistics and management discretion)
15.	Police Protection	- Distributed on basis of survey of past police effort
16.	Interest on Land	- Distributed to revenue cost centers on basis of revenues in each center

Table 3.8 (continued)

17.	First Aid	- Distributed on basis of other indirect cost in revenue cost centers
18.	Access Highways	- Distributed to revenue cost centers on basis of revenue in each area

Source: Lim (1980)

Table 3.9

FINAL PERCENTAGES FOR ALLOCATING SERVICE CENTER COSTS TO REVENUE COST CENTERS

PERCENTAGES

	Terminal Area	Landing Area	Hangar Area	Commercial[a] Area	Operating[b] Area	Total Revenue Area[c]
1. Electrical Distribution System	41.4	7.7	0.9	20.7	18.7	89.4[c]
2. Water & Sewage Systems	34.1	0.2	0.4	10.8	13.3	58.8[c]
3. Heating System	54.8	-	-	-	21.3	76.1[c]
4. Cooling System	72.2	-	-	-	6.4	78.6[c]
5. Gas Distribution System	1.4	0.2	2.4	24.3	23.0	51.6[c]
6. Storm Drain	3.0	72.0	2.0	12.0	11.0	100.0
7. Communication System	75.0	5.0	2.0	8.0	10.0	100.0
8. Telephone	37.3	10.0	-	0.7	52.0	100.0
9. Perimeter Fence & Tree Belt	5.0	95.0	-	-	-	100.0
10. Warehouse, Shops & Misc. Struc.	51.4	21.5	-	2.2	24.9	100.0
11. Equipment Maintenance	51.4	21.5	-	2.2	24.9	100.0
12. Roads & Grounds	36.1	29.3	1.8	14.8	18.0	100.0
13. Fire/Crash Protection	2.0	92.0	2.0	2.0	2.0	100.0
14. Police Security	22.9	19.3	1.9	17.9	18.7	80.7[c]
15. First Aid	37.3	10.0	-	0.7	52.0	100.0
16. Access Highway	36.1	29.3	1.8	14.8	18.0	100.0

Note: a) Cargo Building Areas
b) Operations Building Areas
c) Remainder Allocated to Non-Revenue Cost Centers

Source: Lim, (1980)

Table 3.10

ALLOCATION OF SERVICE CENTER COSTS TO REVENUE COST CENTERS

OPERATING EXPENSES

		Terminal Area $	Landing Area $	Hangar Area $	Commercial Area $	Operating Area $	Total Revenue Area $
1.	Electrical Distribution System	170,471	31,706	3,706	85,236	76,988	368,117
2.	Water and Sewage System	70,099	412	822	22,201	27,341	120,875
3.	Heating System	108,147	-	-	-	42,036	150,183
4.	Cooling System	57,837	-	-	-	5,126	62,963
5.	Gas Distribution System	3,138	448	5,380	54,469	51,555	114,990
6.	Storm Drain	765	18,368	510	3,063	2,805	25,511
7.	Communication System	31,679	2,112	845	3,379	4,221	42,236
8.	Telephone	22,286	5,976	-	419	31,072	59,753
9.	Perimeter Fence & Tree Belt	159	3,020	-	-	-	3,179
10.	Warehouse, Shops & Misc. Str.	109,430	45,773	-	4,685	53,011	212,899
11.	Equipment Maintenance	105,928	44,310	-	4,536	51,316	206,090
12.	Roads & Grounds	132,351	107,420	6,599	54,260	65,993	366,623
13.	Fire/Crash Protection	27,047	1,244,164	27,047	27,047	27,047	1,352,352
14.	Police Security	152,499	128,525	12,653	119,199	124,531	537,407
15.	First Aid	9,358	2,508	-	175	13,044	25,085
16.	Access Highway	77,904	63,229	3,884	31,938	38,845	215,800

Source: Lim, (1980)

costs will be distributed among users.

b. Selection of a set of units (a "yardstick") through which to measure the amount of use made of a facility by each individual user.

c. Adoption of a quantitative method (a "formula") through which the measured use of the facility by a user will be converted to a monetary charge to that user.

We shall discuss separately each of these three steps and attempt to summarize and comment on the range of alternatives that are encountered in international practices in this context.

3.5.1 Principles for Distributing Costs

Much effort was devoted during this research project to this specific topic, namely on identifying, explaining and discussing the advantages and disadvantages of the various principles used internationally to distribute the costs of aeronautical facilities among users. The reader is referred to Chapter V of an accompanying report, The Problem of Cost Allocation at Airports by D. Lippera, for a long and thorough discussion of the subject. Here, we shall simply identify the fundamental alternative approaches available. Those are:

(i) Average-cost pricing

(ii) Separable-cost/marginal-cost pricing

(iii) Ability-to-pay pricing

(iv) Willingness-to-pay/value-of-service pricing.

Under average-cost pricing, the costs allocated to any given cost-center/area-of-service are distributed among its users by simply:

1. Dividing these costs by the total number of "units-of-use" accumulated during the time period of interest (usually a year); this establishes a "unit-rate" charge for each unit of use.

2. Charging each individual user an amount equal to the product of this unit-rate multiplied by the number of units-of-use compiled by that user.

For a simple example, consider the airfield area of an airport (runways, taxiways, terminal air navigation facilities, etc.), with an annual cost of $10,000,000 which is to be recovered from users (this is the part of the total cost-base which has been allocated to this cost center). Assume that this airport measures airside use through the sum of the maximum take-off weights (MTOW) of the aircraft landing at this airport over a year. The unit of use is 1,000 lbs. of MTOW. Suppose now that during a particular year, aircraft with a total MTOW of 5,000,000 thousands of lbs. landed at this airport. Under the average-cost pricing concept, this airport would then establish a unit-rate charge of $2 per thousand pounds of MTOW (= $10,000,000/5,000,000) and an aircraft with an MTOW of 100,000 lbs. would be charged $200 for landing at the airport.

Separable-cost/marginal-cost pricing is considerably more complicated. Simply stated, the basic idea is that users should pay only for that part of a service or a facility that they actually require ("separable cost") or for only that additional cost which their use of a service or a facility actually imposes on the airport or air navigation facility involved ("marginal cost"). For example, consider a 3,000-meter-long runway which is used by only two types of aircraft, one type that requires a runway length of 1,500 meters and a second requiring a length of 3,000 meters. Under the separable-cost pricing concept, all aircraft would then share the costs of the first 1,500 meters of runway but the cost of the second 1,500 meters will be distributed solely among aircraft of the second type. Or, consider an airport where severe peak-period congestion (in terms of both peak hours of the day and peak season of the year) forces considerable expansion of the existing facilities (e.g., a new runway or a new terminal building). Under the marginal-cost pricing concept, the airport involved may then decide to allocate the costs of facility expansion solely to peak-period users under the rationale that it is those users who have forced those expansion costs on the airport authority.

Separable-cost/marginal-cost pricing is difficult to apply in practice. The principal difficulty obviously lies in determining what part of a service or facility a user actually requires or uses and what additional costs each use of a service or facility imposes. Several important concepts have evolved in this respect (see D. Lippera's report for details):

--Uniquely-attributable costs: These are costs that can be logically associated with the needs and operations of a single type of user. Stated in another way, they represent the costs which would be avoided if this user group did not exist. Obviously, if any uniquely-attributable costs can be identified in connection with any type of aeronautical user, they can be directly useful under a separable-cost/marginal-cost pricing scheme.

--Separate systems and facilities: The notion of what airport and enroute air navigation facilities would be required and would exist if only one particular type of user existed, is also very useful in identifying what services and facilities each category of user will be required to pay for (partly or fully).

--Short-run marginal costs: These represent the additional operating and maintenance costs imposed by a user on an aeronautical facility (e.g. the wear-and-tear on a runway caused by an additional movement, the variable costs associated with handling or processing one additional operation, etc.).

--Long-run marginal costs: The costs associated with expanding existing facilities or constructing new facilities to accommodate additional movements. It is important to note that long-run marginal costs cannot be determined until a (possibly approximate) plan for future facilities (e.g. airport master plan) has been developed.

--Congestion-related marginal costs: They are costs created by each additional user of a congested aeronautical facility and consist of two components: the cost of the delay that this particular user suffers (this is the cost that the user himself experiences and pays for through increased operating costs, i.e., it is an internal cost); the cost of the additional delay that this particular user causes to all other users of the airport (this is a cost which, in the absence of a "congestion toll", is not experienced by the additional user, i.e., it is an external cost).

Ability-to-pay pricing refers to cases in which the operator of an aeronautical facility takes into consideration individual users' (perceived or actual) ability-to-pay in distributing facility or service costs among them. This means that the charges paid by a user may not necessarily be related to the costs that his use imposes on the facility in question. Consider, for instance, the case of two aircraft (e.g., the B707-320 and the DC-10-30) which have virtually-identical runway requirements (in terms of runway length and width, pavement strength, taxiway/runway separations, etc. -- in the example of the two aircraft cited, both belong to the FAA's airplane/airport design group IV). If a landing fee is then charged in direct proportion to the weights (MTOW's) of the two aircraft and they end up paying considerably-different charges (in our example the DC-10-30 would pay about 70% more in landing fees than the B707-320), it can only be inferred that ability-to-pay is a factor in determining the user charge. In our example, the aircraft's MTOW serves as a proxy for the aircraft's revenue-generating capacity, i.e., for its ability-to-pay.

Under the fourth and last cost-distribution principle, willingness-to-pay/value-of-benefits, an aeronautical facility's operator takes into consideration the imputed or explicitly-stated willingness-to-pay of users when pricing services or access to the facility and allocating costs among users. For a rather-artificial example, consider a shortest (great-circle) intercontinental route between two cities A and B. Suppose that an aircraft on this route must overfly a particular country X's airspace between two points C and D. Then, the maximum amount that an aircraft flying from A to B would be willing to pay to country X for use of its airspace would be the difference in cost (including the cost of time) between flying (1) the shortest alternative route that does not enter that country's airspace and (2) the original shortest route between A and B. This would be the maximum amount that country X could charge for enroute air navigation services between points C and D under the value-of-benefits approach. It should also be noted that in an environment where runway "slots" at a congested airport are allocated among prospective users through auctioning (as is frequently proposed these days, in the case of several major airports), the "bids" submitted by prospective users would explicitly state the amounts the latter would be willing to pay for access to the airport. Indeed such an auctioning approach would introduce a pure willingness-to-pay system: the amounts that users would pay for access to airports might bear little relationship (at least in the short run) to the cost of airport service.

A number of comments must be made at this point:

a. Numerous variations exist along the lines of the separable-cost/marginal-cost approach. Many, mostly theoretical, papers have been written on such variations. At this point the majority of these proposed approaches are of rather academic interest, due to the simplifying assumptions on which they are based, and to the extensive data requirements they imply (see D. Lippera's report for further discussion).

b. A system of user charges that reflects accurately the costs that each user imposes at an aeronautical facility eventually leads to economically-efficient use of that facility. Such a system of charges is attractive as well, in the sense of appearing to be "fair". From this point of view, the ability-to-pay and the separable-cost/marginal-cost approaches are, respectively, the least and most desirable among the four outlined above. They are widely disliked and endorsed, respectively, by economists.

c. In practice, however, the average-cost approach, often coupled with ability-to-pay considerations, is by far the most-widely used (see also the next two sub-sections). As indicated earlier, the difficulties involved in applying separable-cost/marginal-cost concepts are the reason for the relatively-limited implementation of such approaches. Willingness-to-pay approaches may also become more commonplace in the future, if congestion at aeronautical facilities -- especially major airports -- continues to worsen.

d. The application of marginal-cost concepts by the British Airports Authority (see Chapter 4) is by far the best-known example in which such approaches have been used in practice. Other, less-significant applications include the imposition of modest peak-hour surcharges on general aviation operations at some U.S. airports (JFK International, LaGuardia, Boston, Miami). Finally, most aeronautical cost-allocation studies conducted on behalf of governments adopt a separable-cost/marginal-cost approach. An excellent example is the study undertaken on behalf of the U.S. Department of Transportation in the early 1970's (Lago and Bradley, 1972)(U.S. DOT, 1972). A couple of additional examples will be discussed in Chapter 4.

3.5.2 Selection of Units of Measure

Another crucial aspect of this stage of the cost-allocation process is the choice of a unit system for measuring the amount of use of a facility made by any individual user --or, in other words, of the "workload" imposed on the facility by each user. An unfortunate choice of a unit system would make that much more difficult the development of a system of charges under which each user's fees closely reflect the costs that this user imposes on an aeronautical facility.

As indicated in Chapter 2, something of a consensus seems to have been established by now within the international aviation community, regarding the units of measure on which to base the various types of aeronautical charges. These are summarized below:

	Aeronautical Charge	Unit of Measure
1.	Landing fees	Aircraft weight
2.	Parking and hangar charges	Aircraft weight or aircraft dimensions
3.	Passenger service charges	Number of passengers
4.	Fuel throughput charges	Gallons of fuel
5.	Noise and nuisance charges	Decibels (or other more "composite" measure of noise) possibly combined with aircraft weight
6.	Security charges	Number of passengers
7.	Enroute air navigation charges	Distance flown and/or aircraft weight and/or aircraft flights and/or number of navigation aids used

(It should be noted that the widest variations exist in the area of enroute air navigation charges where some countries impose a flat fee per flight while others use distance flown and/or aircraft weight and/or number of navigation facilities used during a flight to assess user charges.)

ICAO has played a significant role in forging this near-consensus regarding units of measure (see, in particular, §14, 15, 17 (ii) and 33 of Appendix 1A). Consensus, however, does not mean that the units adopted are necessarily the most appropriate ones. In fact, in the case of at least two of the most important types of aeronautical charges - landing fees and enroute air navigation charges - it is becoming increasingly clear that, under current and future technology, the choice of units recommended by ICAO might actually act to <u>discourage</u> the efficient use of aeronautical facilities. A detailed discussion of this point for the case of enroute air navigation charges is presented in Chapter 5 in the context of Eurocontrol's system of charges. Here we briefly summarize a parallel argument concerning the use of aircraft weight in computing landing fees (for much additional detail see Chapter 3 of E. Ch'ng's report Aeronautical Charges and the Pricing of Runways).

The widespread acceptance of aircraft weight (MTOW or maximum landing weight) as the basis for determining landing fees has its roots in long-established practice. Probably the most significant document in this respect is a 1954 ICAO report entitled International Airport Charges (Doc. 7462-C/870, Montreal, April 1984) in which the then-current economic climate for airports was examined and recommendations regarding user charges at international airports were made. In the ICAO document, it was stated that "the most important factors determining airport costs are the nature and volume of the traffic (including frequency of landings) to be served -- primarily the size and performance of the aircraft for which the airport is designed."

The report went on to survey user charges then in effect. It was found that a landing charge based on aircraft weight was "almost universal" at international airports.

Bases for calculation other than maximum take-off weight, which had been either used or suggested at that time, were:

(a) linear dimensions of aircraft;

(b) number of seats;

(c) numbers of passengers and quantities of other loads carried;

(d) passengers or loads embarked or disembarked;

(e) total revenue from passengers or cargo;

(f) horsepower or number of aircraft engines;

(g) payload capacity of aircraft;

(h) maximum landing weight;

(i) weight imposed by aircraft's wheels when stationary on the ground;

(j) length of runway required by aircraft on take-off or landing.

The writers of the document then stated that a close relation between the amount of user charges and the cost imposed on airport operators would give the user a financial incentive to choose types of aircraft and methods of operation that would not necessitate the provision of more-expensive facilities.

They further recommended a single comprehensive charge for each landing, varying with the maximum take-off weight of the aircraft, which is identified as "the earliest established and most widespread system". The resultant charges would be related to the cost imposed on the airport, since landings of large, heavy aircraft involved greater costs in the construction and operation of airports than landings of small aircraft. Larger aircraft also had more exacting requirements for, and made more use of, airport facilities and services. As an additional advantage, weight-related charges would also reflect the value received by users, since the operation of a large aircraft is normally of greater value to its operator than that of a small aircraft, due to its greater revenue-earning capacity per landing.

It would be difficult to assess just how much ICAO's recommendation at the time was merely a reflection of practices already in place and how much a stimulus for practices not yet established. It does seem clear, however, that the weight-based landing fee was generally seen as the solution to the problems of airport cost recovery at that time. The DC-3, introduced in 1935, was the first passenger transport plane of real importance. The DC-4, which followed roughly ten years later, carried more than twice the payload and required 50% more runway length. By the late 1940's the DC-6 and DC-7 were being designed, and both were introduced into service in the early 1950's. A DC-7 requires 1.25 times the runway length of a DC-4 and has a range eight times that of a DC-3. The trend toward larger, heavier, longer-range aircraft (with correspondingly-higher-value payloads) was set. Airports had to expand in order to meet the technological needs of aircraft. Someone had to bear the burden of these costs, and it seemed logical for the aircraft which required the expansion to bear more of it.

In today's aviation climate, the opposite is true. Airport expansion is often severely limited due to a number of political, environmental, economic and land-availability-related issues. New aircraft are as a rule designed to meet the requirements of existing runway lengths and airport layouts than vice versa. Moreover, it is no longer true that larger and heavier aircraft necessarily impose increasing costs on airport airside facilities (runways, taxiways, aprons, etc.). Runway-length and maximum "footprint pressure" requirements seem to have reached a probably permanent plateau. (See also Figure 3.1). (For example, it is well-known that the footprint pressure - which is the principal cause of runway wear - exercised by a B727 on landing is higher than that of the much larger and heavier B747.)

In such an environment the relationship between aircraft weight and cost imposed on airside facilities is tenuous, at best, especially in the case of transport-size aircraft. The continued use of aircraft weight as the sole criterion for determining landing fees is now working to penalize the most efficient aircraft and seems, at this stage, to be dictated more by considerations of ability-to-pay than by concern for achieving economically efficient use of facilities.

3.5.3 Adoption of a Charging "Formula"

The final step in developing a system of user charges requires the adoption on the part of an aeronautical facility's operator of a "formula" through which the charges to each user of the facility will be computed. This is actually a "derivative" step in the sense that is should simply reflect the choices already discussed in the last two subsections, concerning, first, the principles according to which costs will be distributed and, second, the units-of-measure that have been adopted.

In somewhat quantitative terms, let us consider an aeronautical facility which serves n users in a particular year. Let us assume that the facility's operator has selected user-attributes x, y, z, ... as the units-of-measure of facility use. Assume user i (i=1, 2, ..., n) has compiled x_i, y_i, z_i, ... units of attributes x, y, z, ..., respectively.

The facility's operator must now adopt a formula through which to compute the number of units of use, t_i, for which user i will be charged. In other words, one seeks a mathematical expression f (x,y,z, ...) such that t_i can be computed by setting

$$t_i = f\ (x_i,\ y_i,\ z_i,\ ..) \qquad (3.3)$$

For example, in the case of the Eurocontrol charging formula (see expressions (2.2)-(2.4) in Chapter 2) the user-attributes through which facility use is measured (i.e., the variables x, y, z, ...) are the distance flown, d, and the MTOW of an aircraft, w. The function f (x, y, z, ...) corresponds to the expression $f(d,w) = (d/100)\ (\sqrt{w/50})$. The number of units-of-use for which aircraft i wil then be charged is given by:

$$t_i = f\ (d_i,\ w_i) = \frac{d_i}{100} \cdot \sqrt{\frac{w_i}{50}} \qquad (3.4)$$

where d_i is measured in kilometers and w_i in metric tonnes (see also Chapter 5).

During our review of international user charges, it became clear that the functional forms of f (x,y,z,...) - the "formulae" - currently in sure are very simple: generally, t_i is a function of one or, at most, two variables (e.g., distance and weight as in the Eurocontrol formula); moreover the function f (x,y,z,...) is either:

(i) a constant (i.e. a flat fee is imposed on all users);

(ii) a simple linear function of its variable(s);

(iii) a step function (see, e.g. the ASECNA and COCESNA weight-factors in Figure 2.1 of Chapter 2).

(iv) a quadratic or a square-root function (e.g. weight-factor in the Eurocontrol formula).

The most complicated expression we have encountered is the one used by the Netherlands to compute airport noise charges (see expression (2.1) in Chapter 2.)

There are two likely explanations for the use of such simple expressions. First, there is a general desire to keep charging formulae, as far as possible, "simple and suitable for general application". ICAO has strongly endorsed this attitude (see §13(i) and 32(i) in Appendix 1A). The second likely reason is that, at present, our understanding of the functional relationships between aircraft performance characteristics and airport and airway facility costs is very tentative - as already indicated several times in this Chapter and, as a result, the formulae in use reflect only first-order approximations. It is conceivable, and in fact likely, that, in the future, more complicated formulae than the ones currently in use will be adopted. This potential trend would also be encouraged by the fast-growing use of computers by aeronautical facility operators around the world to compute user charges and generate invoices to users.

As a final comment on this topic, it is also important to note that in many instances charge-computation formulae that, at first glance, appear dramatically different may result in essentially similar charging systems. A good example is provided by the Airport and Airway Trust Fund in the United States. This fund derives most of its income from an 8% tax on domestic passenger tickets and can be viewed, for practical purposes, as a user-charge for terminal area air navigation and for enroute air navigation (as well as for some airport capital investments). The user-charge imposed on a flight by this particular tax in the United States is thus equal to 8% of the gross revenue of the flight. This would appear to be a very different charging system than the one used, for instance, by Eurocontrol where the charge is proportional to distance travelled multiplied by the square root of MTOW. However, flight revenue is in fact roughly proportional to flight distance (somewhat less than linearly) and to the number of seats on the aircraft. Moreover (see also Chapter 5, especially Section 5.2) the number of seats on transport-size jet aircraft is, very roughly, proportional to the square root of the aircraft's MTOW. Thus, it can be plausibly argued that the enroute air navigation user charges in the United States and in the Eurocontrol system are, after all, quite similar when it comes to their direct effects on users! (It is, however, true that enroute air navigation is a government-subsidized activity in the United States, whereas virtually full-cost recovery is achieved in Europe).

The question of charging formulae will be picked up again in Chapter 5, where the significant sensitivity of user charges to even minor variations in such formulae will be demonstrated through an analysis of the Eurocontrol charging system.

3.6 PROVISIONS FOR CONSULTATION WITH USERS

The ICAO Statements make a special plea for continuing consultation between providers and users of aeronautical services (§18, 19, 37, 38, 39 of Appendix 1A). The need for prior consultation, advance notice and user comments prior to changes in airport and enroute facility charges are particularly emphasized. While expressing the desirability of a general agreement between providers and users on any proposed changes of charges, the ICAO Statements also recognize that, in the absence of such agreement, the ultimate authority to impose such changes rests with airport authorities and government ATC organizations (§18 and 38).

In the course of this study, "lack of consultation" with regard to changes in airport and enroute charges was perhaps the most-common complaint voiced by the users who were interviewed. It therefore become clear that another point that needs to be addressed in evaluating any particular system of aeronautical charges is the extent to which the facility's provider has made arrangements for consulting with users on a regular basis and, indeed, the amount of effort that the provider expends on keeping the users well-informed of financial developments, and soliciting their views on the subject.

Once again wide variations exist among practices in different countries in this respect. The situation in the United States with regard to this criterion seems to be distinctly superior than that in most other countries. This is partly because airports operating under the residual-cost approach for aeronautical users (see Section 2) are in fact required by their airline agreements to consult with users prior to changing any user fees or undertaking capital projects. In fact, most of these residual-cost-approach airports have "majority-in-interest" agreements with the airlines. Majority-in-interest agreements give the airlines that account for a majority of an airport's traffic the opportunity to review and approve or reject capital projects that would entail significant increases in airport charges (CBO, 1984). But even in airports that use the compensatory-cost approach (see Section 2), the airport's operators in the United States almost invariably have well-established procedures for consulting with users (airlines and general aviation) before undertaking any project that may eventually have a significant impact on user charges.

There are, however, countries where provisions for consultation with users clearly leave much to be desired. Several examples have been cited to the authors in which users are simply notified a short time in advance of large (sometimes as high as 100%) increases in user charges - without being given an opportunity to comment on or review the rationale of or appeal these increases. In many cases there exist no provisions whatsoever for regular consultations between providers and users; airline organizations, such as IATA, often have to take the initiative to arrange for such consultations on an ad hoc basis. In another case, a large international airport owned by a national government allows only native local representatives of international airlines to participate in consultation and review meetings on airport charges. This, of course, tends to inhibit the presentation of user views, since the native local representatives, first, lack the required expertise on cost accounting and user charges and, second, are usually reluctant - for obvious reasons - to antagonize their national government on such issues.

Extreme situations of confrontation between facility operators and users, such as those in Tokyo/Narita and London/Heathrow, are in part due to poor mechanisms for consultation with users, coupled with insufficient communications and exchange of information.

Chapter 4

SELECTED CASE STUDIES

4.1 OUTLINE

In this chapter, four selected case studies are reviewed. Each of the cases has been selected for two reasons:

(1) It helps illustrate one or more of the principal concepts that were discussed in Chapter 3

(2) In itself, the case offers one or more interesting aspects (important airport, innovative approach, controversy, etc.).

The first example discussed is Boston's Logan International Airport. We examine in detail the procedure used to determine the unit-rate (per thousand pounds) for computing landing fees at this major United States airport. This, in turn, offers an opportunity to explain why airside user charges at U.S. international airports are usually considerably lower than those elsewhere in the world.

The controversial case of Tokyo/Narita International Airport is brought up next. It illustrates how a combination of poor site and planning choices and of often-unreasonable cost-allocation practices has led to what seems to be a system of unfair and excessive user charges.

A study aimed at helping the Board of Civil Aviation of Sweden ("Swedish CAA") determine an appropriate system of user charges is summarized next. This study is especially important, because of the several innovative concepts that it contains, principally regarding the practical application of short- and long-term marginal-cost approaches to the setting of user charges.

Finally, cost allocation in the Commonwealth of Australia is reviewed. User charges in Australia have become a matter of considerable controversy in recent years. Moreover, the Australian cost-allocation approach is quite typical of the "traditional" kind of rationale and methodology generally used in efforts of this type.

Throughout the chapter, we liberally intersperse that (i) relate the materials presented to the normative model of Chapter 3, or (ii) discuss the appropriateness, validity or significance, as the case may be, as the case may be, of the approaches described.

4.2 BOSTON/LOGAN INTERNATIONAL AIRPORT

We begin our presentation of specific case studies with Boston's Logan International Airport, for two reasons:

(1) It offers an excellent example of a pure average-cost pricing approach for airside facilities, typical of the approach used by many international airports -- but, perhaps, better-documented than in most other cases.

(2) The example of Logan is helpful in understanding why airside user charges at U.S. international airports are usually considerably lower than those elsewhere in the world.

Logan Airport is owned, managed and operated by the Massachusetts Port Authority (Massport), a state-owned organization overseen by a seven-member Board of Directors. The directors are appointed by the Governor of the Commonwealth of Massachusetts and serve seven-year rotating terms (one appointment is made every year), without compensation.

Logan's airside is operated under the public utility concept and uses a compensatory approach in determining user charges (see Chapter 3). A number of direct and indirect federal, state and local subsidies are also received, as noted below. Like most air-carrier airports in the United States, Boston keeps separate accounts for airside and landside facilities. This practice is almost unavoidable at U.S. airports due to the facts that: (1) many airlines hold exclusive long-term leases on landside facilities; (2) most landside facilities are operated under the commercial-entity concept.

In the United States, such essential services as air traffic control and air navigation services are provided by the Federal Government. A substantial portion of the costs incurred by the government in providing aviation facilities and services is recovered through a system of aviation user taxes. the principal taxes include an 8% tax on the value of airline tickets for domestic travel, a $3 per passenger departure tax on international enplanements, and a $0.12 and a $0.14 per gallon tax on general-aviation gasoline and jet fuel, respectively [US, 1982]. Thus, the charges imposed by Massport do not cover any air traffic control and air navigation charges, as those are paid for directly by the U.S. Government.

The landing-fee computation for Boston/Logan, covering use of the airside facilities of the airport only, is outlined in Table 4.1 for the 1983 fiscal year.

The capital-cost base established by Massport for runway-pricing purposes consists of the following two main items:

(1) The yet-undepreciated capital cost of airside public-aircraft facilities, excluding the amount which was covered by federal grants (for example, under the ADAP program). In the beginning of 1983, this capital cost was $134,788,141 (item A in Table 4.1). In the case of Logan, about 50% of this amount (approximately $67,200,000) was obtained through outside borrowing, while the remainder ($67,600,000) came from internal funds. The average interest rate on borrowed funds was approximately 6.0%.

(2) The corresponding amounts for equipment (primarily fire-fighting equipment and snow-removal and maintenance vehicles). The amounts were

Table 4.1

LANDING-FEE COMPUTATION AT BOSTON LOGAN AIRPORT

(Massachusetts Port Authority, FY 1983)

Item		Dollar Amount (U.S. $)
A.	Capital cost of public aircraft facilities[1]	134,788,141
B.	Amortization at 4% per year	5,391,526
C.	Interest at approximately 6% on average balance	4,034,644
D.	Depreciation of equipment at 10%	136,880
E.	Interest on equipment at 6% on average balance	41,064
F.	Maintenace and operations	5,384,541
G.	Administration (including pension increment)	3,897,642
H.	Allocated portion of estimated tax liability[2]	1,519,346
I.	Contract snow removal	432,630
J.	Credits applied (from previous year)	(555,664)
K.	Annual cost of public aircraft facilities (Items B to J)	20,291,609
L.	Projected schduled air-carrier weights (1000 lbs)	17,200,000
M.	Landing fee (per 1000 lbs) (= k/L)	US $ 1.1797

[1] Does not include costs covered with Airport Development and Aid Program (ADAP) funds.

[2] Voluntary contribution by Massachusetts Port Authority.

$1,366,800 for capital costs and $684,400 for outstanding debt, the latter bearing an average interest rate of 6.0%. It should be noted that some vehicles are included at only a percentage of their cost, as they are not used exclusively for the airfield.

The capital cost of facilities is cumulated on a current-dollar basis, without adjustments for inflation. For example, a $5 million expenditure in 1970 and a $5 million expenditure in 1980 would result in a $10 million cumulative cost, despite the different buying power of the two amounts in their respective years. Massport uses a twenty-five-year straight-line depreciation for airside facilities and a ten-year depreciation for equipment. Thus, in inflationary periods, the depreciation schedule employed by Massport is likely to lead to under-recovery of the cost of replacing the facilities. Depreciation periods of twenty-five years for airside facilities and ten years for equipment are typical of those used in the United States. Shorter depreciation periods (typically of 20 and 8 years, respectively) are, however, often used elsewhere in the world.

The numerous capital costs that comprise item A of Table 4.1 are itemized in Table 4.2. Note that only about $6.4 million of the original runway and taxiway construction costs still remain in the capital-cost base (see second item under "runways, pavement" in Table 4.2).

We can now review briefly the airside cost-base for Boston/Logan. It is comprised of items B through J of Table 4.1. The first four items are self-explanatory: item B amounts to 4% of item A and D to 10% of the equipment-related capital costs (due to the 25- and 10-year depreciation periods, respectively); items C and E represent the interest payments on the outstanding debts noted earlier. Item G includes that part of the personnel

Table 4.2
ITEMIZED CAPITAL COSTS: LOGAN AIRPORT

APRONS

78.3 '77 N APRON REPAIRS	$66,436
1.105 INTL TERM APRON	$1,840,227
1.173 BRAVO II APRON	$2,689,184
1.156 BIF/GA APRON	$196,090
ORIG APRON PAVING	$2,554,018
1.093 S APRN, ALLEGHENY TW	$2,702,314
79.06 N TERM APRON REPAIRS	$110,832
1.104 S TERMINAL APRON	$8,388,798
1.160 N TERM APRN REPLCMNT & REHAB	$937,136
76.8 REHAB APRN-PIERS B & C	$87,309
1.160A-F PREPURCHASES	$16,568
1.154 SW APRON REHAB	$50,780
1.170 APRON RECONST-PIER C	$1,501,961
75.11 REHAB APRON, PIER B	$118,220
1.128 REHAB APRN-PIER B, N TERMINAL	$81,598
1.001-002 PAVING E & N APRNS	$503,786
1.170A-E PREPURCHASES	$65,463
1.017 1ST PORTION-S APRN PAVING	$123,058
SUBTOTAL	$22,033,778

FIRE & CRASH

1.037 FIRE & CRSH BLDG	$495,552
1.176 & 80.32 FIRE STA RPR	$57,926
78.6 OVERHD DRS-FIRE & CRSH STA	$11,630
ORIG FIRE & CRSH BLDG	$18,404
1.111 FIRE BOAT MOORING	$25,923
1.026 LAUNCH RAMP & BOAT HOUSE	$32,600
79.43 WASTE DISP SYS-FIREBOAT	$5,002
SUBTOTAL	$647,037

MISCELLANEOUS CAPITAL PROJECTS

81.09 SFTWARE-FIXED ASSET ACCTING SYS	$10,999
1.028 CNST WEATHR BUR QTRS	$73,676
'RPRT PEOPLE MVR STDY-MSTR PLN-KYSTNE MV	$183,369
80.33 PHYS MSTR PLN-PHSE II	$163,050
78.38 TEMP INVTRY STRG FAC	$4,002
195-22-50 OIL REMVL STDY	$15,000
78.20 INSTL WTR SRVCE-FUEL FARMS	$8,317
195-22-63 LNDSCPE MSTR PLN	$42,096
195-22-84 '77 OFF RENOVATION-HIGH ST	$7,820
73.27 WATER PIPES & FLEX CONNECTORS	$8,215
1.212 MSTR PLN STDY-PHSE II	$27,470
195-22-62 STDY-RMVL OIL POLL & OUTFL DRNS	$38,484
1.115 GENERATOR & GATE HOUSE	$48,672
1.205 CAULK OLD TOWER BLDG	$13,580
1.195 DEMOL NAVY FUEL PIER	$38,365
1.155 SLOPE PRTCTN-GOV ISL & FIREBT AREA	$85,903
78.27 PURCH SNOW RMVL EQUIP	$519,539
1.142 SANITARY SEWER SYS IMPRVMNTS	$256,441
78.47 RENOV STATE POL & AVI DPT OFFICES	$35,310
195-22-2 ADDIT E BOSTON PROPERTIES	$1,122,597
1.186 ADMIN OFF- RELOC PRESS RM	$7,004
1.180 NEPTUNE RD LNDSCPING	$57,686
80.34 BIF ENVIRON STDY	$413,074
1.226 BLDG DEMOL-NEPTUNE RD	$8,737
195-22-86 AIRPT LITIGATION	$363,486
78.12 DEMOLITION DWLING-FRANKFORT ST	$3,088
195-22-73 UTILITY STDY-BIF	$2,705
1.183 BLDG DEMOL-LOWELL ST	$9,173
195-22-55 LASER SYS STDY	$21,209
78.49-51 COLERIDGE ST RELOC	$87,785
80.30 BIF LAND USE STUDY	$79,904
78.2 NEPTUNE RD HSING RELOCATION	$45,418
79.50 LITTLE LEAGUE FLD	$20,875
79.24 ADDIT E BOSTON LAND PURCH	$1,567,208
79.49 PHYS MSTR PLN-LOGAN	$91,169
1.188 BLDG DEMOL-E BOSTON	$15,650
79.36 NEW DRS-FLD MNT BLDG	$28,765
75.9 MODEL HOME-E BOSTON	$679
1.147 OIL, WTR POLLUT CONTROL SYS	$113,397
1.194 DEMOL BLDG-LOWELL ST	$8,175
77.6 SHARE-A-CAB	$52,485
BIRD ISLAND FLATS	$37,088,037
75.3 RELOCATION-SOILS LAB	$558
1.201 BLDG DEMOL-VIENNA ST	$10,500
1.081-082 W INTERCEPTOR DRN & DIKE, BIF	$9,558,888
77.1 DEMOLITION BLDGS-E BOSTON	$8,991
78.48 WTR POL CONTRL SYS	$83,338
80.14 DEMOL. PORCHES-E BOS	$8,126
76.5 & .18 ENG RELOC; EXEC OFF RENOV	$16,021
78.52-54 DEMOLITION DWLLINGS-NEPTUNE RD	$7,868
195-22-41 FAA MVING EXPNS	$258,990
1.219 PROVISION TO ELIM JET FUMES	$2,550
1.052 FLD MAINT BLDG	$938,583
1.103 BIF FILL-ENGINEERING	$90,779
78.57 OFFICE RENOV-HIGH ST.	$87,810
79.38 PARTITION RPRS-FLD MAINT BLDG	$14,450
1.218 AVIATION FUELING PLN-PHASE I	[illegible]
79.31..55-80.09..23 DEMOL BLDGS-E BOS	$23,665
1.166 FLD MNT-BLDG ADDITION	$351,138
195-22-57 FILL INNER LAKES	$39,235
195-22-50 NOISE MONITORING SUPPLIES	$500
79.32 SNO MELTER RELOCATION	$93,430
77.7 NOISE MSMNT OFF RENOV	$15,596
78.19 NOISE ABTMNT STDY	$57,923
195-22-45 ARPRT EXPANSION-PUB HEARINGS	$597,943
78.43 NOISE MSMT COMPUTER INFO	$12,392
195-22-74 AIRPORT INFO DSPLYS	$139,965
195-22-80 NT CURFEW STDY	$159,865
71.8 RELOCATION SNO MELTER	$2,148
1.124-124.5 NOISE MONITORING SYS	$138,017
78.25 NOISE MONIT. SYS	$70,003
78.59 NOISE MSMNT INFO STDY	$26,508
SUBTOTAL	$55,628,024

CAPITAL TOTAL	$134,788,141

Table 4.2 (continued). ITEMIZED CAPITAL COSTS: LOGAN AIRPORT

CAPITAL COSTS OF THE AIRFIELD

PROJECT	CAPITAL COST
RUNWAYS	
PAVEMENT:	
1.019 HOLDING APRON FOR 22L	$3,529
ORIG CONST RW'S & TW'S	$6,443,643
1.063 HOLDING AREA FOR SW 22L	$569,437
1.140-1 PREPURCHASE	$227,576
1.005 REHAB 15R-33L	$599,938
1.018 REHAB 4L-22R & 9-27	$920,387
1.108 OVERLAY & GRVING 4R-22L	$394,406
1.010 REHAB 4R-22L	$49,772
1.133 IMPROVEMENTS 15R-33L	$1,483,159
76.4 RUBBER REMOVAL 27 & 33L	$5,985
1.140 IMPROVEMENT TO 4R	$2,331,524
1.060 EXIT TW & LNDING STRIP REHAB	$753,284
1.133A PREPURCHASE, 1.133	$233,767
1.100 15L-33R PHSE I CONST	$230,199
1.125E EXTENSIONS 4L & 9	$1,527,005
1.080 PAVE & LIGHT 15R EXT	$3,612,407
1.073 FILL, SAND, DRAIN 15R EXT	$1,737,593
1.053 15R EXTENSION	$306,305
SUBTOTAL	$21,468,806
LIGHTING	
ORIG FIELD LIGHTING	$386,891
1.016 NEW FLD. LT. VAULT	$258,148
1.071 MOD & EXPAND ELEC SYSTEM	$87,447
1.087 WD. IS. SUB-STA	$96,543
1.089 ELEC CABLE & CONNECTORS	$46,037
1.106 ELEC DIST & CONDUITS	$127,381
1.107 MOD TO 4160 VOLT SYS	$39,235
1.117 REHAB & UPGRADE ELEC SERV & LTING	$144,774
1.129 MOD WOOD IS & PORTER ST SUB-STA	$145,676
1.129A PREPURCHASES	$45,149
74.7 ELEC SUBMTR- 144 ADDISON ST	$3,700
74.38 REMOVE LTS WINTHROP WATER TANKS	$1,380
72.29 VOLTAGE REGULATOR	$203
1.162 RELIAB & SFTY STDY-AIRFLD LTING SYS	$15,000
1.164A-E PREPURCHASES	$110,285
1.200 TRANSFORMER REPAIRS	$8,737
1.229 EMER EDISON CABLE REPLCMNT	$10,782
SUBTOTAL	$1,527,358
OTHER:	
1.003,1.004 GRADE ILS & APP LTS-15R-33L	$909,493
1.043 OBSTRUCTION LTS-APPR. 4R & 4L	$135,528
1.054 RW MARKING, 4R	$7,106
1.114 RECONST APPR. LTS, 4R	$299,064
195-22-83 DEMO 4R CAT II	$72,617
1.140-SCH. B IMPRVMNTS 4R CAT II	$560,032
78.37 EMER REPAIRS 33L APPR LT PIERS	$14,668
1.133 IMPRVMNTS 15R-33L CAT II	$147,025
78.24 FNCE REHAB-4R CAT II SHP DETECT SYS	$1,040
1.198 SHIP DETECTION SYS	$38,260
SUBTOTAL	$2,174,833
AIRFIELD: MISC.	
1.098 RW, APRON, TW IMPVMNT	$6,315,511
1.187A SCAN 16	$505,571
1.187 '81 AIRFIELD IMPRVMNT	$1,729,174
1.031 SEAL COATING-RW'S, APRNS, TW'S	$104,994
1.169A-E PREPURCHASES	$213,962
1.039 MISC AIRFIELD IMP.	$898,942
1.169 RW IMPROVEMENTS	$687,841
1.059 PVMNT SEAL COATING	$263,630
1.011 CRACK SEALING- RW'S & TW'S	$58,589
1.159 AIRFIELD REHAB	$1,512,219
1.015 MISC. AIRFIELD IMP.	$408,687
1.042 SEAL COATING-RW'S, APRNS, TW'S	$230,672
1.153A-E PREPURCHASES	$111,939
1.153 MISC AIRFIELD REHAB	$1,179,436
1.159A-B PREPURCHASES	$45,968
1.149 '77 AIRFIELD IMPRVMNT	$854,478
1.038 SERVICE RDS & RELATED FACILITIES	$207,355
76.19 EXTND CNTRL REFRIG SYS TO NEW TWR	$53,712
76.7 REPAIRS, TWR COMPRESSOR	$11,489
1.027 ELEVATOR INST & TWR MODIFICATION	$160,397
78.32 ALT REFRIG SYS-NEW TWR	$111,983
1.024 CONTROL CAB WINDOWS	$7,845
1.095 NEW CONTROL TOWER	$7,492,832
1.095A EMER GENERATOR-NEW TWR	$111,000
1.118 DRAINAGE SYS-POND AREAS	$340,449
OLD CONTROL TWR-ORIG CONST	$480,225
1.044 APRN FLD LTING & BLAST PADS	$86,815
SUBTOTAL	$24,185,715
TAXIWAYS	
1.062 SW APRON TAXIWAY	$244,682
1.109-109A OUTER TW IMPRVMNTS	$3,162,979
1.127 COMPLT S APRON TW	$1,563,238
1.121 RECONST N APRON TW	$2,151,691
SUBTOTAL	$7,122,590

costs of the Aviation Department of Massport (which also has a Harbor Department, a Bridge and Tunnels Department, etc.), which are allocated to the airfield cost-center of Logan, as well as an overhead for administrative personnel costs at Massport headquarters.

Massport is a tax-exempt organization. However, Massport voluntarily makes a contribution, in lieu of taxes, to the neighboring communities in the Metropolitan Boston area every year. This "goodwill" payment amounted to about $10 million in 1983. A portion of this amount is raised through landing fees, and is therefore allocated to Logan's airside facilities (a cost center). Item H in Table 4.1 shows this amount, which can be thought of as the "fair return on investment" to the airport's true owner, the Commonwealth of Massachusetts, from the airfield part of Logan Airport. Since the internal funds invested in airside capital amount to approximately $68.3 million ($67.6 million in capital costs and $0.7 million in equipment costs), the $1.52 million voluntary tax contribution amounts to a 2.2% annual return on investment. This is quite low, even under the public-utility operating concept and represents a very "fair deal" for the airport's users.

Contract snow removal is performed by an outside company for certain portions of the aircraft aprons (item I). Finally, "credits applied" are adjustments for over-recovery of costs during the previous year. This over-recovery (item J) is deducted from this year's cost base. The landing-fee rate (fee per thousand pounds) is determined by dividing the annual cost of public aircraft facilities (item K) by the projected demand (item L).

Over-recovery (or under-recovery) is due to errors in airport cost projections (items F through I, since B through E are known for certain at the beginning of the year) and in the airport demand forecast, namely item L, which represents the forecasted total landing weight (in thousands of pounds) of the air-carrier aircraft that are expected to land at Logan during 1983. (Massport uses maximum landing weight as the basis for assessing landing fees.) If the projected air-carrier landing weights turn out to be too high (or too low), then there is a shortfall (or a surplus) at the end of the year vis-a-vis reaching the stated revenue goal, i.e. item K, the total airside cost base.

A number of facts that contribute to reducing the landing-fee rate at Logan -- and at major U.S. airports, in general -- can now be noted.

(i) The cost of terminal-area air navigation is not included in the cost base, which is covered by the landing fee -- unlike what happens in most other parts of the world, where terminal air navigation is paid for through landing charges.

(ii) A variety of government subsidies reduce costs: federal grants for airfield construction; federal grants for airfield planning; tax-exemption of Airport Authorities; tax-exempt status of airport bonds which result in lower interest costs, etc.

(iii) Although this is not the case at Boston/Logan, the residual approach to landing-fee determination used by many U.S. airports (see also Chapter 3) also permits cross-subsidization of airfield users through landside revenues.

(iv) The use of: historical cost for capital expenditures; long terms (25 years) for capital depreciation; the straight-line approch for depreciation/amortization; and low rates of return-on-investment for airside facilities, are all favorable to airside users.

(v) Perhaps most importantly, the high volumes of traffic achieved by major United States airports tend to drive average costs to dramatically-lower levels (the landing-fee rate for Logan Airport, for example, is less than 10% of the corresponding rate for Tokyo's Narita International Airport -- see

Section 4.4.). This point can best be appreciated from the fact that 15 of the 20 busiest airports in the world in 1983 (in terms of the annual number of passengers) were in the United States. Logan Airport, which ranks only 10th in the United States, is also the 12th busiest airport in the world.

The average-cost pricing approach, illustrated here through the example of Boston/Logan, is particularly attractive to airport operators by virtue of its simplicity. As noted, it is very easy, for example, to adjust for errors in the forecasts from year to year. It is easy, as well, to update the landing-fee computation from year to year. For example, if Massport were to spend a total of $10 million on Logan airside construction in 1983, item A would be equal to $139,396,615 (= $134,788,141 - $5,391,526 + $10,000,000) for 1984. A flat landing-fee rate is also very simple to administer.

On the other hand, the average-cost-pricing approach that uses aircraft weight as its sole criterion for determining landing fees has its drawbacks, as well. As noted in Chapter 3, although aircraft weight has direct relevance to the provision of runway facilities and services, it is not the only factor which influences the costs of the facilities and services. Consequently, it is unlikely that the amount paid by an aircraft for landing at Boston Logan Airport can accurately reflect the cost imposed by the flight on the airport. If fairness refers to the degree to which the price of a service reflects the cost of providing the service, then the landing charges at Boston/Logan Airport will appear to be unfair and discriminate against certain classes of users, notably the wide-body, high-technology transport aircraft.

It should be noted that, in the summer of 1981, Massport initiated a minimum daily landing fee for operations at peak hours, of $50 in addition to the standard landing fee. This minimum landing fee was intended to discourage use of the airport at peak-traffic hours by small private aircraft. (The minimum daily landing fee was subsequently rescinded in August 1982 when appointees of Governor Edward J. King, who was opposed to this fee, gained a majority on Massport's Board of Directors, but was re-instituted at a $25 level in the summer of 1984 under Governor Michael Dukakis.)

The minimum daily landing fee at Logan represents an attempt to ensure that the runway facilities are used by those who can contribute more "transportation-value-per-operation" during the peak period. This practice is in line with congestion-pricing concepts. Aircraft with higher productivity as a rule weigh more. As such, the standard landing fee at Boston/Logan Airport, which is directly proportional to the aircraft weight, will not alone encourage the use of more-productive aircraft during peak periods. An airport authority which faces this dilemma may wish to consider a landing fee which varies less than proportionately with the weight of aircraft. The minimum daily landing fee is a step in that direction.

4.3 TOKYO/NARITA INTERNATIONAL AIRPORT

The Tokyo/Narita International Airport provides another interesting example in the area of international-aviation user charges. It is generally considered to be the airport that imposes the highest or second-highest (next to London/Heathrow) user charges in the world. (Typically, the sum of landing, parking and passenger service charges amounted to approximately $950, $2,700 and $5,600 for a DC-9-30, A300 and B747-200 aircraft, respectively, in 1983, assuming a 60% load factor.) Nonetheless, the New Tokyo International Airport Authority (TIAA) that owns, administers and operates the airport incurs significant annual losses, with no end in sight: the Civil Aviation Bureau of Japan recently estimated that TIAA will be able to break even for the first time only after year 2,005! This doubly-unfortunate state of affairs is believed here to have been brought about by a combination of (1) poor site-selection and planning choices, and (2) occasionally-unreasonable practices regarding the airport's cost-base and cost-allocation systems.

TIAA is a unique organization in Japan, in the sense that it is the only quasi-independent, state-owned Airport Authority in that country. Its responsibility covers only Tokyo/Narita; it has no jurisdiction over Tokyo's other airport, Haneda. (In 1983, Tokyo/Narita handled 9 million passengers, all international, while Tokyo/Haneda handled 23 million, mostly domestic.)

TIAA is performing two tasks in parallel: operating and administering Tokyo/Narita; and constructing the airport. Its organizational structure reflects this: There are three divisions: a general administrative one, located in Tokyo; a "business" division, located at the airport; and a "planning, design and construction" division, whose staff is spread among the Tokyo head office, the airport (construction supervision and land acquisition), and Chiba City, where a fuel-pipeline construction project to supply the airport has just been completed.

TIAA relies on sub-contractors to provide ground handling services at the airport, as well as for such tasks as operation and maintenance of power-plant stations, operation of parking lots, airport terminal concessions, etc. Some 239 different commercial enterprises currently conduct some kind of activity at Tokyo/Narita.

TIAA's aim is to eventually become financially self-sufficient, including recovery of capital costs and earning a fair return on investment. The relative priorities for cost-recovery are in the following order:

1. Operating costs, including general administration costs
2. Depreciation costs (needed to reimburse the principal on, and/or as a source of capital for, repairing and modernizing facilities)
3. Interest on loans
4. Fair return on investment

A fair return on investment is deemed highly-desirable by TIAA in order to finance a part of the cost of future airport improvement and expansion.

Services and facilities at the airport are classified into services that are "strongly public" in nature and those which are "commercial" in nature. Basic aeronautical facilities, as well as utilities, are considered public in nature. Services to the tenants and related enterprises, as well as most landside services and concessions, are considered as commercial in nature. Charges for services which are public in nature are kept "as low as possible". The charges cover only the cost of providing the services. The aim is to break even. On the other hand, services which are considered commercial in nature are priced according to "what the market will bear".

The construction costs at Tokyo/Narita have been truly staggering by any international comparison standard. The total investment in airport construction amounts to about 440 billion yen, so far ($1.7 billion). A further investment of about 700 billion yen ($2.7 billion) is expected in the coming six to seven years to complete the second phase of airport construction work. The first phase of work has resulted in the development by 1978 of the currently-existing airport that basically consists of a single runway, a passenger terminal building and a cargo facility. The future investment of $2.7 billion will be for construction of two additional runways, a second, larger, terminal building, expanded cargo facilities, and a "people mover" to connect the two terminals. A 47-kilometer pipeline from Chiba Harbor has also been constructed and began operating during 1983. The cost of the pipeline project alone was about 150 billion yen ($600 million)!

About 20% of the airport construction cost during the first phase has been paid for by the Japanese Government in the form of an outright grant. TIAA is not required to pay back this amount. Another 54% of the construction cost is financed through the Japanese Government's Treasury Investment and Loan Program. The interest rate on the government loans is lower than that of private loans. Because of the high initial investment and the nature of airport investment, a deficit cannot be avoided in the early years of airport operation. The cumulative loss during the first four years of operation (up to fiscal year 1981) amounted to 47.8 billion yen ($183 million). During 1982 the loss was a more-moderate 3.4 billion yen ($14 million).

Aeronautical revenues such as landing fees, aircraft parking fees, fuel charges and passenger-service charges constitute 72% of the airport's total income. The major aeronautical charges are given in Table 4.3. The passenger-service charge is collected from the passengers directly at the airport before departure. The user charges paid by the airlines (including fuel charges and rents) amounted to 64% of the total aeronautical revenues in fiscal year 1981.

At the present time, the best that TIAA can hope to do is to establish some kind of balance between revenues and current expenditures (including depreciation and interest) as quickly as possible. TIAA does not expect Narita Airport to attain breakeven (even in this limited sense) in the next several years. This is because after 1984, the 150 billion yen associated with the pipeline project will be added to the airport's capital-cost base and worsen the airport's financial position.

In order to improve the current financial situation of Tokyo-Narita

Airport, TIAA states that it will be necessary

> "to revise the user charges appropriately and properly, to increase revenues from concessionaires, and to produce revenue from the land acquired for noise abatement purposes through more effective land use".

Table 4.3

MAJOR AERONAUTICAL CHARGES AT TOKYO/NARITA AIRPORT

Types of Charges	Rate (in Yen)	Remarks
Landing Fee	2,300/tonne	Charged on each landing
Parking fee	170/tonne	Charged for every 24-hour parking. Free parking for the first 6 hours
Passenger Service Charge	2,000/departing adult	Children less than 2 years of age, national guest, etc., are exempted
	1,000/departing child	Passengers over 12 years of age are considered adult
Departure Baggage Handling Facilities	10,000/flight	Only flights which used the service are charged. 1,800 for exclusive cargo flight

However, attempts to raise the landing fee and other aeronautical charges (which provide a large portion of the airport's income) are likely to be met with strong resistance from the international airlines, as these charges are already very high when compared to those at other international airports around the world.

Faced with increasing depreciation and debt-service costs on the one hand, and difficulty in raising airport charges (more specifically, landing fees) on the other, the TIAA is apparently pinning its hopes on a high rate of increase in air transportation demand and on a strong recovery of the world's economy.

Tokyo/Narita Airport still experiences very strong opposition from communities surrounding the airport and has taken exceptional measures to placate the communities and to guard the airport. When the decision was made in 1966 to locate the airport near Narita, the Japanese Government agreed to assume responsibility for the following measures, aimed at alleviating the impact on local residents:

1. Compensation for land, housing, other property, etc.
2. Offer of substitute land
3. Consideration of noise-abatement measures
4. Assistance to local residents in changing occupation
5. Construction of new roads, railways, waterworks, drainage facilities, as well as the establishment of new towns, if necessary

TIAA agreed to pursue the following policies in relation to the operation of the airport:

1. Special consideration to concessionaires and concession activities that would benefit local residents
2. Employment of local people at airport-related enterprises, including TIAA. (About 20,000 local residents are already employed at the airport.)
3. Procurement of commodities and services from local enterprises

TIAA is also providing business guidance to concessionaires operated by local residents, and grants favorable lease conditions to these people until their business operations stabilize. TIAA has also adopted a very-comprehensive public-relations program to help local residents understand and appreciate airport operations better.

TIAA tries hard to comply with requests made by the local communities. Some 3,179 households and 15,636 hectares (38,621 acres) of land were considered to be seriously affected by the airport noise problem. TIAA paid 4 billion yen ($15.3 million) in subsidies for sound-proofing work and 18 billion yen ($68.8 million) as compensation for relocating of residents and for acquisition of land affected by noise. Other measures taken to counter aircraft noise include:

1. Construction of a noise barrier and planting of 13.1 hectares (32.4 acres) of forest to serve as a noise buffer zone between the airport and the surrounding communities
2. Installation of noise-measuring equipment at ten locations
3. Installation of flight-course-monitoring equipment at four locations
4. Installation of 16,000 flutter-free television antennas for local residents

5. Installation of three Ultra High Frequency (UHF) satellite stations for the benefit of 30,000 households

TIAA also gives aid and grants to local communities for systematic improvement of public facilities. This aid amounted to 4.3 billion yen ($16.4 million) from 1978 to 1981, and 1.6 billion yen ($6.1 million) for fiscal year 1982. The aid is financed by a fuel tax levied on domestic airlines.

Tokyo/Narita Airport often comes under "attack" by Japanese radical groups and local residents strongly opposed to the airport. Large-scale demonstrations can be expected in the vicinity of the airport several times yearly. In consideration of this, TIAA has mounted a massive program aimed at insuring the safety of aircraft and passengers. Checkpoints have been established at all seven entrances of the airport. Double fences equipped with intrusion-warning devices were erected around the airport. Important facilities, such as fuel-supply depots, the outer markers of the instrument landing systems, and the passenger terminal building, are protected by special guard systems. These security measures are in addition to those taken to prevent hijacking and to guarantee the safety of flights.

The average traffic per day was 190 aircraft movements in 1983, about half the estimated daily capacity of 365 at the single-runway airport. However, further traffic growth at Tokyo/Narita is impeded by the fact that a high evening peak in traffic saturates the terminal capacity of the airport, even under current demand loads. Also, until recently a fuel shortage existed, due to the capacity limit imposed by the need to transport fuel by railway. The problem was alleviated in August 1983 when the pipelines from Chiba were finally brought into service. The fuel shortage had prevented the airport from accepting more flights until then. As a short-term measure, the airport had actually asked the airlines to reduce fuel uplift by 5%. Following opening of the pipeline, TIAA promptly imposed a high fuel-throughput surcharge which, as of this writing, the airlines were still refusing to pay.

Tokyo/Narita Airport imposes a night curfew from 11 p.m. until 6 a.m. on airport traffic operations. During the period May 1978 to December 1981, 62 planes were prevented from taking off until the next morning because of the curfew. Fifty planes landed at Narita Airport during the curfew time of 11 p.m. to 6 a.m. because of emergency and other technical reasons. Local residents are currently demanding extension of the curfew hours.

Several observations can now be made with regard to the Tokyo/Narita case.

1. It is clear that the difficult position in which the airport finds itself, with regard to both user charges and its own finances, can be traced to poor site-selection and rigid planning practices on the part of the Japanese government. This naturally raises the question of whether the government itself should not be bearing a larger share of the costs of Tokyo/Narita than it currently does. The grant for 20% of construction costs that the government has made, and its offering of a lower interest rate on another 54% of the construction costs, would seem to be inadequate, in this respect.

2. Capital costs for construction of the airport and supporting facilities have been clearly affected by the difficulties at the airport site. Unit costs are clearly exorbitant, as illustrated by the $2.7 billion price tag for the second phase of construction, which would essentially produce two new runways and a second terminal building. (We have been told that the

second phase of construction was to have been _completed_ by 1975, according to the original plan; however, TIAA is still negotiating to acquire the land for this expansion, with 82 acres of land and 12 farmers' houses still outstanding.) It might be useful to estimate for Tokyo/Narita what capital costs would have been in the _absence_ of the site-specific and case-specific problems. These could be called the "normal" construction costs of the airport. The cost base for setting user charges would then include only these normal capital costs. The remainder ("excess" costs) could not be fairly attributed to users and would have to be covered by alternative sources -- for example, general funds contributed by the Japanese government.

3. With regard to airport _operating_ costs, similar questions can be raised with regard to at least two items: security costs, and noise and nuisance costs. It seems unreasonable to expect users to cover the extraordinarily-high costs that TIAA incurs in this respect. An approach similar to the one described above for capital costs could again be adopted. Users would be asked to cover "normal" operating costs, while "excess" costs (high fences, special protection for airport-related facilities which are remote from the airport site, "flutter-free TV antennas", etc.) would be paid for through alternative means.

4. Site-specific problems and government policies can also be blamed for the constraints that have been placed on the growth of demand at the airport. (Increased demand would divide the cost base among more users and reduce average costs.) Given the peaked time-of-the-day demand pattern for international movements (which is dictated by the geographical position of Japan and is difficult to change), it would seem that there is little room left for traffic growth at Tokyo/Narita without expansion of runway and terminal facilities (second phase of construction). It is interesting to note

that the high cost base of Tokyo/Narita was allocated among only 67,000 aircraft movements in 1983 (by contrast, more than 300,000 shared in covering airport costs at Boston/Logan during the same year). It can also be noted that a large-scale, off-shore expansion project is already underway at Tokyo/Haneda, which would seem to further dampen the prospects for traffic growth at Tokyo/Narita. In fact, the Tokyo/Haneda project would seem to raise additional questions about the advisability of the entire Tokyo/Narita undertaking, in the first place.

4.4 DETERMINATION OF USER CHARGES IN SWEDEN

4.4.1 Background

In this section, we review a recent study on aeronautical cost-allocation and user-charge determination performed by the Board of Civil Aviation of Sweden ("Swedish CAA"). It is felt here that this study is a particularly-important one, for a number of reasons:

a) It is one of the most thorough and exhaustive of its kind ever undertaken.

b) It presents several interesting and innovative cost-allocation concepts, including convenient classifications of users and of aeronautical services.

c) It deals with a global set of aeronautical charges (landing fees, passenger-service charges, ATC charges, etc.) rather than a specific one.

d) It leads to some interesting findings regarding the relative magnitude of capital vs. operating costs of aeronautical facilities and services; while these findings apply only to the Swedish environment, they might also indicate more generally-applicable principles.

e) The study led to a revision of some user charges in Sweden -- on the basis of both sound theory and good empirical information contained in the study.

We shall only outline here briefly the approach taken by the Swedish CAA. This outline is drawn primarily from a summary of the study (in English) which was prepared in February 1980. Additional details were provided in a personal communication from the Swedish CAA.

The Swedish CAA plays a role analogous to the combined role of the FAA and the CAB (prior to airline deregulation) in the United States. It administers and operates all civil airports in Sweden , as well as providing terminal and enroute ATC services. Its four principal functions are:

1. To operate Sweden's civil, state-owned airports.
2. To be responsible for air navigation services.
3. To be the highest national flight safety authority.
4. To plan for the development of air transport.

According to the economic mandate of the Swedish CAA, full recovery of all costs is to be achieved. This shall include a surplus corresponding to the interest on the state capital employed. The Swedish CAA is to finance its activities through user charges and through payment for other activities compatible with its primary tasks.

Approximately three-quarters of the total revenues of the Swedish CAA consists of revenues from air traffic. The main part of these revenues represents payments made according to the published charges for services to aircraft, passengers and cargo. The pricing of these services is consequently of decisive importance to the Swedish CAA in meeting its financial target.

The users of Swedish airports have on many occasions questioned whether the charges imposed by the CAA are "fair". "Fairness", in this case, is taken to mean the degree to which a charge corresponds to the cost of providing a service. Because of this, the Swedish CAA initiated a cost and pricing study in 1979. The main part of that study was carried out during 1979-1980. The purpose was to acquire an understanding of costs for various services, to investigate cost relationships, to allocate among users the costs of providing various services and to define which services are to be covered by which user charges. The ultimate objective was to establish a basis for changing, if necessary, the then-existing charging system.

All the costs of the CAA, including capital costs, were to be allocated among the following categories of users:

- Heavy Aircraft
  - Domestic Traffic
    - Scheduled Flights
    - Charter Flights
  - International Traffic
    - Scheduled Flights
    - Charter Flights
- Light Aircraft
  - Domestic Traffic
    - Commercial Flights
    - Other Flights
  - International Traffic
    - Commercial Flights
    - Other Flights

(Note that general-aviation activities are included under "light aircraft".)

The cost allocation encompassed all the CAA activities, including those that involve transport regulation. The exercise was carried out with specific reference to costs in fiscal year 1979. Total costs of the CAA in that year amounted to SKR 613.3 million (approximately $130 million at then-prevailing exchange rates).

4.4.2 The End Users

These costs (100% of the amount) were allocated among users outside the CAA, referred to henceforth as end users. The terms final services, to denote services received by end users), and part services (or "internal" services), which are services provided within the CAA to support activities of various CAA units.

The structure of the cost-allocation study is outlined in Figure 4.1. It proceeds in two steps: internal cost allocation and external cost allocation.

The internal cost alloation consists of calculating the costs of internal services and allocating these to the final services.

The external cost allocation consists of the allocation of the final services to the end users.

The rationale behind the division of customers and groups of customers in different groups of end users is as follows:

By definition, the receiver of a final service is a customer outside the CAA who requires and uses the service. A characteristic for an end user is thus that he uses the final service and has some form of requirement for its

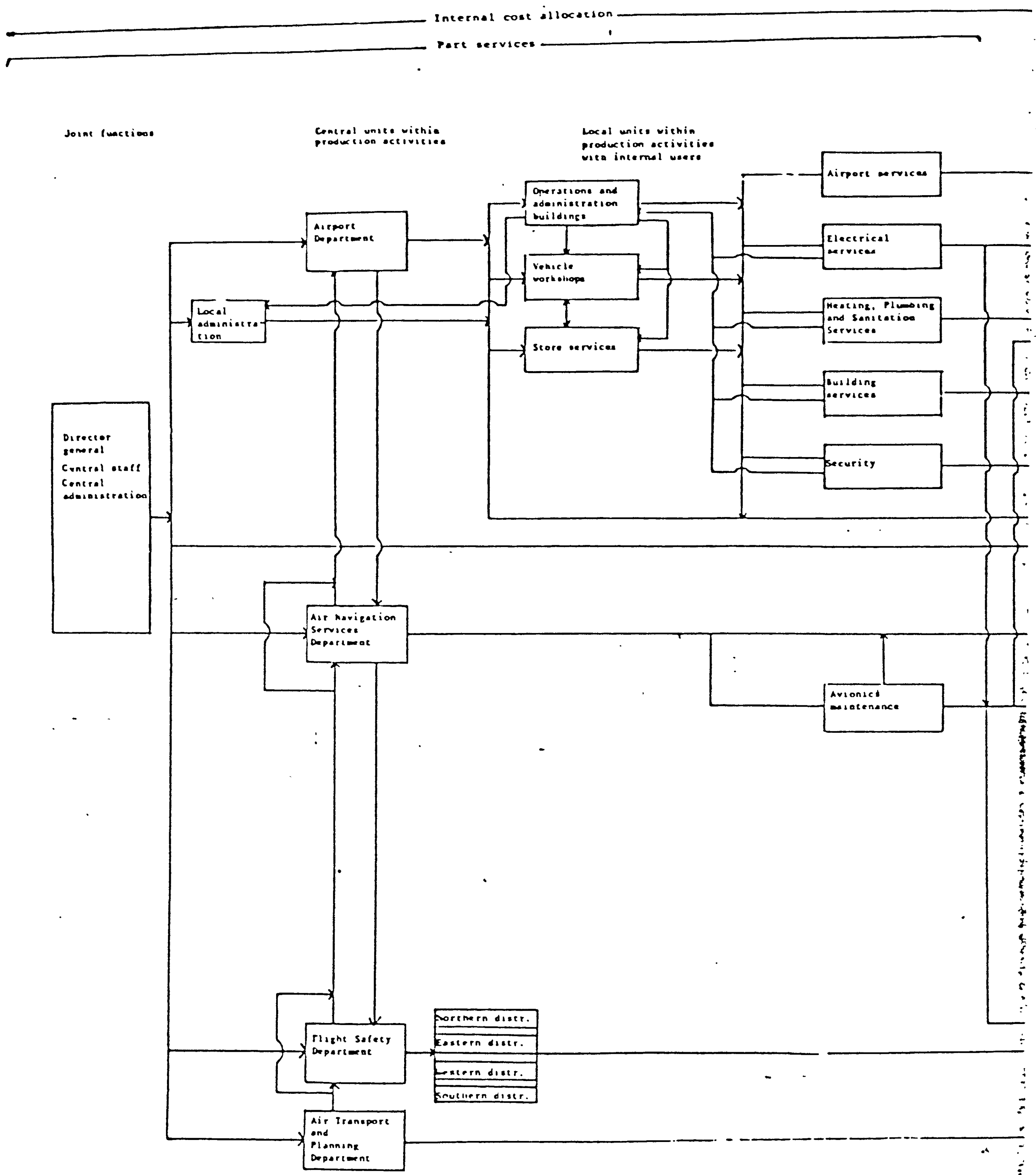


Figure 4.1

STRUCTURE OF SWEDISH COST-ALLOCATION PROCESS

[Source: Sweden (1980)]

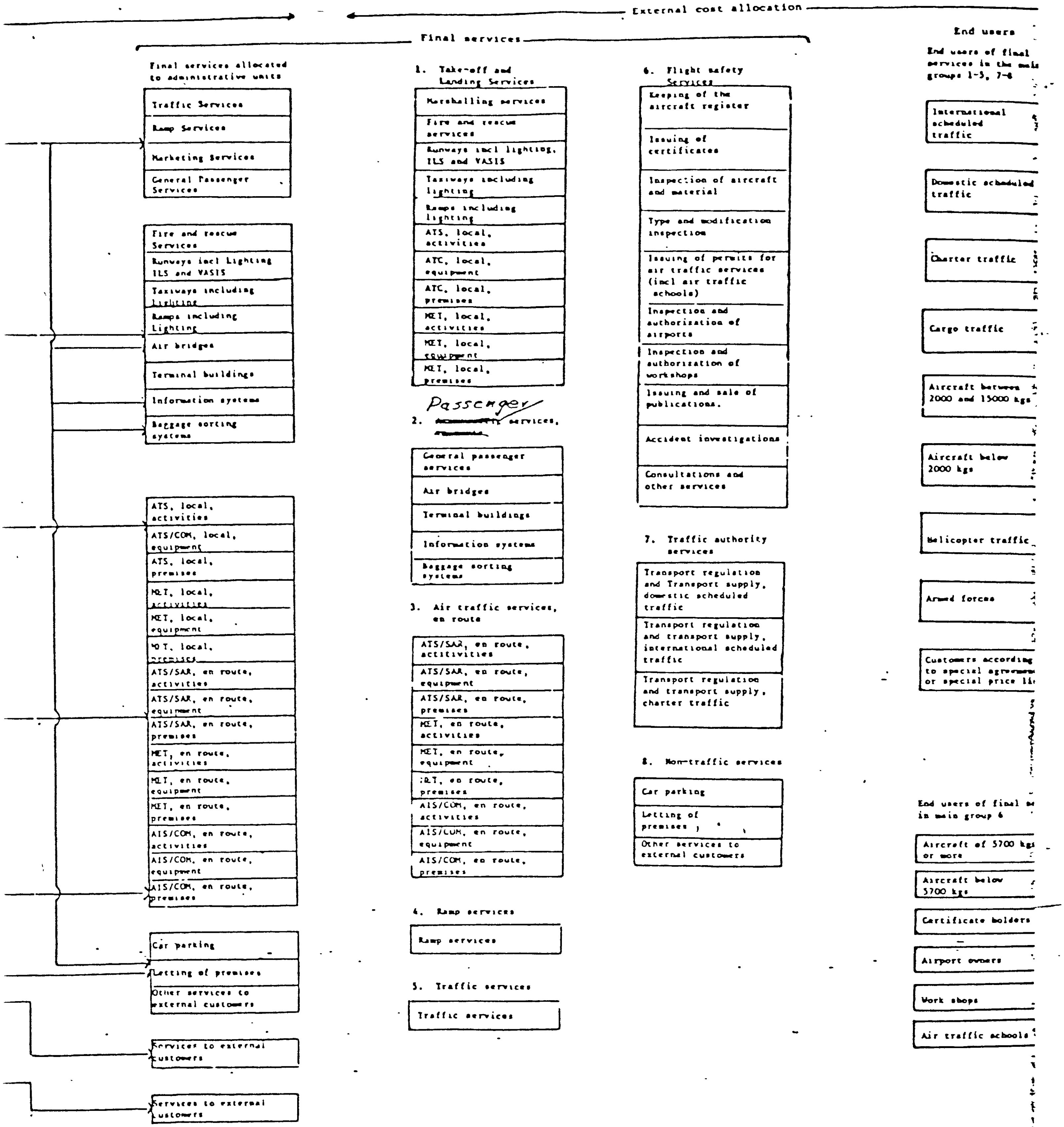


Figure 4.1 (continued)

STURCTURE OF SWEDISH COST-ALLOCATION PROCESS design, capacity and quality. A given end user, -- e.g., an airline -- may have diferent requirements for the same final service, depending on which aircraft type is used, or for which purpose -- e.g., cargo, international or domestic -- an aircraft is used.

The classification of end-users into groups has been made with the objective of forming relatively-homogeneous groups. All members of each group have approximately-similar requirements for the final services of the CAA.

The nine user groups ("end users" identified) are shown at the upper-right-hand part of Figure 4.1 and are listed below:

1. International scheduled traffic
2. Domestic scheduled traffic
3. Charter traffic
4. Cargo traffic (all cargo aircraft)
5. Aircraft between 2,000 and 15,000 kgs.
6. Aircraft below 2,000 kgs.
7. Helicopter traffic
8. Armed forces
9. Non-traffic services (commercial activities)

Air traffic with heavy aircraft, i.e. aircraft with a maximum take-off weight of 15,000 kgs or more, has been classified according to the purpose of the flight.

- Passenger Flights
  - Domestic
    - Scheduled Flights
    - Charter Flights
  - International
    - Scheduled Flights
    - Charter Flights
- Cargo Flights
  - Domestic
  - International

Within each of these categories of air transport there may be differences in the degree of use of a certain final service, because of the type and the size of the aircraft involved. As a measure of aircraft size, the maximum take-off weight has been used.

While the above classification of heavy aircraft is made mainly according to the purpose of the flight, the classification of end users with light aircraft -- below 15,000 kgs -- has been made according to the weight of the aircraft used. The weight limits used are 15,000 kgs and 2,000 kgs.

The 15,000 kgs weight limit has been chosen because flights with aircraft with a MTOW of 15,000 kgs or more, in scheduled traffic and in charter trafic, impose greater requirements on the landing aids of an instrument runway than flights with aircraft under 15,000 kgs.

The weight limit of 2,000 kgs is motivated by the fact that aircraft under 2,000 kgs, with few exceptions, are not used commercially, and consequently, have no requirements for facilities intended for passenger trafic. There are, however, aircraft types between 2,000 kgs and 15,000 kts MTOW, which are used commercially and which therefore have different requirements for facilities, equipment and services.

Helicopters are placed in their own classification group because of their special requirements for landing space.

The services used by all the above groups of end users are for aircraft or passengers or for activities directly connected with flying. The price for the services of the CAA are in these cases, as a rule, published in tariff regulations.

The group "Customers according to special contracts or special price lists" contains a number of different receivers of such services, which have a more-indirect connection with flight activities.

4.4.3 Cost-Allocation Criteria

An interesting feature of the Swedish cost-allocation approach is the use of somewhat-unconventional criteria for determining the cost responsibility of an end-user for a final service. Many cost-allocation studies classify the costs of an operator of aeronautical facilities and services as "capital costs" and "operating costs", and then proceed to allocate these among end users. The Swedish study, instead, used the concepts of "capacity costs" and "service costs". These terms will be explained below, but we note at the outset that they correspond roughly to long-term and short-term marginal costs, respectively (see discussion of marginal-cost pricing in Chapter 3).

When a facility is built, equipment purchased and expensive systems introduced, a long-term choice of the level of capacity and quality of service-to-be-offered is made. The decision to acquire facilities, equipment and systems also entails a long-term choice of the level of capacity and quality levels for maintenance, inspection and service.

The capital costs of the CAA and a great part of the operating costs are consequently costs for the procurement and maintenance of capacity. This type of costs have therefore been called "capacity costs" and defined as follows:

Capacity cost = cost of building, procuring and maintaining durable facilities or systems

On the other hand, some of the activities of the CAA are such that the resources involved can gradually be adjusted to changes in the customer requirements and demand for final services. In such cases there is a closer connection between the service and its costs. This type of costs have therefore been called "service costs".

Service cost = a cost occurring when capacity is put to use

The allocation of capacity costs has been made according to the long-term requirement of end-users for capacity and quality. The allocation of service costs has been made according to the current use of available capacity by end users.

To determine the long-term requirements for capacity and quality that exist, and which end users have put forward these requirements, use has been made of forecasts of traffic development, various documents pertaining to building or procurement, technical manuals for aircraft, rules of the air and other ICAO regulations.

To determine the current use of available capacity by end users (service costs), landing statistics, timetables and hours-of-use statistics have been employed, for the most part.

4.4.4 Cost-Allocation for Final Services

We now outline in broad terms the approaches used to allocate the costs of final services among the various groups of end users. The final services are shown on the second and third right-most columns of Figure 4.1 (numbered 1-8) and each is subdivided into a number of specific activities or services. We now discuss each one separately.

(i) Air Traffic Services

This category of final services contains services classified under the main groups "take off and landing services" and "air traffic services en route" on the third right-most column of Figure 4.1. A factor which affects in a fundamental way a flight's requirements for these final services is whether the flight is performed according to instrument flight rules (IFR) or visual flight rules (VFR). One of the main end-users groups, aircraft under 2,000 kgs, was assumed to correspond to traffic that always flies under VFR.

The capacity costs of air traffic services have in their entirety been allocated to end-users who perform IFR flights. The reason for this is that customers who fly solely VFR do not have requirements that influence capacity.

The service costs for air traffic services vary with the traffic in two ways:

-- Peaks in traffic that influence hourly manpower requirements

-- Requirement for hours of service that influence the total manpower requirement

The service costs have therefore been allocated to the end users according to their share of traffic. The current allocation for each airport has been determined by studies of time-tables, movement statistics, hours of service and manpower planning for the air traffic services. It has been established that the cost for each unit of service provided is independent of aircraft size and of flight rules -- IFR and VFR.

(ii) Runways and Ramps/Aprons

Under this main heading the following final services are included:

-- Marshalling services

-- Fire and rescue services

-- Runways, including ILS, lighting and VASIS

-- Ramps, including lighting

All aircraft landing or taking off require one or more of these final services. Take-off and landing performance, aircraft size, wingspan and weight, expressed in requirements for runway bearing capacity, have determined the characteristics and extent of these services. For ramps and for fire and rescue services, traffic frequency and traffic peaking are also decisive factors.

The costs for "runways including ILS, lighting and VASIS", "ramps including lighting", and "fire and rescue services" are entirely capacity costs. These have been allocated according to aircraft take-off and landing performance, size, weight and wing span. Within each group of end users, the aircraft in the group that has the most-stringent requirements for final services has been taken as the basis for the calculations. The costs of marshalling, including push-back and bussing, are in their entirety service costs, and the basis for cost allocation has been the number of service occasions.

(iii) Taxiways

This final service offers the possibility of an intensive and regular traffic flow during peak traffic periods. The costs have consequently been allocated to those end-users that, because of the nature of their service, can be regarded as requiring a high degree of traffic-flow regularity. The allocation has further been made with regard for the different requirements for bearing capacity and width of taxiways imposed by the various users.

(iv) Passenger Facilities and Services

Under this heading the following final services are included:

-- General passenger services

-- Air bridges

-- Terminal buildings

-- Information systems

-- Baggage-sorting systems

All aircraft in passenger service require one or more of these final services. Determinants of the characteristics and extent of these final services are:

-- the purpose of the flight

-- the size of the aircraft

-- the traffic frequency

-- the traffic-peaking characteristics

Capacity costs have been allocated according to the long-term forecasts for international and domestic traffic of the end users. Service costs vary with traffic in two ways, as manpower requirements are a function of traffic peaks, their distribution and length, as well as of the number of hours of service required.

(v) Ramp and Traffic Services

The costs of these services are in their entirety service costs. The costs are mainly influenced by:

— traffic volume

— traffic peaking

— aircraft type

— aircraft size

— amount of service required

— hours of service

(vi) Non-Traffic Services

These final services involve mainly facilities and activities related to the rental of facilities and space, concessions, car parking, etc. The requirements and conditions for these services are to a large extent determined by agreements between the CAA and various customers. The cost allocation has been made with these agreements as a basis.

(vii) Flight Safety Services

This category comprises the activities of the Flight Safety Department of the CAA. The activities of this department, as well as those of the Air Transport and Planning Department, differ from other CAA activities in that they are regulatory in nature. However, similar principles for cost allocation, as for other CAA services, have been used. The final services under the "flight safety" class are:

-- Maintaining the aircraft register

-- Issuing of certificates

-- Inspection of aircraft and materials

-- Type- and modifications inspection

-- Issuing of permits for air traffic activities (including air traffic schools)

-- Inspection and approval of airports

-- Authorization of workshops

-- Issuing and sale of publications

-- Accident investigations

-- Consultations and other activities

All these activities except the last three are subject to charges.

As the activities of the Flight Safety Department are different from the rest of the CAA, it has not been possible to allocate its costs to the same categories of end users. Instead, the chargeable final services have been allocated to the following groups:

-- Aircraft of 5,700 kgs or more

-- Aircraft below 5,700 kgs

-- Certificate holders

-- Airport owners

-- Workshops

-- Air traffic schools

(viii) Traffic Authority Services

These costs have either been allocated indirectly via airport services, air traffic services and flight safety services, or directly to the end users. The services are all regulatory in nature.

4.5.5 Conclusions and Policy Implications

It is interesting to examine some of the quantitative conclusions of the cost-allocation process. For example, the relative cost distribution between the different main groups of final services is shown below:

Main Groups of Final Services	Share of Total Costs (in %)
Takeoff and Landing Services	49
Passenger Services	16
Air Traffic Services Enroute	17
Ramp Services	5
Traffic Services	2
Flight Safety Services	2
Traffic Authority Services	0.2
Non-Traffic Services	8

Terminal-area ATC services (which are included under "take-off and landing services" in the above table) accounted for approximately 19% of total costs. Thus, the total cost of all ATC services (air traffic services enroute -- 17% of total costs from above table -- and terminal-area services) is responsible for 36% of the total costs of aeronautical services in Sweden.

The distribution between capacity costs and service costs for the main groups of final services is:

Main Groups of Final Services	Capacity Costs (%)	Service Costs (%)
Takeoff and Landing Services	70	30
Passenger Services	92	8
Air Traffic Services Enroute	32	68
Ramp Services	--	100
Traffic Services	--	100
Flight Safety Services	--	100
Traffic Authority Services	--	100
Non-Traffic Services	67	33
Average	59	41

The detailed breakdown between capacity costs and service costs for each of the final services is shown in Table 4.4. Table 4.5 shows the corresponding breakdown along the more conventional lines of capital costs vs. operating costs. It should be noted that "passenger services", "take-off and landing services", "non-traffic services" and, to a lesser extent, "air traffic services en route", have the highest "capacity costs" and are also the most capital-intensive final services. (There is, of course, a strong correlation between "capacity" costs and capital costs, but the former is a more-inclusive category of costs than the latter.)

Table 4.4

Costs for final services.
Capacity and service costs (mill SKR).

Final services	Capacity costs	Service costs	Total
1. Take off and landing services	208.1	91.3	299.4
2. Passenger services	86.3	7.7	93.9
3. Air traffic services en route	33.7	71.6	105.4
4. Ramp services	-	32.3	32.3
5. Traffic services	-	14.4	14.4
6. Flight safety services	-	15.2	15.2
7. Traffic authority services	-	1.3	1.3
8. Non-traffic services	34.6	16.7	51.4
Sum:	362.8	250.5	613.3
Percentage distribution	59	41	100

[Source: Sweden (1980)]

Table 4.5

Costs for final services.

Operating and capital costs (mill SKR).

Final service	Operating costs	Capital costs	Total
1. Take off and landing services	188.9	110.5	299.4
2. Passenger services	34.9	59.0	93.9
3. Air traffic services en route	87.9	17.5	105.4
4. Ramp services	26.1	6.2	32.3
5. Traffic services	13.1	1.3	14.4
6. Flight safety services	15.2	-	15.2
7. Traffic authority services	1.3	-	1.3
8. Non-traffic services	22.3	29.1	51.4
Sum	389.7	223.6	613.3
Percentage distribution	64	36	100

[Source: Sweden (1980)]

The detailed distribution of the costs of final services among the various subcategories of services as obtained through the cost-allocation study is shown in Table 4.6.

Finally, the CAA study concluded with comparisons between the estimated costs of the main groups of end services and the revenues from the charges for these services (Table 4.7), as well as between the costs of final services to the various end-users and the revenues received from these users (Table 4.8). These important tabulations indicate:

(1) In Table 4.7, significant over-recovery of "passenger services" costs and "non-traffic services costs" (these are mostly landside services) and under-recovery of "take-off and landing services" costs, as well as of the costs of "air traffic services", "flight safety services" and "traffic authority services" (these are mostly airside and purely-aeronautical services).

(2) In Table 4.8, significant under-recovery of the costs of "domestic scheduled traffic", "cargo traffic" and aircraft with weights under 15 tons (general-aviation traffic for the most part); "international scheduled traffic", "charter traffic" and military flights seem to cover their allocated share of the costs.

(Tables 4.7 and 4.8 estimate costs and degree of cost recovery with reference to two different levels of interest: the 8.75% interest rate represents the desired rate-of-return on investment set by the Swedish Government for the Swedish CAA; the 0% interest rate is also used in order to gain an understanding of the degree of cost recovery that could be achieved if no "fair-return-on-investment" were sought by the government.)

The results of the cost-allocation study raised numerous policy issues for the Swedish CAA. A couple of obvious ones were: how to achieve better cost-recovery from cargo traffic and from domestic and general-aviation traffic; and whether to maintain a status quo under which landside services

Table 4.6

Costs for final services (Mill SKR)

1.	Take off and landing services	
	Marshalling	8.2
	Fire and rescue services	32.0
	Runways	78.3
	Taxi ways	27.5
	Ramps	36.8
	ATS, local, activities	73.8
	ATS/COM, local, equipment	24.8
	ATS, local, buildings	5.9
	MET, local, activities	9.2
	MET, local, equipment	1.6
	MET, local, buildings	1.3
		Sum: 299.4
2.	Passenger services	
	General Passenger services	7.7
	Air bridges	5.0
	Terminals	62.5
	Information systems	10.7
	Baggage sorting equipment	8.0
		Sum: 93.9
3.	Air traffic services en route	
	ATS/SAR, activities	40.1
	ATS/SAR, equipment	25.6
	ATS/SAR, buildings	3.6
	MET, activities	17.0
	MET, equipment	1.7
	MET, buildings	0.5
	AIS/COM, activities	14.7
	AIS/COM, equipment	1.7
	AIS/COM, buildings	0.5
		Sum: 105.4

Table 4.6 (continued)

4.	Ramp services	32.3
5.	Traffic services	14.4
6.	Flight safety services	
	Keeping of aircraft register	0.3
	Issuing of certificates	3.6
	Inspection of aircraft and material	3.1
	Type- and modification inspection	1.1
	Issuing of permits for air traffic activities (including air traffic schools)	3.6
	Inspection and approval of airports	0.6
	Authorization of work shops	1.5
	Issuing and sale of publications	0.1
	Accident investigations	1.2
	Consultations and other activities	0.1
		Sum: 15.2
7.	Traffic authority services	1.3
8.	Services not directly connected with air traffic	
	Carparking	17.4
	Leasing of premises etc	34.9
	Other external activities	9.1
		Sum: 51.4
Total for all final services		613.3

[Source: Sweden (1980)]

Table 4.7

Cost at different interest levels for final services compared with corresponding revenues (mill SKR)

Final services	Costs at an interest level of 8.75%	0%	Revenues	Degree of cost recovery of an interest level of 8.75%	0%
Take off and landing services	299.4	215.7	123.0	41%	57%
Passenger services	93.9	55.4	122.0	130%	220%
Air traffic services en route	105.4	95.4	89.0	84%	93%
Ramp services	32.3	25.3	33.0	102%	130%
Traffic services	14.4	13.9	7.0	49%	50%
Flight safety services	15.2	15.2	8.0	53%	53%
Traffic authority services	1.3	1.3	-	-	-
Non-traffic services	51.4	28.4	121.0	235%	426%
Sum:	613.3	450.6	503.0	82%	112%

[Source: Sweden (1980)]

Table 4.8

Cost at different interest levels for final services compared with revenues from end users (mill SKK

End users	Costs at an interest level of 8.75%	0%	Revenues	Degree of cost recovery of an interest level of 8.75%	0%
International scheduled traffic	146.6	99.6	137.0	93%	138%
Domestic scheduled traffic	165.4	126.0	77.0	47%	61%
Charter traffic	129.5	88.4	111.0	86%	126%
Cargo traffic	13.5	7.6	6.0	44%	79%
Aircraft between 2 and 15 tons	38.0	34.6	7.0	13%	14%
Aircraft under 2 tons	14.5	14.0			
Helicopter traffic	-	-	-		
Armed forces	37.4	34.9	37.0	99%	106%
Customers according to special agreements and special price lists	53.2	30.2	121.0	227%	401%
Sub total	598.1	435.4	495.0	83%	114%
Users of flight safety services	15.2	15.2	8.0	53%	53%
Total	613.3	450.6	503.0	82%	112%

[Source: Sweden (1980)]

effectively cross-subsidize airside and air navigation services. At a subtler level, it became clear to the Swedish CAA that long-term costs (= "capacity costs") and short-term costs (= "service costs") represented higher and lower percentages, respectively, of total costs than previously thought.

An immediate consequence of this latter observation was the adoption in 1980 of a new landing-fee structure for domestic flights in Sweden. A two-part landing fee was adopted, under which a flight would pay a fixed charge for each landing, plus a variable charge based on the number of passengers carried. The fixed charge was designed to cover long-term ("capacity") costs and the variable charge short-term ("service") costs. This is shown schematically in Figure 4.2 ("two-parts tariff" denotes the new two-part landing fee). The short-term (variable) part of the fee is very small, in keeping with the findings of the study. The CAA believes that the new landing-fee structure has already proved successful, and has played a role in stimulating growth of traffic and achieving better facility utilization in the years since its implementation in 1980.

4.5 COST-ALLOCATION AND USER CHARGES IN AUSTRALIA

4.5.1 Background

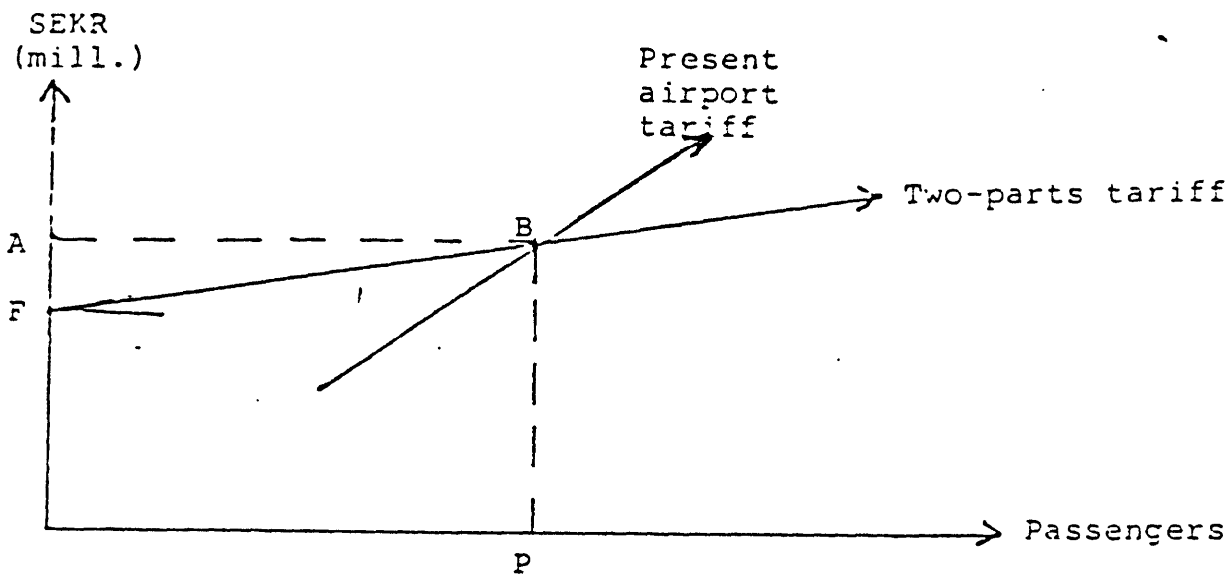
The case of aeronautical-cost recovery in Australia presents several interesting parallels as well as contrasts to the Swedish approach which was described in the previous section. The discussion in this section will be more brief and is designed to highlight the most important elements of the Australian analysis, as well as point out similarities and differences between the two approaches.

The Government of the Commonwealth of Australia owns and operates all the important airports in Australia, in addition to being responsible for

Figure 4.2

TWO-PART LANDING TARIFF

Source: [Fransson, 1983]



B = budgeted amount, pertaining to revenues from domestic airlines (estimated from landing fees and passenger charges)

P = number of passengers in the budget

A = total revenues according to the present airport tariff (sum of landing fees and passenger charges)

F = fixed amount for a fiscal year, corresponding to CAA capacity costs. SAS and LIN have to pay this amount together, apart from traffic volume. The fixed amount is, however, separated between the two airlines, but not related to differences in the market situation, which is quite different.

Australia's ATC system. The Commonwealth Government provides the funding for both the capital and the operating expenses for aeronautical facilities and services. The Government's Department of Aviation manages, plans for and operates this system. In recent years, Aviation has, at times, been a separate Department with its own Minister of Aviation or, alternatively, it has also been, as an organization, a part of the Department of Transport. To avoid confusion, we shall refer to it henceforth as the Department of Aviation/Transport. Among its other activities, the Department, through its Policy Division, conducts cost-allocation studies concerning the air transport industry and uses such studies to set policy guidelines regarding the setting of user charges.

Australia employs a quite-unusual method for computing user charges. A single charge is imposed to cover both landing and enroute air navigation fees. This charge is computed by:

(1) Determining a "unit charge" based solely on aircraft weight

(2) Assigning to each flight a "flight factor", based on origin-destination for the flight

(3) Multiplying the unit charge by the flight factor to arrive at the user charge for the flight.

The details of this procedure are given in Appendix 4A. (Note also that a somewhat-different procedure is used for general-aviation flights.) The flight factors for all origin-destination pairs are specified in the text of the Air Navigation (Charges) Act (originally passed in 1952 and amended many times subsequently). As an example, a 350,000 kg. aircraft (B747) flying from Europe to Sydney would in 1983 have been charged as follows (see also Appendix 4A):

Unit charge = 82.73 + (.415) (500) = $290.23

Flight factor = 10

Charge = $2902.30.

(All the amounts shown in this section are in Australian dollars.)

This charge must, in turn, be multiplied by 2 — since it is imposed on both an arriving and a departing flight -- resulting in a $5,805 charge (approximately U.S. $5,350 at 1983 exchange rates) imposed by Australia on a round-trip Sydney-Europe flight. A flight by the same aircraft from the United States to Sydney and back would pay $3,483, due to the fact that it is charged for a 6-unit flight factor (each way), since only 1,200 kilometers of Australian airspace would typically be traversed by such a flight, as opposed to about 4,000 kilometers for a Europe-Sydney flight.

4.5.2 Allocation of Costs

The Australian cost-allocation methodology identifies five classes of end-users (called "sectors" in this case) of aeronautical services. These are:

(1) International airlnes

(2) Domestic trunk airlnes

(3) Rural/regional airlines

(4) Commuter airlines

(5) General aviation.

It should be pointed out that Australia's Department of Aviation/Transport normally does not draw a distinction between categories (4) and (5), and labels commuter airline flights as "general aviation flights"; the extent to which detailed separate data are available to the department concerning the activities, costs and revenues that concern commuters and private general aviation is therefore unclear. On the other hand, there is no overlap between international and domestic trunk carriers, since the Australian international airline, Qantas, is a strictly-international airline while the domestic ones, TAA and Ansett, are strictly domestic.

Unlike the Swedish case, the Australian Government recognizes that not all costs associated with air-transport-related activities need be recovered from users. Costs associated with the Government's regulatory, planning or policy functions vis-a-vis aviation should, according to the rationale of the Australian analysis, be excluded from the cost base to be allocated. Costs are classified as attributable (to aircraft operations) and non-attributable. Thus, the cost-recovery analysis requires a review of all aviation-related costs of all governmental Divisions and Division Branches, in order to determine what parts of said costs are attributable to aviation users ("sectors") and what are not.

A number of examples in this respect are provided by the Department of Aviation/Transport:

> For instance, 90% of the Airways Operation Division's costs in 1977/78 were "attributable" whereas 100% of Air Transport Policy Division's were "non-attributable." Within the Airways Operations Division, 100% of Operational Service Branch were "attributable" while the total costs of the Environmental and Security Branch were "non-attributable". (Air Transport Industry Cost-Recovery Report, May 1979 version.)

Attributable costs are further subdivided into current and non-current costs. Current costs (corresponding roughly to what are usually referred to as "operating costs") are expenditures related to the operation and maintenance of the aeronautical facilities provided.

Non-current costs (essentially "capital costs") account for the provision of capital items such as land, runways and taxiways, buildings, plant and equipment which are necessary for aircraft operations. Three items account for these costs:

(1) Depreciation on all assets except land.

(2) Interest, computed at the long-term bond rate on the historical cost of the aeronautical assets, including land. (This is presumed here to mean interest on the yet-undepreciated part of historical costs.)

(3) An allowance made to cover the cost of future retirement benefits of government employees in aeronautical services. (It is unusual to include these latter costs among capital costs.)

Once attributable costs have been identified, it remains to allocate them among the various sectors of users. Depending on the type of cost, different approaches have been adopted. A number of important examples are given below:

(a) Paved runways: their costs are allocated among all sectors; the allocation criteria are (1) the length of runway required by aircraft in each sector and (2) the number of aircraft movements by each sector on the runway.

(b) Terminal buildings: their costs are allocated solely to the international airline and domestic airline sectors. When separate terminals for international and domestic operations exist (Sydney, Brisbane), all the costs of these terminals are allocated directly to the appropriate sector. When there are joint terminals (Melbourne, Adelaide, Perth, Darwin, Cairns, Hobart, Townsville, Norfolk Island), allocation is made on the basis of the number of passengers and visitors from each of the two sectors using the terminal.

(c) Navigational aids: their costs are allocated among all sectors. The allocation criteria are (1) the type of aid required by the sectors (each sector shares in the costs of only those navigational aids the sector requires) and (2) the number of aircraft using the aid for those aids which are required by more than one sector.

(d) ATC and flight services personnel: their costs are allocated among all sectors. Allocation is made in proportion to the actual number of aircraft from each sector handled by personnel on the various air routes.

It is clear from the above that the allocation approach and criteria adopted by Australia are considerably-less sophisticated than those of the Swedish CAA. However, they are probably more typical of corresponding criteria adopted elsewhere. The definition of the criteria is also not particularly precise -- at least in the written materials that we have reviewed. For example, it is not clear how it is decided what navigational aids any sector requires (as opposed to actually uses). On the other hand, the Department of Transport apparently recognizes that there may be shortcomings in its approach:

> As will be appreciated there are different criteria which may be adopted in the allocation of costs and revenues to the various sectors. The current method of allocation is at present being reviewed by a Study Team formed by the Aviation Industry Advisory Council for this purpose. (Air Transport Industry Cost Recovery Report, May 1979 version).

A number of issues have also been raised by various users regarding cost-allocation policies. One, for example, concerns meteorological costs of which, it is claimed, too high a fraction is allocated to aviation -- as opposed to all the other end-users of meteorological information. In response to this criticism, the Australian Government has decided that charges to the aviation industry for meteorological services would henceforth be based "on the marginal costs of providing these services over and above the costs of providing the public weather services."

A second concern is the charging of interest -- at a rate equal to long-term government bond rates -- on the historical cost of assets required by the government for aeronautical use. The question was raised as to why this interest is charged, since it is a "notional" one and not a "true" cost to the Department of Aviation/Transport. This objection seems to be without merit. There is clearly an "opportunity cost" associated with capital tied up in aeronautical assets and Australian practices in this respect are consistent with those of many other countries (see, e.g., Chapter 3, as well as the preceding section on Sweden).

4.5.3 Allocation of Revenues

The allocation of revenues to the various sectors is a simpler task than allocation of costs, since in most cases the sector which is the source of some amount of revenues is readily identifiable. One possible exception is revenue from a fuel excise-tax, which is applicable to domestic aviation only and is not collected by the Department of Aviation/Transport. This revenue is considered attributable (i.e., credit is received for it by the various domestic-aviation sectors) and its allocation among sectors is made by taking into consideration the number of aircraft in each such sector and the average fuel-consumption rates of the particular aircraft types used.

However, we have come across at least one striking apparent inconsistency in the attribution of revenues to sectors. Australia currently collects a $20 departure tax from international passengers. This tax, collected directly from the passenger at the airport of departure, is entirely analogous to the passenger-service charge imposed by the great majority of nations around the world. Yet, this tax does not appear anywhere in lists of Australian aeronautical charges (see, e.g. the Commonwealth of Australia Air Navigation (Charges) Act, or the listing of Australia's aeronautical charges in ICAO's Doc. 7100, Manual of Airport and Air Navigation Facility Tariffs). The explanation given is that the international departure tax is not an aeronautical charge, since it is not collected by the Department of Aviation/Transport and its proceeds are allocated to non-aeronautical purposes (i.e., to assisting immigration to Australia).

This argument is not a convincing one. No matter what the ultimate use of the revenues from this tax is, it nonetheless represents a charge imposed specifically on aeronautical users, i.e., international air passengers. Since the sector (out of the five defined) with which those who pay this charge are associated is "international airlines", revenues from the tax should be treated as revenue attributable to the international sector. After all, to the extent that the departure tax increases the cost of international travel to/from Australia, it also reduces demand for seats on international airlines serving Australia.

There is also an apparent inconsistency between the way the international departure tax and the domestic fuel-excise tax are treated for revenue-attribution purposes. The fuel tax is not collected for the Department of Aviation/Transport either and its proceeds are not designed to offset any specifically aeronautical costs. It would seem that two taxes which are very similar in nature (and are both aeronautical ones) are treated in entirely-different ways when it comes to revenue attribution -- a possible case of discrimination against international carriers.

This is a matter of considerable practical importance: the number of international enplanements in Australia has for the last several years stabilized to more than 2 million per year. Thus, the international departure tax proceeds have been, during the last several years, in the $40-$50 million range per year. Were these revenues to be credited to the international sector, the total revenues from that sector would increase by more than 50%(!) from what they are currently estimated to be by the Australian Government (see also below).

4.5.4 Findings and Comments

The main findings of the Australian cost-allocation studies can now be sumarized. In the process, we shall also offer some comments on these findings:

(a) Throughout the period for which information was available, there is a consistent pattern of over-recovery of costs associated with the international sector; at the same time there was under-recovery of costs for all domestic sectors (domestic trunks, regional/rural, commuters, general aviation). This pattern is summarized in Table 4.9 (note that the 1981-1982 and 1982-1983 recovery rates indicated are estimates only). The magnitude of over-recoveries, in the case of the international sector, and of under-recoveries, in the cases of the regional/rural and commuter/general aviation sectors, is impressive as also shown by the more-detailed figures of Table 4.10. During the 5-year period 1976-1981 the total amounts involved are +$57.8 million (over-recovery) -$95.8 million and -$400.7 million (under-recoveries) for these three groupings, respectively. (The corresponding figure for domestic trunk carriers was -$40.5 million.) It should be noted

Table 4.9

CIVIL AVIATION COST RECOVERY RATES 1971-72/1982-83

YEAR	INTERNATIONAL %	DOMESTIC TRUNK %	REGIONAL %	GENERAL AVIATION %	TOTAL %
1971-72	Recovery rates by sectors not available				50.5
1972-73	Recovery rates by sectors not available				49.6
1973-74	Recovery rates by sectors not available				53.6
1974-75	86.5	75.2	24.2	17.0	54.8
1975-76	114.7	80.4	29.7	14.2	60.6
1976-77	113.2	74.2	30.8	14.5	58.5
1977-78	128.0	84.7	36.1	14.5	62.3
1978-79	127.7	92.0	30.2	14.5	59.9
1979-80	159.4	89.3	30.6	16.4	66.1
1980-81	125.3	100.9	31.6	15.0	62.7
*1981-82	114.0	98.0	27.0	15.0	59.0
*1982-83	100.0	90.0	25.0	15.0	53.0

* Recovery rates for 1981/82 and 1982/83 are estimates only.

- Allocation of costs and revenues to sectors was undertaken for the first time for 1974-75.

Table 4.10

COSTS, REVENUES AND RECOVERY RATES IN TOTAL AND BY SECTOR

	1976/1977	1977/1978	1978/1979	1979/1980	1980/1981
TOTAL					
Cost	$207.4	$224.4	$245.1	$262.2	$298.2
Revenue	121.4	139.7	146.8	173.4	186.8
Surplus/Deficit	-86.0	-84.7	-98.3	-88.8	-111.4
Recovery Rate (%)	58.5	62.3	59.9	66.1	62.7
INTERNATIONAL					
Cost	39.7	39.4	41.0	45.6	52.2
Revenue	44.9	50.5	52.4	72.7	65.4
Surplus/Deficit	+5.2	+11.1	+11.4	+27.1	+13.2
Recovery Rate (%)	113.2	128.3	127.7	159.4	125.3
TRUNK					
Cost	81.6	73.2	77.5	83.5	92.4
Revenue	60.6	68.0	71.3	74.6	93.2
Surplus/Deficit	-21.0	-5.2	-6.3	-8.9	+0.8
Recovery Rate (%)	74.2	92.9	92.0	89.3	100.9
REGIONAL					
Cost	20.8	27.7	29.8	30.5	31.9
Revenue	6.4	10.1	9.0	9.3	10.1
Surplus/Deficit	-14.4	-17.6	-20.8	-21.2	-21.8
Recovery Rate (%)	30.8	36.4	30.2	30.6	31.6

(continued)

Table 4.10 (continued)

	1976/1977	1977/1978	1978/1979	1979/1980	1980/1981
GENERAL AVIATION					
Cost	65.3	84.1	96.8	102.6	121.7
Revenue	9.3	11.1	14.1	16.8	18.1
Surplus/Deficit	-55.8	-73.0	-82.7	-85.8	-103.4
Recovery Rate (%)	14.5	13.2	14.6	16.4	15.0

that the amount of over-recovery for the international sector would have increased several-fold, had the revenues from the international-departure tax been credited to that sector -- as, we have argued, they should.

(b) A more-detailed breakdown of the sources of attributable revenue by sector is shown in Table 4.11, where revenues are classified as being derived from aeronautical charges (ANC's), the fuel excise-tax and "other" revenue (i.e. air-transport and non-air-transport rentals, car parking at airport terminals, airport business concessions, etc.). Remarkable stability in the distribution of these revenues (see percentages shown) is evident in the case of the total revenues and, to a lesser extent, in the case of the individual sectors. One interesting aspect, in this regard, is the increasing importance of ANC's as a source of revenues from domestic trunk airlines (this point is further explained below). A second noteworthy point is that "other" revenues (i.e., from rentals and commercial activities) is increasing in importance as a source of total revenues at the expense of the fuel excise tax. It is also interesting to note that if revenues from the international departures tax were considered a "passenger service charge", the amount of ANC's contributed by the international sector would nearly double.

(c) A breakdown of total costs, shown in Table 4.12 (for a different period of time), also indicates remarkable stability in the distribution of these costs (see associated percentages). The one item that has grown appreciably as a percentage of total costs is retirement ("superannuation") benefits, which increased by 221% during the 1974-1978 period (from $7.1 to $22.8 million) -- while total costs increased by 61% during that same period and other non-current costs (depreciation plus interest) by 42%. If this trend is continuing, it should be a matter of concern.

The relationship between current and non-current costs has remained very

Table 4.11

SOURCES OF REVENUE FROM THE VARIOUS SECTORS

	1976/77	1977/78	1978/79	1979/80	1980/81
Total:					
ANC's	$61.6 (51%)	73.5 (53%)	76.2 (52%)	84.1 (49%)	95.9 (51%)
Fuel Excise	36.0 (30%)	39.9 (29%)	42.1 (29%)	42.9 (25%)	45.2 (24%)
Other Revenue	23.8 (19%)	26.3 (18%)	28.5 (19%)	6.4 (26%)	45.7 (25%)
International:					
ANC's	36.9 (82%)	42.8 (85%)	41.9 (80%)	46.3 (64%)	44.2 (68%)
Other Revenue	8.0 (18%)	7.7 (15%)	10.5 (20%)	26.4 (36%)	21.2 (32%)
Domestic Trunk:					
ANC's	19.9 (33%)	24.0 (35%)	27.7 (39%)	29.4 (40%)	42.2 (45%)
Fuel Excise	27.8 (46%)	29.1 (43%)	30.5 (43%)	30.8 (41%)	33.0 (35%)
Other Revenue	12.9 (21%)	14.9 (22%)	13.1 (18%)	14.4 (19%)	18.0 (20%)
Regional:					
ANC's	1.1 (17%)	2.4 (24%)	2.1 (23%)	2.4 (26%)	2.9 (29%)
Fuel Excise	3.9 (61%)	5.9 (58%)	5.1 (57%)	5.0 (54%)	5.1 (50%)
Other Revenue	1.4 (22%)	1.8 (18%)	1.8 (20%)	1.9 (20%)	2.1 (21%)
General Aviation:					
ANC's	3.7 (39%)	4.3 (39%)	4.5 (32%)	6.0 (36%)	6.6 (36%)
Fuel Excise	4.3 (45%)	4.9 (44%)	6.5 (46%)	7.1 (42%)	7.1 (39%)
Other Revenue	1.5 (16%)	1.9 (17%)	3.1 (22%)	3.7 (22%)	4.4 (25%)

Table 4.12

CURRENT VS. NON-CURRENT COSTS BY ITEM

	1973/1974	1974/1975	1975/1976	1976/1977	1977/1978
Current Costs:	98.4 (70%)	123.8 (71%)	131.9 (72%)	142.0 (68%)	153.1 (68%)
Airport and Route Facilities	54.8 (39%)	70.9 (41%)	79.6 (43%)	87.3 (42%)	93.8 (42%)
Regional Offices	22.7 (16%)	27.0 (15%)	25.8 (14%)	26.5 (12%)	27.5 (12%)
Head Office and Special Costs	20.9 (15%)	25.9 (15%)	26.5 (15%)	28.2 (14%)	31.8 (14%)
Non-Current Costs:	41.3 (30%)	51.3 (29%)	52.0 (28%)	65.4 (32%)	71.3 (32%)
Depreciation	12.9 (9%)	14.6 (8%)	15.0 (8%)	15.7 (8%)	17.5 (8%)
Interest	21.3 (16%)	27.1 (15%)	26.9 (15%)	28.5 (14%)	31.0 (14%)
Retirement Benefits	7.1 (5%)	9.6 (6%)	10.1 (5%)	21.2 (10%)	22.8 (10%)
TOTAL COSTS	139.7	175.1	183.9	207.4	224.4

stable in the 70% vs. 30% area, respectively, throughout the period shown in Table 4.12. This is remarkably similar to the 64% vs. 36% relationship shown between operating and capital costs in the Swedish cost-allocation study (Section 4.4, Table 4.5). It would be interesting to investigate whether a similar kind of relationship between the magnitudes of annual operating and capital costs of aeronautical facilities and services exists for other countries as well.

(d) An examination of financial results at the two major Australian airports that have separate international and domestic terminals (Sydney and Brisbane) indicates that, as in the case of total costs and revenues, there is over-recovery from the international terminals while domestic terminals (serving primarily domestic trunk airlines) approximately break even. (This statement refers to statistics through 1981.) Sydney, which is by far the principal international airport in Australia, has developed very-significant revenues from business concessions, which now provide more than 75% of total revenues for the international terminal.

The Australian cost-allocation analyses have had a number of consequences. As might well be expected, inequities in the recovery rates such as those indicated in Tables 4.9 and 4.10, have given rise to considerable controversy. International airlines serving Australia have justifiably complained with respect to the over-recovery problem, as regards their sector, and foreign governments (e.g. the U.S. Government) have expressed considerable interest in the matter.

The Australian Government has announced that over-recoveries from the 1980/1981 fiscal year "onwards are to be applied to future deficits as they arise in the international sector." However, no specific provisions have been made for returning such over-recoveries to the international sector, nor have the issues of interest accrued on over-recovered funds or of the effects of inflation on the over-recovered amounts been addressed. Similarly, there has been no change in policy with regard to the international-departure-tax issue described earlier.

On the other hand, considerable effort has clearly been made toward increasing recovery rates from certain categories of domestic users. This is demonstrated by the examples given in Table 4.13. As can be seen, international air navigation charges (in current dollars) have been slightly reduced over the 5-year period 1977-1982, whereas domestic ones (including those on commuters and general aviation) have more than doubled during that period. This has been accomplished through the adoption of separate formulae for the computation of the unit-charges (based on weight) for each aviation sector (see also Appendix 4A). Thus, the Department of Aviation/Transport can adjust the magnitude of ANC's for each sector separately, as it wishes. As Table 4.14 also indicates, recent emphasis has been on charge increases to domestic sectors.

It is also our understanding that the Commonwealth's Government is in the process of revising its thinking regarding the size of costs which are attributable to general aviation. This was apparently prompted by a realization that it is infeasible to attempt to recover all such costs from that sector -- as that would imply prohibitive charges on the sector. Thus, an explicit policy of government subsidies to the commuter/general aviation sector may eventually be adopted.

Table 4.13

COMPARISON OF USER CHARGES FOR SELECTED FLIGHTS

Aircraft Type and Flight	1977 ANC	1982 ANC	% Charge
350,000 kg. aircraft (international/domestic)			
Europe-Sydney (10 units)	$5,805	$5,315	-5%
Perth-Sydney (13 units)	3,773	8,415	+123%
140,000 kg. aircraft (international/domestic)			
Europe-Sydney (10 units)	2,319	2,203	-5%
Perth-Sydney (13 units)	1,507	3,365	+123%
52,000 kg. aircraft (regional)			
Darwin-Cairns (4 units)	159	343	+116%
6,000 kg. aircraft (regional)			
Camberra-Newcastle (2 units)	4.26	9.62	+116%

Chapter 5

EUROCONTROL ENROUTE AIR NAVIGATION CHARGES

5.1 BACKGROUND

The seven states (Belgium, France, Federal Republic of Germany, Ireland, Luxembourg, Netherlands, United Kingdom), which are signatories to the Eurocontrol International Convention of 1960 relating to Co-operation for the Safety of Air Navigation, as well as four non-member States (Austria, Portugal, Spain, Switzerland), have agreed to adopt a common system of charges for use of enroute air navigation facilities and services provided within their airspace.

The Eurocontrol Agency in Brussels, through its Central Route Charges Office (CRCO), provides a central billing and collection service for the entire system. For any particular flight, a separate charge is calculated for each State overflown, and a total charge is calculated by adding together the separate charges for each individual State. Thus, the aircraft operator pays a single charge for a flight originating in or passing over or terminating in the Eurocontrol area. (Typically, each airline utilizing Eurocontrol airspace receives a monthly bill from CRCO listing all flights during the month and the corresponding charge for each -- see, for example, in Figure 5.1 a copy of one page of the bill received by Pan American World Airways for the month of July 1982: the entire bill is 100 pages long and the total charge amounts to $2,288,462.95). On the other hand, each State overflown is credited with its appropriate share of the combined charge for each flight.

A common formula is used by all States to compute the air navigation charge for a flight:

POUR LA SECURITE DE LA NAVIGATION AERIENNE
SERVICE CENTRAL DE REDEVANCES DE ROUTE

EUROCONTROL
RUE DE LA LOI 72 - B - 1040 BRUXELLES
TEL: (02) 233.04.49
(02) 233.02.11 (Central)
TELEX : 25595 CRCO B.

EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION
CENTRAL ROUTE CHARGES OFFICE

RELEVE PRO FORMA / PRO FORMA STATEMENT

DATE 24-08-82 PERIOD JUL 1982
REF 2085/48/1/8207/001 PAGE 7
CODE PA /PAN AMERICAN

PAN AMERICAN WORLD AIRWAYS, INC.
R.A.FOSSMAN & H.KLEMENS
MGR OPERATIONAL CHARGES
ROOM 909, PAN AM BLDG
200 PARK AVENUE
NEW YORK,NY 10166(USA)

JOUR DAY 1	REF VOL REF TO FLIGHT 2	No VOL OU IMMATRIC No FLIGHT OR REGIST 3	DETAILS 4	CODE 5	A DEDUIRE DEDUCTED 6	REDEVANCE CHARGE 7
02	00216	PA614	1650 EDDH EDBT B737			$64,78
	00217	PA8123	1706 EGKK KBWI DC10			$956,56
	~~00218~~	~~PA617~~	~~1710 EDBT EDDH B737~~			~~$64,78~~
	00219	PA690	1710 EDDM EDBT B737			$183,96
	00220	PA693	1730 EDBT EDDM B727			$230,41
	00221	PA001	1732 EGLL KJFK B747			$1.217,01
	~~00222~~	~~PA6570~~	~~1755 EDBT EDDF B727~~			~~$81,91~~
	00223	PA627	1755 EDBT EDDN B737			$88,62
	00224	PA161	1800 EDDF KJFK B747			$2.213,55
	00225	PA8128	1800 EINN KOFD DC10			$227,24
	~~00226~~	~~PA616~~	~~1825 EDDH EDBT B737~~			~~$64,78~~
	00227	PA668	1825 EDDS EDBT B727			$167,64
	00228	PA619	1855 EDBT EDDH B737			$64,78
	00229	PA692	1910 EDDM EDBT B737			$183,96
	~~00230~~	~~PA676~~	~~1920 EDDN EDBT B737~~			~~$88,62~~
	00231	PA6560	1930 EDDF EDBT B727			$81,91
	00232	PA891G	2000 EDBT LTAC B727			$482,16
	00233	PA893G	2000 EDBT LTBA B727			$482,16
	~~00234~~	~~PA162~~	~~2013 EBBR OMAA B747~~			~~$1.188,30~~
	00235	PA629	2130 EDBT EDDF B727			$81,91
	00236	PA628	2335 EDDF EDBT B727			$81,91
~~03~~	~~00237~~	~~PA8926~~	~~0238 LTBA EDBT B727~~			~~$482,16~~
	00238	PA25	0238 OEDR KJFK B747			$2.318,18
	00239	PA890G	0250 LTAC EDBT B727			$482,16
	00240	PA164	0317 KOFD EGLL B747			$1.217,01
	~~00241~~	~~PA8128~~	~~0355 KOFD EINN DC10~~			~~$227,24~~
	00242	PA3121T	0405 EDBT EBBR B727			$358,73
	00243	PA837G	0405 EDBT LEPA B727			$921,65
	00244	PA72	0417 KJFK EDDF B747			$2.213,55
	~~00245~~	~~PA110~~	~~0434 KJFK LIRF B747~~			~~$1.700,00~~
	00246	PA681	0440 EDBT EDDM B727			$230,41
	00247	PA76	0456 KJFK EDDM L101			$1.887,65
	00248	PA002	0511 KJFK EGLL B747			$1.217,01
	~~00249~~	~~PA633~~	~~0515 EDBT EDDF B727~~			~~$81,91~~
	00250	PA661	0525 EDBT EDDS B737			$133,84
					$849,28	$165.399,55

Table 5.1

SAMPLE PAGE OF MONTHLY STATEMENT OF CHARGES

TOTAL

5296 UTILISEZ CE PAPILLON POUR LES RECLAMATIONS S.V.P.
USE THIS LABEL FOR YOUR CLAIMS, PLEASE

REF P.F. 2085/48/1/8207/001/8207

$$\text{Charge} = R \times \frac{D}{100} \times \sqrt{\frac{W}{50}} \qquad (1)$$

where:

R = the route per service unit for a given State (see below)

D = the distance travelled in the State's airspace, measured in kilometers

W = the maximum take-off weight of the aircraft involved, measured in (metric) tonnes

The rate per service unit, R, is set annually for each State for the period April 1 - March 31 and is expressed in US$. For the period beginning April 1, 1983 the values of R were as follows:

Belgium/Luxembourg	$42.49
France	31.83
Germany	47.39
Ireland	35.26
Netherlands	48.42
United Kingdom	64.15
Austria	43.11
Portugal	27.58
Spain (Mainland)	30.29
Spain (Canaries)	29.24
Switzerland	59.00

The product of the distance factor, D/100, times the weight factor, $\sqrt{W/50}$, gives the number of service units for which a flight is charged. For example, a flight of 426 kms by an aircraft with W=170 tonnes over France would be charged for (4.26)(1.84) = 7.84 units of service, i.e. an amount of (31.83) (7.84) = $249.55. The distance factor and the weight factor are computed to two decimal places.)

Many additional details on the computation of Eurocontrol charges are provided in Appendix 5A, which reproduces the 1983 issue of the "Information on Tariffs and Conditions of Application of the Route Charges System", prepared on an annual basis by CRCO. Of particular interest are: Articles 7 and 8 on the computation of the distance and of the weight factors, respectively; Article 12, describing the determination of Eurocontrol charges for flights originating or terminating in (essentially) North America -- for which flights a "standardized" charge applies based on a statistically-averaged route for each origin/destination pair; and Article 14, listing the categories of flights which are exempted from Eurocontrol charges.

It is worth noting that formula (1), known as the "Eurocontrol formula", is being adopted by an ever-increasing number of States other than those that participate in the Eurocontrol system. As of the end of 1982, the following states used formula (1) -- or slight variations of it -- to compute air navigation charges in their airspace (the corresponding 1982 unit rates, R, for these states are also indicated):

Algeria	$12.82
Bolivia	$ 6.51 x n (n is the number of radio aids available enroute)
Brazil	$12.90
Greece	$ 5.30
Italy	$15.02
Mauritius	$ 6.76
Morocco	$ 1.62
Norway	$26.45
Sweden	$21.88
Tunisia	$ 2.50
Yugoslavia	$10.43
Zambia	$10.99

Finally, the Eurocontrol formula is consistent with the ICAO Council's Statements regarding charges for route air navigation facilities (§ 33, Chapter II, Statements by the Council to Contracting States on Charges for Airports and Route Air Navigation Facilities: 1981, Doc. 9082/2; see Appendix 1A):

> The charge for route air navigation facilities and services should, so far as possible, be a single charge per flight; that is to say, it should constitute a single charge for all route facilities and services provided by a State or group of States for the airspace to which the charge applies. The charge should be based essentially on:
>
> (i) the distance flown within a defined area;
>
> (ii) the aircraft weight.
>
> The element of distance flown, taken as one of the acceptable measures of the service rendered, should be applied by means of a distance scale using great circle distances or other commonly agreed distances. The element of aircraft weight should be applied by means of a weight scale using broad intervals which should be standardized so far as possible. This weight scale should take into account, less than proportionately, the relative productive capacities of the different aircraft types concerned.

5.2 DISCUSSION

Despite its widespread adoption (or, perhaps, because of it) the Eurocontrol formula continues to be the focus of much debate and controversy in the aviation industry. At the center of the controversy is the expression used to estimate the number of service units that a flight is charged for: $(D/100) \cdot (\sqrt{W/50})$.

It has been often suggested that this expression -- and, especially, the weight factor, $\sqrt{W/50}$ -- leads to a distribution of charges which bears little relationship to the true distribution of costs in providing air navigation services to enroute facility users. This is undoubtedly correct, as can be seen from the following simple example:

Consider two commercial jet aircraft, a Boeing 737-200 and a Boeing 747-200B. Assume that both aircraft travel the same enroute distance over the same route within a given State's airspace. For all practical purposes, the workload (and marginal costs) that the two aircraft will impose on the ATC system of the State in question will be about the same: the two aircraft most likely will have about the same air navigation, surveillance and communications capabilities (as far as enroute ATC in continental airspace is concerned), they are flown by professional crews and will traverse the State's airspace in approximately the same amount of time. [If a distinction were to be made between the two aircraft, it could in fact be argued that the B747, if anything, would impose somewhat less of a workload than the B737 due to the fact that the former would likely fly at a higher altitude -- and less-intensively-utilized airspace -- and, possibly, have somewhat-more-sophisticated ATC equipment on board; however, for the purposes of our argument, it is sufficient to treat the two aircraft as equal]. Yet with typical values of W in the order of 52.4 tonnes and 351.5 tonnes for the B737-200 and the B747-200B, respectively, the B747-200B would pay a charge which is 2.6 times as much as that for the B737-200 according to the Eurocontrol formula ($\sqrt{52.4/50} = 1.02$, $\sqrt{351.5/50} = 2.65$, $2.65/1.02 = 2.6$). This argument can, of course, be repeated for any given pair of large commercial jet aircraft. With their cruising speeds, crew capabilities and ATC equipment being similar, they would all seem to impose almost identical workloads/costs on enroute air navigation systems over the same flight distances; yet they are charged amounts that span a range between 1 and 3.3, roughly, for the same services. (This ratio is obtained by comparing charges for a Fokker F-28 with W=33.1 tonnes at one extreme[1] and a Boeing 747-300B with W=362.8 tonnes at the other). It should, finally, be pointed out that, whereas wide-body aircraft "consume" more airspace during the landing and take-off phases of a flight due to wake-vortex-dictated separations, the same is not true for the enroute phase, where wake vortices are not a factor in determining minimum separation requirements.

[1]The F-28 also has a considerably lower cruising speed than most other large commercial jet aircraft.

So far we have concentrated on cases involving commercial jet aircraft only, i.e. aircraft traveling at roughly similar enroute speeds. When it comes to comparing jets with propeller or turbo-prop aircraft, then the fairness of the distance factor, as well, in the Eurocontrol formula can be questioned. For, while distance is a reasonable proxy for time for aircraft travelling at roughly-similar speeds, it ceases to be so when such speeds differ by a factor of 2. Given the way enroute air navigation systems are designed and operated (virtual segregation of traffic by speed with jet aircraft occupying upper airspace; different sector configurations for upper and for lower airspace), it would seem that time spent in a State's airspace is a better indicator of workload imposed on the enroute system than merely the distance travelled. This is because the longer an aircraft stays in a given sector and on a given route, the more communications contacts with ATC it is likely to make. By failing to account for aircraft speed, the Eurocontrol formula would then seem to be unfairly weighted against the (generally-heavier) air carrier jet aircraft.

In summary, one would conclude from the above that by (i) setting charges in proportion to (the square root of) an aircraft's maximum take-off weight and (ii) by failing to take aircraft speed (or any other characteristics) into account, the Eurocontrol formula results in a charging system which is inconsistent with the principle that individual user fees should be set in proportion (or, at least, bear some relationship) to the costs that each such user imposes on the air navigation system.

On the other side of the argument, its defenders argue that the Eurocontrol formula represents a "compromise" that sets enroute air navigation charges by taking into consideration an aircraft's "ability to pay". Leaving aside the issue of whether this is indeed the proper objective for a schedule of user charges, it is true that, at least for commercial aircraft, the formula leads to charges which are, in very rough terms, proportional to ability-to-pay, assuming that such ability can be inferred from the number of seats (or the useful payload) on an aircraft.

Table 5.1 lists the maximum take-off weight, W, and the number of passenger seats for a number of common current or near-future aircraft types. Figure 5.2 plots this information, using -- arbitrarily -- the middle point of the range of seats given in Table 5.1 for some types of aircraft to represent these aircraft.

One might naturally be tempted to use Figure 5.2 to develop some kind of statistical relationship function between the number of seats on an aircraft and its maximum take-off weight, W,

$$N = f(W)$$

where N is the number of seats and f(.) is a "best-fit" function to be calculated through (non-linear) regression. In truth, an analysis of this kind would be ill-advised, due to problems with the data shown in Figure 5.2: the aircraft shown have been arbitrarily selected and f(W) could be easily modified by inclusion of more or exclusion of some aircraft types; the aircraft involved are associated with technologies spanning some 40 years; different aircraft types have been developed for different purposes/missions; and, finally, the number of seats (and payloads) for some of the larger (and most important, from the point of view of the statistical analysis) aircraft vary widely, in practice, depending on the type of use and environment for which the aircraft are intended.

Table 5.1 and Figure 5.2 should, therefore, be used only to draw qualitative conclusions. In that respect, it is clear that the number of seats in commercial aircraft -- and, hence, the ability-to-pay of flight

Table 5.1

MAXIMUM TAKE-OFF WEIGHT AND NUMBER OF SEATS FOR SELECTED AIRCRAFT

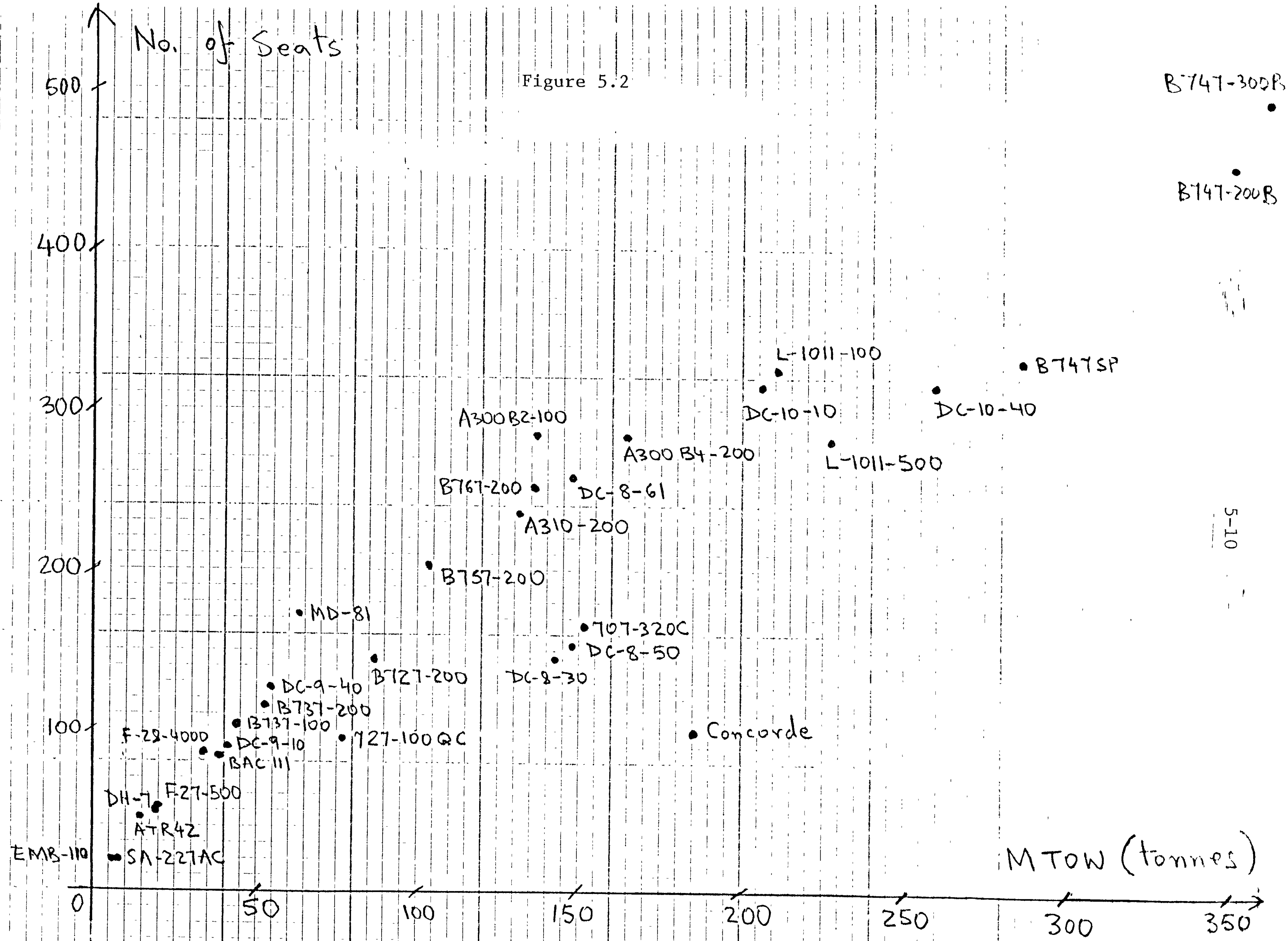
Type of Aircraft	Maximum Take-Off Weight (Tonnes)	No. of Passengers
Airbus		
A300B2-100	137.0	220-345
A300B4-200	165.0	220-345
A310-200	132.0	210-265
Aeritalia/Aerospatiale		
ATR42	14.9	42-50
British Aerospace		
BAC 111 (Series 400)	39.6	74-89
British Aerospace/Aerospatiale		
Concorde	185	100
Boeing		
707-320C	151.3	165
727-100QC	76.7	94
727-200	86.4	145
737-100	44.0	103
737-200	52.4	115
747-200B	351.5	452
747-300B	362.8	496
747SP	285.8	331
757-200	104.3	186-220
767-200	136.1	211-290
deHavilland Canada		
DH-7	19.7	50
Embraer		
EMB-110 (Bandeirante)	5.7	19
Fairchild Swearingen		
SA-227AC Metro 3	6.6	19-20
Fokker		
F-27-500	19.8	52
F-28-4000	33.1	85
Lockheed		
L-1011-100	211.4	250-400
L-1011-500	228.6	230-330
McDonnell Douglas		
DC-8-30 (and -40)	142.9	116-176
DC-8-50	147.4	116-189
DC-8-61	147.4	259
DC-9-10	41.5	90
DC-9-40	54.9	128
MD-81 (DC-9-Super 80)	63.5	172
DC-10-10	206.4	250-380
DC-10-40	259.5	250-380

Sources:

a. "Maximum Permissible Take-off Weights", Manual of Airport and Air Navigation Facility Tariffs, ICAO, Doc. 7100, pp 1.7-1.11, 1982 Edition.

b. "U.S. Commercial Transports, Multinational Aircraft, International Aircraft", Aviation Week and Space Technology, pp. 138-144, March 12, 1984.

Figure 5.2



No. of Seats
500
400
300
200
100
0
50
100
150
200
250
300
350
MTOW (tonnes)
B747-300B
B747-200B
L-1011-100
B747SP
DC-10-10
DC-10-40
A300B2-100
A300 B4-200
L-1011-500
B767-200
DC-8-61
A310-200
B757-200
MD-81
707-320C
DC-8-50
B727-200
DC-8-30
DC-9-40
B737-200
B737-100
F-28-4000
DC-9-10
727-100QC
Concorde
BAC 111
DH-7
F27-500
ATR42
EMB-110
SA-227AC

operators -- generally increase with W and, at least after a certain range of W, less than linearly with W. Thus, in qualitative terms, the "$\sqrt{W/50}$" term in the Eurocontrol formula, would seem to capture this type of effect.

It is difficult to find additional technical or economic arguments in favor of the Eurocontrol formula's reliance on aircraft weight as a principal criterion for determining enroute air navigation charges. One argument that has been occasionally put forward goes briefly as follows: larger/heavier aircraft should have to pay a high proportion of the costs of developing and operating enroute ATC/air navigation systems, because the reason for such systems, in the first place, is to support flights by high-performance, highly-sophisticated aircraft. This argument is specious: reliable ATC systems are requisites for the development of effective and safe air transportation. The configuration, equipment and operating costs of such ATC systems are largely independent of the type of aircraft that use them (especially in the case of enroute ATC) and depend mostly on the number of flights, route configurations and user requirements. For example, the ATC system in Eurocontrol States would have been substantially the same as it is today, even if wide-body aircraft had never been introduced. (In such an event, however, the system would have been more congested at many locations due to an increased number of flights -- which emphasizes our earlier comment regarding dependence on the number of flights). Larger and heavier aircraft have been developed for the purpose of increasing, where possible, the economic efficiency with which air transportation is provided. By charging these airplanes more for using air navigation services, for no reason other than ability-to-pay, the Eurocontrol formula can be viewed as penalizing and discouraging such efficiency. Moreover, smaller airplanes, including private and corporate aircraft, that partake of enroute air navigation services, clearly derive a benefit from such services and might reasonably be expected to pay their fair share of the costs. Pending further evidence to the contrary, there seems no a priori good reason to believe that the costs associated with providing enroute air navigation services to, say, a 5-tonne aircraft over a given distance and route, are substantially less than the costs of providing the same service to a Boeing 747 -- and, in fact, one could plausibly argue that the reverse is true.

It is worth noting that the Eurocontrol formula was criticized in no uncertain terms in the recent report Civil Aviation Authority: A Report on the Supplying by the Authority of Navigation and Air Traffic Control Services to Civil Aircraft (The Monopolies and Mergers Commission, Cmnd. 9068, Her Majesty's Stationery Office, London, November 1983), which was prepared for the Department of Trade and Industry, United Kingdom. Referring to the current pricing structure for enroute charges, the Commission observes (§6.36, p. 52, op. cit.):

> These changes will in general only be partially related to costs involved. The use of distance in the charging equation provides a very rough proxy for costs incurred by a flight, in that the longer the distance the longer the time the aircraft is under ATC. However, a long distance high altitude overflight, for example, generates less work and imposes less cost than a shorter distance flight which descends through a TMA [= terminal area] or crosses airways. The weight element in the en route charging equation will not be related to costs. En route separation and hence costs are more related to speed, which is not related to weight. (Emphasis added)

The response of the Civil Aviation Authority (CAA) to these comments carefully avoids taking a position on the substance of the issue (Response to the Report of the Monopolies and Mergers Commission, CAP 488, Civil Aviation Authority, London, February 1984):

> The Authority considers that the MMC's conclusions and recommendations do not take sufficient account of the influence on charging structures of international agreements and also of the attitudes of users. Thus, the formula used for route charges, involving distance flown and aircraft weight, has been evolved by international agreement between the member states of Eurocontrol of which the UK is one. The formula is considered by Eurocontrol to be fully in accordance with the guidance promulgated by ICAO as a result of two major international conferences on en route charging costs and principles." (p. 18, op. cit.)

It should also be added at this point that the Eurocontrol formula seems to have been adopted originally (and placed in use on November 1, 1971) without consultation -- for any practical purposes -- with users. According to a letter dated September 15, 1982 written by Mr. R.A. Rossman, the Air Transport Association's Eurocontrol representative, to Mr. E.E. Gad, chairman of Eurocontrol's Consultative Group, the following sequence of events took place:

> In a 1 August 1969 letter to Mr. Knut Hammarskjold, Director General of IATA, Mr. Rene Bulin notified IATA that the 23rd session of the Permanent Commission had decided on the introduction of a system of user charges in 1971 and the 24th session adopted the principles of the regional charging system. Mr. Bulin notes, however, the following:
> 'It is the case that even the maximum service rate envisaged in para. 7 will result in the recovery less than a quarter of the cost of providing the enroute service and it would, therefore, appear to be unproductive to engage in discussion about the way in which costs are computed.'
>
> Furthermore, Mr. Ralph Winship of IATA reported to the members of the Charges Working Group on 9 October 1970 about a conversation with Mr. J. Barnes of the U.K. Board of Trade and then Chairman of the Consultative Group. "He (Barnes) confirms Eurocontrol formula not, repeat, not negotiable."

One should keep in mind that, at the time when the Eurocontrol formula was first used (1971), only 15% of the participating States' expenditure for enroute air navigation were recovered from the users (see also Section 4). Thus the precise charging formula in effect did not perhaps seem to be a matter of high importance at the time. However, with 100% recovery being reached by 1981 and with a total amount of some $700 million involved by 1983, the issue of the Eurocontrol formula and its possible modification now looms as a large one.

Finally, we note that, while Eurocontrol's formula is indeed consistent with ICAO's Statements on the subject (see quotation of § 33, Chapter II from the Statements at the end of the previous section), other formulae that would lead to decreased dependence of charges on aircraft weight would also be consistent with the Statements. Indeed, such diverse countries as Burma, Cyprus, Denmark, the Republic of Korea, Sri Lanka, Thailand, Turkey, the Soviet Union, and Uruguay have implemented schedules of air navigation charges which are either completely flat or very insensitive to aircraft weight. The United Kingdom, a participant in the Eurocontrol system, also operates the Shanwick Oceanic Control Center where a single, flat fee of approximately $110 for air navigation services (independent of aircraft weight and distance traveled) is imposed on all flights. There is, therefore, ample precedent and, it is believed here, justification for de-emphasizing aircraft weight as a determinant of air navigation charges. Any movement in that direction would make air navigation charges more cost-related and thus more efficient, in the long run.

5.3 VARIABILITY OF THE DISTRIBUTION OF EUROCONTROL USER CHARGES

It was argued in the last section that it is difficult to find any convincing arguments in support of the formula used by Eurocontrol to calculate user charges, other than the fact that the formula reflects roughly ability-to-pay. Moreover, the formula was not originally derived through a rigorous analysis but rather seems to have been adopted on the basis of being a "reasonable" one.

In light of this background, it is important to examine how sensitive the distribution of Eurocontrol's cost burden among various types of aircraft is to changes in the Eurocontrol formula. For, if this distribution is relatively insensitive to modifications in the formula, it would be unnecessary to be concerned any further about the matter. On the other hand, if even "marginal" changes to the formula result in significant re-allocation of the cost burden, it is clear that, in view of the large economic stakes involved, the issue of the precise form of the formula to be used should come under increased scrutiny.

To perform this sensitivity analysis, it was necessary to have a data base that would permit re-calculation of Eurocontrol charges for each hypothetical charging formula. To this effect, information was requested from Eurocontrol's CRCO on the distribution of flight lengths (= "distances") and aircraft weight on a disaggregate (by State) basis. This information was made available for calendar year 1983 and is reproduced in Appendix 5B.

Six alternative formulae for calculating enroute air navigation user charges were investigated:

1. A "square root" formula:

$$\text{Charge} = R_1 \times \frac{D}{100} \times \sqrt{\frac{W}{50}} \qquad (1)$$

(same as (1) above)

2. A "third root" formula:

$$\text{Charge} = R_2 \times \frac{D}{100} \times \sqrt{\frac{W}{0}} \qquad (2)$$

3. A "fourth root" formula:

$$\text{Charge} = R_3 \times \frac{D}{100} \times \sqrt[4]{\frac{W}{50}} \qquad (3)$$

4. A "linear" formula:

$$\text{Charge} = R_4 \times \frac{D}{100} \times \frac{W}{50} \qquad (4)$$

5. A "no weight" formula:

$$\text{Charge} = R_5 \times \frac{D}{100} \qquad (5)$$

6. An "additional fixed charge" formula:

$$\text{Charge} = R_6 + R_6 \times \frac{D}{100} \times \sqrt{\frac{W}{50}} \qquad (6)$$

As before, D and W indicate, respectively, distance (in kms.) and maximum take-off weight (in tonnes). R_1, R_2, ..., R_6 denote the rate (in US$) per service unit. We have used different subscripts for each of the formulae (1)-(6) to underline the fact that the rate per service unit will vary depending on what formula is used. This point will be further explained shortly.

Formulae (2)-(6) represent a range of alternatives to (1), the current Eurocontrol formula. Formulae (2), (3) and (5) are alternatives that progressively de-emphasize the importance of aircraft weight in determining air navigation charges. [In (5), weight is not a factor at all and the air navigation charge is calculated solely in proportion to distance travelled in the airspace of interest.] Formula (4) moves in the opposite direction and makes the charge linearly proportional to aircraft weight. Finally, (6) is the case in which all users must pay a fixed charge for each flight equal to the cost of one service unit [the first term of (6) can be read as R_6 multiplied by 1], plus a variable cost that depends on distance and weight in the same way as the current Eurocontrol formula. Thus, every flight, no matter how short or by what type of aircraft, would be charged a minimum of $\$R_6$. Such a fixed charge might be viewed as being associated with the "start-up" costs (to the ATC system) of a flight, e.g. filing and pre-processing of flight plan, printing out of flight strips, etc.

The results of the analysis are presented in Tables 5.2 - 5.8: the distribution of Eurocontrol charges among aircraft types is shown for the entire Eurocontrol system for each of formulae (1)-(6) in Table 5.2 and on a disaggregate, State-by-State basis in Tables 5.3 - 5.8. They all refer to 1983 traffic.

Table 5.3 and the "square root" column of Table 5.2 show the actual distribution of charges on a disaggregate and aggregate basis, respectively. The distributions for the hypothetical formulae (2)-(6) were obtained under the assumption that each State would have collected exactly the same total amount of money for air navigation charges if it were using one of the hypothetical formulae, as it actually did in 1983 by using the Eurocontrol formula. For example, Belgium/Luxembourg collected approximately $27 million

EURO-CONTROL COST ALLOCATIONS

	SQUARE ROOT	THIRD ROOT	FOURTH ROOT	LINEAR	NO WEIGHT	ADDITIONAL FIXED CHARGE
0-2T	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
2-5T	0.651	1.140	1.467	0.106	3.081	1.405
5-10T	1.422	2.183	2.645	0.345	4.594	2.252
10-15T	0.667	0.947	1.101	0.202	1.684	1.027
15-20T	0.959	1.283	1.455	0.337	2.035	1.408
20-30T	0.768	0.982	1.095	0.328	1.484	1.111
30-40T	1.162	1.383	1.488	0.593	1.773	1.351
40-45T	3.510	4.033	4.259	1.972	4.798	3.799
45-50T	6.287	7.016	7.331	4.018	8.086	6.879
50-60T	18.550	20.451	21.240	12.268	23.034	19.081
60-70T	1.680	1.802	1.841	1.145	1.864	1.781
70-80T	0.585	0.628	0.643	0.429	0.680	0.578
80-90T	9.334	9.670	9.770	7.657	9.834	9.433
90-100T	1.252	1.253	1.247	1.078	1.196	1.193
100-150T	3.565	3.487	3.434	3.415	3.175	3.406
150-200T	11.154	10.317	10.056	12.623	8.720	10.458
200-250T	6.708	6.055	5.731	8.180	4.699	6.215
250-300T	8.345	7.467	7.049	10.718	5.768	7.760
300-400T	23.411	19.784	18.159	34.581	13.516	21.142
400+T	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	100.010	99.881	100.010	99.995	100.020	99.599

Table 5.2

AGGREGATE DISTRIBUTION OF CHARGES BY AIRCRAFT WEIGHT: ALL PARTICIPATING STATES

APPLYING SQUARE-ROOT

	AUSTRIA	BEL-LUX	CANARIES	FRANCE	GERMANY	IRELAND	NETHERLANDS
2T	0.00	0.00	0.00	(<0.01)	0.00	0.00	0.00
2-5T	0.30	0.98	0.06	0.36	1.10	0.30	0.89
5-10T	0.81	1.69	0.05	1.23	2.01	0.51	1.92
10-15T	0.24	0.59	0.02	0.50	0.54	0.53	0.84
15-20T	0.12	0.93	0.04	0.49	0.40	0.30	1.73
20-30T	0.24	0.70	0.30	0.20	0.99	0.28	2.35
30-40T	0.13	1.77	0.03	1.30	0.57	0.94	2.15
40-45T	0.96	4.73	0.13	3.25	2.15	0.67	4.86
45-50T	11.18	8.54	1.02	5.42	16.78	0.73	11.69
50-60T	22.57	19.46	3.78	26.83	23.89	3.92	20.60
60-70T	0.52	1.50	0.39	1.22	0.54	0.23	2.72
70-80T	0.66	0.41	0.14	0.69	0.56	0.25	0.48
80-90T	8.18	6.82	15.17	12.75	11.89	0.13	5.36
90-100T	3.94	1.25	0.60	1.13	2.36	0.26	3.01
100-150T	5.79	4.85	6.05	4.09	5.12	0.90	2.95
150-200T	12.29	8.70	17.09	13.07	9.21	13.65	9.71
200-250T	7.44	10.13	7.18	6.49	4.35	11.09	2.37
250-300T	5.20	6.08	10.03	5.53	3.91	9.28	7.64
300-400T	19.43	20.86	29.96	15.47	13.63	55.99	18.16
400+T	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	100.00	99.99	100.04	100.02	100.00	100.00	99.98

	PORTUGAL	SANTA-MAR	SPAIN	SWITZ	UK
2T	0.00	0.00	0.00	0.00	0.00
2-5T	0.11	0.03	0.22	0.35	1.26
5-10T	0.29	0.02	0.59	3.51	2.47
10-15T	0.07	0.01	0.21	0.60	1.70
15-20T	0.03	0.05	0.22	0.29	2.95
20-30T	0.04	0.96	0.84	0.93	1.07
30-40T	0.12	0.12	0.62	1.34	2.47
40-45T	0.57	0.02	1.98	1.53	8.67
45-50T	1.09	0.00	9.02	12.42	2.20
50-60T	28.90	0.21	24.93	29.19	16.55
60-70T	0.32	0.06	0.31	0.65	4.94
70-80T	2.74	0.39	0.69	0.67	0.51
80-90T	12.98	1.77	23.87	13.75	1.83
90-100T	1.60	0.04	0.70	0.97	1.12
100-150T	4.48	2.33	3.34	3.80	1.81
150-200T	14.16	12.61	12.70	11.08	7.65
200-250T	8.07	10.39	5.05	3.47	7.07
250-300T	10.62	23.24	6.00	6.71	5.30
300-400T	13.80	47.78	8.72	9.04	30.43
400+T	0.00	0.00	0.00	0.00	0.00
TOTAL	99.99	100.03	100.01	100.00	100.00

Table 5.3

DISTRIBUTION OF CHARGES BY AIRCRAFT WEIGHT FOR FORMULA (1): SHOWN BY STATE

APPLYING THIRD-ROOT

	AUSTRIA	BEL-LUX	CANARIES	FRANCE	GERMANY	IRELAND	NETHERLANDS
<2T	0.00	0.00	0.00	(<0.01)	0.00	0.00	0.00
2-5T	0.55	1.74	0.11	0.63	1.88	0.61	1.53
5-10T	1.27	2.63	0.09	1.90	3.01	0.91	2.91
10-15T	0.35	0.85	0.03	0.72	0.75	0.87	1.16
15-20T	0.17	1.25	0.06	0.65	0.52	0.46	2.27
20-30T	0.31	0.89	0.42	0.25	1.21	0.41	2.90
30-40T	0.15	2.11	0.04	1.55	0.66	1.30	2.51
40-45T	1.12	5.48	0.16	3.75	2.40	0.89	5.47
45-50T	12.88	9.71	1.29	6.13	18.41	0.96	12.92
50-60T	25.37	21.57	4.65	29.63	25.56	5.00	22.20
60-70T	0.56	1.62	0.46	1.30	0.57	0.28	2.85
70-80T	0.70	0.43	0.16	0.72	0.57	0.30	0.49
80-90T	8.55	7.02	17.34	13.08	11.81	0.15	5.86
90-100T	4.03	1.26	0.68	1.14	2.30	0.30	2.95
100-150T	5.66	4.67	6.48	3.92	4.76	1.00	2.77
150-200T	11.34	7.92	17.28	11.86	8.10	14.33	8.60
200-250T	6.58	8.84	6.95	5.64	3.66	11.13	2.01
250-300T	4.44	5.13	16.88	4.65	3.19	9.00	6.31
300-400T	15.95	16.88	26.92	12.47	10.65	52.10	14.29
400+T	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	99.98	100.00	99.99	99.99	100.01	100.00	100.09

	PORTUGAL	SANTA-MAR	SPAIN	SWITZ	UK
<2T	0.00	0.00	0.00	0.00	0.00
2-5T	0.21	0.07	0.38	1.61	2.22
5-10T	0.46	0.04	0.90	5.21	3.83
10-15T	0.11	0.02	0.29	0.82	2.41
15-20T	0.05	0.09	0.29	0.50	3.95
20-30T	0.05	1.43	1.05	1.13	1.35
30-40T	0.15	0.17	0.73	1.53	2.94
40-45T	0.68	0.03	2.26	1.69	9.99
45-50T	1.27	0.00	10.10	13.48	2.49
50-60T	32.85	0.27	27.22	29.93	18.25
60-70T	0.36	0.07	0.33	0.57	5.30
70-80T	2.95	0.49	0.71	0.67	0.54
80-90T	13.71	2.15	24.20	13.51	1.88
90-100T	1.65	(<0.01)	0.70	0.93	1.12
100-150T	4.43	2.63	3.17	3.49	1.73
150-200T	13.22	13.48	11.39	9.63	6.39
200-250T	7.22	10.65	4.34	2.89	6.14
250-300T	9.18	23.02	4.99	5.40	4.45
300-400T	11.45	45.41	6.95	7.00	24.50
400+T	0.00	0.00	0.00	0.00	0.00
TOTAL	100.00	100.02	100.00	99.99	100.02

Table 5.4

DISTRIBUTION OF CHARGES BY AIRCRAFT WEIGHT
FOR FORMULA (2): SHOWN BY STATE

APPLYING THE FOURTH-ROOT

	AUSTRIA	BEL-LUX	CANARIES	FRANCE	GERMANY	IRELAND	NETHERLANDS
2T	0.00	0.00	0.00	(<0.01)	0.00	0.00	0.00
2-5T	0.71	2.26	0.15	0.81	2.40	0.85	1.96
5-10T	1.57	3.21	0.12	2.32	3.62	1.19	3.50
10-15T	0.41	0.99	0.04	0.84	0.86	1.09	1.34
15-20T	0.19	1.42	0.07	0.75	0.58	0.56	2.55
20-30T	0.35	0.99	0.49	0.28	1.32	0.49	3.17
30-40T	0.17	2.28	0.04	1.68	0.70	1.50	2.67
40-45T	1.20	5.81	0.18	3.99	2.51	1.01	5.73
45-50T	13.67	10.20	1.43	6.46	19.07	1.08	13.40
50-60T	26.61	22.41	5.11	30.82	26.16	5.57	22.76
60-70T	0.58	1.66	0.50	1.74	0.57	0.31	2.88
70-80T	0.72	0.43	0.17	0.73	0.56	0.33	0.49
80-90T	8.66	7.05	18.40	13.14	11.67	0.16	5.81
90-100T	4.05	1.26	0.71	1.17	2.26	0.32	2.90
100-150T	5.56	4.54	6.66	3.82	4.57	1.04	2.66
150-200T	10.85	7.50	17.30	11.24	7.55	14.56	8.03
200-250T	6.17	8.20	6.82	5.24	3.35	11.09	1.84
250-300T	4.10	4.68	16.30	4.25	2.87	8.81	5.67
300-400T	14.43	15.12	25.51	11.18	9.40	50.05	12.63
400+T	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	100.00	100.01	100.00	100.02	100.02	100.00	100.00

	PORTUGAL	SANTA-MAR	SPAIN	SWITZ	UK
2T	0.00	0.00	0.00	0.00	0.00
2-5T	0.27	0.09	0.49	2.04	2.86
5-10T	0.57	0.06	1.09	6.22	4.63
10-15T	0.13	0.02	0.34	0.94	2.80
15-20T	0.06	0.11	0.33	0.56	4.47
20-30T	0.05	1.72	1.15	1.22	1.49
30-40T	0.17	0.19	0.79	1.62	3.15
40-45T	0.73	0.03	2.39	1.76	10.53
45-50T	1.36	0.00	10.60	13.88	2.60
50-60T	34.71	0.31	28.22	30.36	18.85
60-70T	0.37	0.08	0.34	0.67	5.40
70-80T	3.04	0.54	0.72	0.67	0.54
80-90T	13.98	2.34	24.23	13.28	1.87
90-100T	1.67	0.01	0.69	0.91	1.11
100-150T	4.39	2.79	3.08	3.33	1.67
150-200T	12.73	13.88	10.77	8.94	6.52
200-250T	6.81	10.75	4.02	2.63	5.66
250-300T	8.53	22.86	4.54	4.83	4.04
300-400T	10.43	44.24	6.21	6.13	21.82
400+T	0.00	0.00	0.00	0.00	0.00
TOTAL	100.00	100.02	100.00	99.99	100.01

Table 5.5

DISTRIBUTION OF CHARGES BY AIRCRAFT WEIGHT
FOR FORMULA (3): SHOWN BY STATE

LINEAR WEIGHT

	AUSTRIA	BEL-LUX	CANARIES	FRANCE	GERMANY	IRELAND	NETHERLANDS
0-2T	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-5T	0.05	0.16	(<0.01)	0.06	0.20	0.03	0.15
5-10T	0.19	0.40	0.01	0.30	0.53	0.09	0.49
10-15T	0.07	0.18	(<0.01)	0.16	0.19	0.12	0.27
15-20T	0.04	0.33	0.01	0.18	0.16	0.08	0.67
20-30T	0.10	0.30	0.10	0.09	0.48	0.09	1.09
30-40T	0.06	0.90	0.01	0.69	0.33	0.35	1.18
40-45T	0.53	2.65	0.06	1.90	1.36	0.27	2.93
45-50T	6.59	5.06	0.48	3.35	11.21	0.31	7.46
50-60T	14.32	12.41	1.93	17.85	17.16	1.80	14.14
60-70T	0.36	1.04	0.22	0.88	0.42	0.11	2.03
70-80T	0.49	0.30	0.08	0.53	0.47	0.13	0.39
80-90T	6.46	5.41	9.65	10.54	10.61	0.07	5.00
90-100T	3.28	1.05	0.41	0.99	2.23	0.16	2.71
100-150T	5.53	4.66	4.67	4.10	5.54	0.62	3.05
150-200T	13.90	9.99	15.60	15.50	11.80	11.20	11.89
200-250T	9.54	13.07	7.43	8.72	6.32	10.29	3.30
250-300T	7.38	6.67	20.63	8.22	6.29	9.52	11.81
300-400T	31.09	33.54	38.69	25.94	24.70	64.77	31.44
400+T	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	99.98	100.02	99.98	100.00	100.00	100.01	99.99

	PORTUGAL	SANTA-MAR	SPAIN	SWITZ	UK
0-2T	0.00	0.00	0.00	0.00	0.00
2-5T	0.02	(<0.01)	0.04	0.18	0.19
5-10T	0.07	(<0.01)	0.15	0.36	0.56
10-15T	0.02	(<0.01)	0.07	0.21	0.49
15-20T	0.01	0.01	0.09	0.16	1.01
20-30T	0.02	0.29	0.40	0.47	0.44
30-40T	0.06	0.04	0.35	0.79	1.20
40-45T	0.31	0.01	1.23	1.00	4.65
45-50T	0.64	0.00	5.92	9.35	1.25
50-60T	18.13	0.09	17.60	20.88	10.10
60-70T	0.22	0.03	0.24	0.52	3.28
70-80T	2.00	0.21	0.56	0.58	0.37
80-90T	10.12	0.99	20.94	12.66	1.39
90-100T	1.32	(<0.01)	0.65	0.94	0.89
100-150T	4.24	1.57	3.55	4.24	1.66
150-200T	15.84	10.07	16.00	14.65	9.71
200-250T	10.24	9.41	7.21	5.20	8.73
250-300T	14.90	23.28	9.47	11.12	7.23
300-400T	21.84	53.98	15.52	16.89	46.84
400+T	0.00	0.00	0.00	0.00	0.00
TOTAL	100.00	99.98	99.99	100.00	99.99

Table 5.6

DISTRIBUTION OF CHARGES BY AIRCRAFT WEIGHT
FOR FORMULA (4): SHOWN BY STATE

NO WEIGHT IN FORMULA

	AUSTRIA	BEL-LUX	CANARIES	FRANCE	GERMANY	IRELAND	NETHERLANDS
0-2T	0.00	0.00	0.00	(<0.01)	0.00	0.00	0.00
2-5T	1.60	4.82	0.39	1.77	4.93	2.27	4.03
5-10T	2.90	5.67	0.26	4.17	6.14	2.65	5.95
10-15T	0.67	1.54	0.08	1.33	1.29	2.13	2.00
15-20T	0.29	2.03	0.12	1.39	0.80	1.01	3.50
20-30T	0.48	1.29	0.79	0.37	1.66	0.81	3.99
30-40T	0.21	2.74	0.06	2.05	0.31	2.27	3.08
40-45T	1.44	6.65	0.26	4.65	2.77	1.46	6.31
45-50T	15.96	11.36	1.95	7.22	20.43	1.52	14.36
50-60T	29.94	24.05	6.72	33.70	27.02	7.53	23.52
60-70T	0.63	1.71	0.63	1.40	0.57	0.40	2.86
70-80T	0.75	0.43	0.21	0.74	0.54	0.41	0.47
80-90T	8.74	6.78	21.72	12.69	10.81	0.19	5.38
90-100T	3.97	1.75	0.82	1.08	2.03	0.79	2.61
100-150T	5.09	3.97	7.15	3.40	3.84	1.14	2.23
150-200T	9.14	6.03	17.05	9.20	5.84	14.73	6.21
200-250T	4.88	6.19	6.32	4.03	2.43	10.53	1.34
250-300T	3.09	3.36	14.35	3.11	1.98	7.97	3.93
300-400T	10.22	10.22	21.14	7.70	6.11	42.60	8.22
400+T	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	100.00	100.02	100.02	100.00	99.98	100.00	99.99

	PORTUGAL	SANTA-MAR	SPAIN	SWITZ	UK
0-2T	0.00	0.00	0.00	0.00	0.00
2-5T	0.63	0.27	1.06	4.12	5.90
5-10T	1.08	0.14	1.97	10.38	7.91
10-15T	0.22	0.04	0.54	1.38	4.20
15-20T	0.08	0.20	0.49	0.76	6.17
20-30T	0.08	3.03	1.54	1.51	1.88
30-40T	0.22	0.31	0.96	1.84	3.66
40-45T	0.90	0.05	2.79	1.90	11.65
45-50T	1.64	0.00	12.02	14.39	2.79
50-60T	40.25	0.45	30.87	30.77	19.55
60-70T	0.41	0.11	0.35	0.65	5.37
70-80T	3.26	0.72	0.73	0.62	0.52
80-90T	14.55	3.04	23.77	12.08	1.74
90-100T	1.69	(<0.01)	0.66	0.80	1.00
100-150T	4.14	3.28	2.74	2.75	1.41
150-200T	11.06	15.03	8.82	6.78	5.06
200-250T	5.56	10.93	3.09	1.87	4.13
250-300T	6.61	22.11	3.32	3.28	2.80
300-400T	7.62	40.29	4.27	3.91	14.25
400+T	0.00	0.00	0.00	0.00	0.00
TOTAL	100.00	100.00	99.99	99.99	99.99

Table 5.7

DISTRIBUTION OF CHARGES BY AIRCRAFT WEIGHT
FOR FORMULA (5): SHOWN BY STATE

ADDING A FIXED FEE

	AUSTRIA	BEL-LUX	CANARIES	FRANCE	GERMANY	IRELAND	NETHERLANDS
<2T	0.00	0.00	0.00	(<0.01)	0.00	0.00	0.00
2-5T	0.86	2.38	0.11	0.83	2.14	1.15	1.95
5-10T	1.73	3.34	0.08	2.05	3.27	1.61	3.50
10-15T	0.37	0.87	0.02	0.68	0.80	1.23	1.39
15-20T	0.18	1.46	0.06	0.92	0.57	0.67	2.56
20-30T	0.51	1.23	0.46	0.26	1.24	0.35	4.09
30-40T	0.17	1.95	0.03	1.59	0.66	1.81	2.80
40-45T	1.03	4.50	0.15	3.46	2.42	1.21	4.91
45-50T	12.28	9.34	1.42	5.66	17.47	1.32	13.11
50-60T	25.18	21.34	4.41	26.71	23.82	6.37	19.51
60-70T	0.53	1.39	0.42	1.21	0.57	0.37	2.70
70-80T	0.68	0.45	0.15	0.69	0.52	0.25	0.46
80-90T	8.28	6.94	17.09	12.68	11.85	0.16	5.33
90-100T	3.71	1.26	0.65	1.10	2.19	0.29	2.55
100-150T	5.49	4.29	6.06	3.88	4.76	0.92	2.51
150-200T	11.28	7.80	16.87	12.43	8.25	12.58	8.42
200-250T	6.48	8.34	7.03	6.13	3.98	10.34	2.06
250-300T	4.51	5.55	17.09	5.18	3.55	8.61	6.71
300-400T	16.72	17.57	27.93	14.55	11.95	50.77	15.43
400+T	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	99.99	100.00	100.02	100.01	100.00	100.02	100.00

	PORTUGAL	SANTA-MAR	SPAIN	SWITZ	UK
<2T	0.00	0.00	0.00	0.00	0.00
2-5T	0.25	0.04	0.38	2.29	2.71
5-10T	0.67	0.03	0.78	6.93	3.29
10-15T	0.10	0.01	0.26	1.02	2.69
15-20T	0.05	0.06	0.27	0.63	4.16
20-30T	0.05	1.82	1.21	1.15	1.38
30-40T	0.15	0.12	0.68	1.56	2.73
40-45T	0.60	0.02	2.13	1.93	9.43
45-50T	1.40	0.00	9.61	12.00	2.51
50-60T	28.31	0.22	25.61	29.78	17.33
60-70T	0.31	0.06	0.31	0.91	4.89
70-80T	2.74	0.41	0.68	0.63	0.47
80-90T	13.64	1.86	23.50	11.74	2.04
90-100T	1.51	(<0.01)	0.68	0.97	1.09
100-150T	4.17	2.32	3.20	3.34	1.84
150-200T	13.80	12.64	11.92	9.31	6.94
200-250T	7.77	10.33	4.73	3.07	6.27
250-300T	10.20	22.92	5.62	5.22	4.62
300-400T	14.28	47.12	8.42	7.57	25.60
400+T	0.00	0.00	0.00	0.00	0.00
TOTAL	100.00	99.98	99.99	99.99	100.01

Table 5.8

DISTRIBTUION OF CHARGES BY AIRCRAFT WEIGHT
FOR FORMULA (6): SHOWN BY STATE

in 1983 through formula (1). The distribution of charges shown in Tables 5.4 - 5.8 for Belgium/Luxembourg have been derived by assuming that Belgium/Luxembourg would also have collected the same $27 million, no matter which formula was in force. This, of course, means that Belgium/Luxembourg would have to use a different rate, R, per service unit depending on the formula in force [hence, the use of subscripts with R in (1)-(6)].

Because of the fact that the data (Appendix 5B) aggregate flight distances into intervals of hundreds of kilometers and aircraft weights into various groups (e.g. 2-5 tonnes, 45-50 tonnes, 90-100 tonnes, 100-150 tonnes, 300-400 tonnes), the following assumption was made: The distance associated with each distance group and the weight associated with each weight group are the average values of the upper and lower limits for each group. For instance, flights in the 500-599 km. category are assumed to have covered a distance of 550 kms.; similarly, aircraft in the 90-100 tonne category are assumed to weigh 95 tonnes.

In view of the small "width" of the intervals involved, it is believed that this "averaging" assumption has a very minor impact on the accuracy of the results shown in Tables 5.2 - 5.8. Had the analysis been based on more disaggregate data (e.g., distance and aircraft weight given for every individual flight), the results would have been essentially identical for all practical purposes.

A number of interesting observations can now be made. The most important, from the practical point of view, is that the distribution of charges among Eurocontrol users is indeed sensitive to even modest changes in the charging formula in force. This can be easily appreciated by examining the overall results in Table 5.2. It will be seen that three broad "classes" of aircraft can be identified -- each of which is affected in different ways by modifications in the Eurocontrol formula:

Class 1: Aircraft with maximum take-off weight of 60 tonnes or less.

Class 2: Aircraft with maximum take-off weight between 60 tonnes and 150 tonnes.

Class 3: Aircraft with maximum take-off weight of more than 150 tonnes.

Aircraft in Class 1 will be burdened with an increasingly-large fraction of total Eurocontrol costs as the emphasis shifts away from weight as a criterion for computing charges, i.e. as the formula shifts from (4) to (1) to (2) to (3) to (5). The opposite is true for Class 3 aircraft, while Class 2 aircraft remain more-or-less unaffected by changes in the formula. Table 5.9 summarizes this effect (percentages have been rounded off to the nearest integer):

As Table 5.9 indicates, what is at stake in the range of formulae between the two extremes -- the "linear" formula (4) and the "no weight" formula (5) -- is the allocation of a full one-third of total Eurocontrol costs between Class 1 and Class 3 aircraft. Under a linear formula, Class 1 aircraft would pay for only 20% of total costs, but under the no-weight formula, 50%; conversely, Class 3 aircraft would pay 66% and 33%, respectively, in the two cases.

To appreciate what this means in economic terms, it should be realized that total Eurocontrol charges in 1982 amounted to $733.5 million (see Table 5.10) and that forecasted revenues for 1983 were about $720 million. Thus, a change from the current square-root Eurocontrol formula to a no-weight formula would mean that charges to Class 1 and to Class 3 aircraft would be increased and decreased, respectively, by an amount equal to 16-17% of total charges or about $120 million for 1983 alone! This amount is roughly similar to the total operating profits for 1983 of all the profitable Western European airlines!

Table 5.9

DISTRIBUTION OF EUROCONTROL USER CHARGES
AMONG THREE CLASSES OF AIRCRAFT

Class	Linear	Square Root	Third Root	Fourth Root	No Weight
Class 1	20	34	39	42	50
Class 2	14	16	17	17	17
Class 3	66	50	44	41	33

REMBOURSEMENTS DES REDEVANCES DE ROUTE AUX ETATS PARTICIPANTS

REIMBURSEMENTS OF ROUTE CHARGES TO PARTICIPATING STATES

Période/Period - 1.11.1975 - 30.11.1982

	Montant brut remboursé aux Etats en 1982 (Redevances de Route) Gross amount reimbursed to the States in 1982 (Route Charges)	Charges administratives retenues sur les recettes des Etats en 1982 Administrative Charges deducted from States' Receipts in 1982	Montant net remboursé aux Etats en 1982 Net amount reimbursed to the States in 1982
	US $	US $	US $
Belgique/Luxembourg Belgium/Luxembourg	35,514,351.52	26,460.77	35,487,890.75
Rép. Féd. d'Allemagne Fed. Rep. of Germany	165,060,351.34	68,189.52	164,992,161.82
France	138,888,693.26	496,588.86	138,392,104.40
Royaume-Uni/United Kingdom	203,252,719.94	107,504.42	203,145,215.52
Pays-Bas/Netherlands	22,339,739.01	15,980.51	22,323,758.50
Irlande/Ireland	13,869,825.41	18,181.69	13,851,643.72
Suisse/Switzerland	36,920,637.67	5,905.53	36,914,732.14
Portugal	11,869,502.03	26,884.05	11,842,617.98
Autriche/Austria	26,765,929.43	7,362.05	26,758,567.38
Espagne/Spain FIRs Continental(es) FIR's	61,780,110.73	65,363.53	61,714,747.20
FIR Canaries FIR	17,258,925.79	4,258.76	17,254,667.03
	733,520,786.13	842,679.69	732,678,106.44

Table 5.10

SOURCE: EUROCONTROL, ROUTE ON THE OPERATION OF THE ROUTE CHARGES SYSTEM IN 1982, JUNE 1983

A number of other observations can now be made. For example, it will be noted in Table 5.3 that there are significant differences in the way various States currently derive their revenues from various classes of aircraft. Ireland, for instance, obtains a full 56% of revenues from Boeing 747's (weight of 300-400 tonnes) as a consequence of the fact that most of the traffic in Irish airspace consists of trans-Atlantic flights by wide-body aircraft. By contrast, the corresponding percentages for West Germany and Switzerland -- both of which serve much intra-European traffic due to their geographical positions -- are 13.6% and 9%, respectively.

A direct consequence of this last observation is that on a State-by-State basis, different aircraft will be affected in different ways by changes in the Eurocontrol formula. For example, were a no-weight formula to be adopted instead of a square-root one, 80-90-tonne aircraft (typically Boeing 727-200's) would bear a considerably-higher burden of air navigation charges in the Canaries (21.7% vs. 15.2% currently), about the same fraction as now in France (12.9% vs. 12.75% currently), and a smaller fraction in Switzerland (12.1% vs. 13.75% currently). This is because, relatively speaking, the B727-200 is a "small" aircraft in the Canaries FIR (by comparison to other common aircraft in that region), a "typical" aircraft in France and a "large" aircraft in Switzerland. Similar examples abound (note, e.g., the extent to which charges to Boeing 747's are affected by formula modifications on a State-by-State basis).

A third observation is that the "additional fixed charge" formula has only marginal consequences, by comparison to the current distribution of charges, for most aircraft classes. A look at Table 5.2 will indicate that only aircraft of 30 tonnes or lighter -- i.e. with all commercial jets excluded -- will suffer a significant increase in charges, were such a formula to be adopted. This is as expected, because it is only for these aircraft that a charge for one service unit would currently constitute an important fraction of the typical fee paid for air navigation services. Most of the increase in charges for such small aircraft would result from a reduction in the share of charges paid by B747's (300-400 tonne aircraft), were formula (6) to be adopted. It should be noted that if the additional fixed charge were to be increased, e.g. to the equivalent of 3 service units instead of 1, more dramatic changes in the distribution of charges would certainly result, with the fraction of charges allocated to lighter aircraft increasing and corresponding reductions for heavier aircraft.

The findings of this section can now be summarized as follows: The distribution of the cost burden for enroute air navigation services among users in the Eurocontrol region depends critically on and is sensitive to the charging formula in force. Even minor changes in the formula can have dramatic economic effects on users, especially in view of the fact that a 1% shift in the distribution is equivalent to about $7 million on an annual basis (at mid-1984 exchange rates). While the effects on different aircraft weight classes will vary from State to State, generally speaking, aircraft of 60 tonnes or less (i.e., B737, DC-9 and lighter aircraft) assume an increasing fraction of the cost burden as the importance of weight in determining air navigation charges is de-emphasized. Charges to aircraft of roughly 150 tonnes or more (i.e., all wide-body aircraft -- including the B767 and the A310 -- as well as stretch versions of the B707 and DC-8) will generally be reduced under such a modification. Finally, charges to aircraft in-between these two classes [including B727, B757 and MD-80 (= DC-9-Super 80) aircraft] will be largely unchanged.

5.4 THE COST BASE

To this point, this investigation has concentrated on the distribution among aircraft types of the cost burden for enroute air navigation services. Clearly, a second set of issues of equal importance pertains to the magnitude of the total costs to be distributed.

It is unavoidable that costs of this magnitude -- currently running at a rate of $700 million per year, as seen earlier -- would be a source of continued concern for both service providers and service users. In the case of Eurocontrol, however, a number of circumstances have led to an unusual amount of tension between these two sides.

One of the reasons can be found in the history of these enroute charges. Although it may sound surprising today, until as recently as the late 1960's enroute air navigation services were generally provided to aircraft operators at no direct cost to them. In the case of Eurocontrol, the original Member States decided in 1966 to set up a working group to study how a common system of route charges could be introduced for the purpose of covering some of the enroute air navigation expenditures incurred by the States and the Eurocontrol organization. The expenditures in question are those associated with implementing enroute air navigation facilities and services (operational and maintenance costs, depreciation and interest on capital expenditures) plus administrative costs including charge OF collection costs incurred by national agencies and CRCO.

The first period during which the route charges system was applied lasted from November 1, 1971 to October 31, 1973. The cost-base consisted of the participating States' expenditures for enroute air navigation in 1969. A cost-recovery rate of 15% of these expenditures (plus collection costs) was used for each one of the two years in question. The cost-recovery rate was gradually increased, thereafter, to 30% of 1971 expenditures for the period November 1, 1973 - October 31, 1975, to 60% for 1975-1977, and so on, until the recovery rate reached 100% in 1981. Currently, periods are of one-year duration, the recovery rate is 100% and the cost-base is the forecasted costs for the year in question (and not the actual costs incurred during a past year).

Aside from the "shock" of the transition from paying no Eurocontrol charges as late as 1971 to covering 100% of expenditures by 1981, users have also been concerned about rather-dramatic increases in the national cost-bases during that same period. The average annual percentage increase in actual enroute service costs during the 1973-81 period, measured in each State's national currency, were as follows:

Belgium/Luxembourg	9.8%
France	15.0%
Germany	8.3%
Ireland	18.4%
Netherlands	7.5%
United Kingdom	15.9%
Austria	9.7%
Portugal	26.1%
Spain (Mainland)	19.7%
Spain (Canaries)	21.9%
Switzerland	5.9%

(Source: Eurocontrol, Report on the Operation of the Route Charges System in 1982, June 1983)

In view of this background, it is appropriate to ask a number of questions: How are the rates per service unit determined for each state? How are national cost-bases established? Are cost-base reporting requirements adequate for monitoring purposes? Are costs allocated to enroute air navigation services reasonable or do they appear excessive? Why are the rates per service unit charged by each of the eleven participating States so different? This section will attempt to address, to the extent posssible by available information, questions of this type.

5.4.1 Computation of the Rate per Service Unit

The computation of the rate per service unit for each State is relatively straightforward. It is illustrated in Table 5.11, which shows the computation of the unit rates that went into effect on April 1, 1983. Each State submits its estimate of national costs (in U.S.$) associated with enroute air navigation services[2] (column 1 of Table 5.11). To this amount is added the Eurocontrol expenditure[2] allocated to each State (column 2) to arrive at the "non-reduced cost-base" (column 3). From the non-reduced cost-base one then subtracts the costs allocated to the service of VFR flights (column 4), of "circular flights", i.e., flights terminating at the airport from which an aircraft took off and during which no other intermediate flights took place (column 5), and, finally, of other exempted flights (column 7) falling in eight different categories (see Article 14, Appendix 5A) to arrive at the final reduced cost-base (column 8). This is the amount to be distributed among airspace users according to the number of service units that each user is charged for -- the latter number to be determined by multiplying the distance factor, D/100, times the weight factor, $\sqrt{W/50}$, for each user's flight. Column (9) indicates the forecasted number of chargeable service units for the year in question (1983) for each of the States. The rate per service unit for each State is then determined by dividing the reduced cost-base (column 8) by the number of chargeable service units (column 9), as shown in column (10).

[2]National and Eurocontrol costs will be discussed in more detail in the following subsection.

Table 5.11

ANNEXE
ANNEX

ASSIETTE DES REDEVANCES ET TAUX UNITAIRES POUR LA 10ème PERIODE A PARTIR DES COMPTES PREVISIONNELS 1983

COST-BASE AND NATIONAL UNIT RATES FOR THE 10th PERIOD : 1983 FORECAST ACCOUNTS

ETAT STATE	Dépenses nationales en $ National costs in $	Dépenses EUROCONTROL en $ EUROCONTROL costs, in $	Assiette des redevances non réduite, en $ Non-reduced cost-base, in $	Réduction liée aux coûts VFR, en $ Reduction for VFR costs, in $	Vols circulaires en $ Circular flights, in $	Assiette imputable aux vols IFR, excepté vols circulaires, en $ Cost-base attributable to IFR flights, circular flights excepted, in $	Réduction pour vols exonérés en $ Reduction for exempted flights in $	Assiette des redevances réduite en $ Reduced cost-base for chargeable units in $	Unités taxables 1983 1983 chargeable units	Taux unitaires nationaux National unit rates
	(1)	(2)	(3) = (1)+(2)	(4)	(5)	(6)=(3)-(4)	(7)	(8)=(6)-(7)-(5)	(9)	(10)=(8) : (9)
Belg.-Lux.	18.139.182.55	10.901.148.98	29.040.331.53			29.040.331.53	2.115.090.94	26.925.240.59	636.274	42,32 $
Allemagne/Germany	108.758.493.88	27.291.936.22	136.050.430.10	559.597.09	322.99334	135.490.833.01	5.940.218.09	115.237.694.33 6)	2.440.572	47,22 $
France	187.546.251.66 1)2)	8.544.143.79	196.090.395.45	2.612.187.85		193.478.207.60	34.362.637.79	159.115.569.81	5.026.263	31,66 $
Royaume-Uni/ United Kingdom	196.951.532.80 3)	9.702.124.25	206.653.657.05			206.653.657.05	741.714.04	205.911.943.01	2.951.617 4)	69,76 $
Pays-Bas/Netherl.	22.379.753.30	3.820.720.46	26.200.473.76	866.725.06		25.333.748.70	1.458.600.71	23.875.147.99	494.854	48,25 $
Irlande/Ireland	19.223.253.97	1.381.822.53	20.605.076.50			20.605.076.50	1.297.593.71	19.307.482.79	550.257	35,09 $
Suisse/Switzerl.	25.825.769.63	-	25.825.769.63	327.500.70		25.498.268.93	108.272.90	27.588.929.31 5)	469.000	58,83 $
Portugal	20.516.927.02	149.666.06	20.666.593.08			20.666.593.08	1.482.777.84	19.183.815.24	699.829	27,41 $
Autriche/Austria	26.720.679.98	-	26.720.679.98	988.602.66		25.732.077.32	487.010.96	25.606.942.60 5)	596.330	42,94 $
Espagne/Spain										
- Cont	83.398.688.59	277.682.32	83.676.370.91	836.763.71		82.839.607.20	4.173.293.63	75.966.313.57 6)	2.522.159	30,12 $
- Canaries	19.910.365.89	-	19.910.365.89	199.103.66		19.711.262.23	160.051.38	18.751.210.85 6)	645.105	29,07 $

(1) Coûts relatifs au contrôle de Genève dans l'espace aérien français compris (coûts VFR inclus): 29.500.000 FS = 13.801.815,29 $ = 97.498.784 FF
(2) Coûts des service de route des îles anglo-normandes inclus : 1.467.102 £ = 2.512.591,20 $ = 17.749.447 FF
(3) Coûts civils
(4) Unités civiles.
(5) Pertes de change résiduelles 1980/81 comprises (non réduites) : Suisse = 4.700.000 FS; Autriche = 6.369.239 Sch.
(6) Ajustements : Allemagne : 13.989.927,25 $; Espagne Continentale = 2.700.000 $, Espagne Canaries = 800,000 $.

(1) Including expenditure in respect of Geneva ATC in French Airspace (VFR costs included): 29.500.000 SF = 13.801.815,29 $ = 97.498.784 FF.
(2) Including Channel Islands en-route expenditure : 1.467.102 £ = 2.512.591,20 $ = 17.749.447 FF.
(3) Civil costs
(4) Civil units
(5) Including residual 1980/81 exchange losses (non-reduced) : Switzerland = 4.700.000 SF; Austria = 6.369.239 Sch.
(6) Adjustments : Germany = 13.989.927,25 $; Spain Continental = 2.700.000 $, Spain Canaries = 800.000 $.

Source: Eurocontrol, Report on the Operation of the Route Charges System in 1982, June 1983

Clearly, if the <u>actual</u> number of chargeable service units in a particular year turns out to be greater (less) than the forecasted number for a particular State in column (9), that State will over-recover (under-recover) its cost-base of column (8). Perhaps less obviously, the same will happen if the exchange rate between the State's national currency and the U.S. dollar changes during the year. For it should be remembered that national costs (column 1) are computed in each State's national currency, in the first place, and subsequently converted to U.S.$ at the exchange rate prevailing at the time when the rate per service unit is set.[3] Thus, if the national currency of a State declines (rises) by comparison to the U.S. dollar during the year in question, that State will over-recover (under-recover) its costs during that year, even if the forecasted number of chargeable service units turns out to be accurate. Adjustments for over- and under-recoveries of this type are shown in the footnotes of Table 5.11: Switzerland and Austria under-recovered their costs in 1981 and, therefore, adjusted their reduced cost-base (column 8) upward for 1983, as indicated by footnote 5; conversely, West Germany and Spain have adjusted column 8 downward due to over-recovery in 1981 (footnote 6).

As has just been indicated, adjustments for over- or under-recovery of costs during a particular year (year n-2) are only made two years later (year n), due to the fact that the rate per service unit (column 10) for any particular year (year n-1) must be announced before the accounts for the previous year (year n-2) are finalized -- and the over- or under-recoveries, if any, are known. Recently this has led to considerable friction between the Eurocontrol service providers and its users. The reason is that the rapid

[3]More precisely, the exchange rate prevailing on November 1 of the previous year is the one used in the final computation of the rate per service unit that goes into effect on April 1 of the following year.

advance of the U.S. dollar vis-a-vis most European currencies since the summer of 1981 resulted in significant over-recovery of costs by several States in 1982 and, probably, in 1983 as well.[4] This is indicated in Table 5.12 which shows the preliminary computation of the rates per service unit to be charged by Eurocontrol States for 1984. (The Table was prepared in September 1983 for presentation to Eurocontrol's user representatives.) Note, first, that over- and under-recoveries are by now sufficiently widespread and large to warrant a separate column (column 9 in Table 5.12). Second, most States experienced over-recoveries for 1982, which in several cases amount to a significant percentage (10% or more) of recoverable costs (column 8) for 1984 -- let alone 1982. Finally, the total amount over-recovered in 1982 by Eurocontrol States, i.e., the net sum of the amounts shown in column 9, was $44,615,480.45. While this amount will eventually be redistributed to the users through its deduction from the cost base in 1984, it should be realized nonetheless that the net effect was an <u>interest-free</u> loan of $45 million from the users to the Eurocontrol States. This at a time (1982) when the cost of capital to the airlines in the financial markets was at least 15% per annum and often considerably more! On the other hand, the situation could naturally be reversed, were the U.S. dollar's value against European currencies to decline rapidly at some future time.

In response to strongly-worded complaints from several airlines regarding this kind of problem, Eurocontrol's CRCO has put into effect as of January 1, 1984, a monthly updating of exchange rates between the U.S. dollar and national currencies.

[4]At the time that this was written the final results for calendar year 1983 were not available.

ASSIETTE DES REDEVANCES ET TAUX UNITAIRES POUR LA 11ème PERIODE A PARTIR DES COMPTES PREVISIONNELS 1984

COST-BASE AND NATIONAL UNIT RATES FOR THE 11th PERIOD : 1984 FORECAST ACCOUNTS

ETAT STATE	Dépenses nationales en $ National costs in $ *	Dépenses EUROCONTROL en $ EUROCONTROL costs, in $	Assiette des redevances non réduite, en $ Non-reduced cost-base, in $	Réduction liée aux coûts VFR, en $ Reduction for VFR costs, in $	Vols circulaires en $ Circular flights, in $	Assiette imputable aux vols IFR, en $ Cost-base attributable to IFR flights, in $	Réduction pour vols exonérés en $ Reduction for exempted flights in $	Assiette des redevances réduite en $ Reduced cost-base for chargeable units in $	Sous-recouvrements/surplus 1982, en $ 1982 under-/over-recovery in $	Unités taxables 1984 1984 chargeable units	Taux unitaires nationaux National Unit rates
	(1)	(2)	(3) = (1)+(2)	(4)	(5)	(6)=(3)-(4)-(5)	(7)	(8)=(6)-(7)	(9)	(10)	(11) = (8)-(9) / (10)
Belg.-Lux.	15.969.163,00	11.049.969,11	27.019.132,11	-	-	27.019.132,11	2.212.583,37	24.806.548,74	+ 7.228.145,99	621.155	28,30 $
Allemagne/Germany	100.498.747,24	25.237.468,02	125.736.215,26	860.102,46	346.115,98	124.529.996,82	6.085.641,84	118.444.354,98	+ 13.258.600,28	2.467.324	42,63 $
(France	181.350.579,20	8.723.031,77	190.073.610,97	1.435.380,33	-	188.638.230,64	35.903.347,16	152.734.883,48)	+ 4.809.232,50)	4.820.608)	33,39 $
(Genève/Geneva 1)	13.635.943,42	-	13.635.943,42	161.782,38		13.474.161,04	2.564.525,12	10.909.635,92)	- 498.286,96)	)	
(Jersey 2)	2.410.961,68	-	2.410.961,68	-	-	2.410.961,68	458.876,20	1.952.085,48)	+ 321.582,58)	)	
Royaume-Uni/ United Kingdom	165.764.087,15 3)	9.863.444,16	175.627.531,31	-	-	175.627.531,31	554.033,54	175.073.497,77	+ 9.172.087,15	3.018.097 4)	54,97 $
Pays-Bas/Netherl.	21.002.845,66	3.893.571,34	24.896.417,00	840.308,00	-	24.056.109,00	1.201.475,34	22.854.633,66	- 1.923.550,72	501.728	49,39 $
Irlande/Ireland	14.512.668,79	1.255.523,33	15.768.192,12	-	-	15.768.192,12	871.524,44	14.896.667,68	+ 335.544,15	562.092	25,91 $
Suisse/Switzerl.	25.792.733,66	-	25.792.733,66	300.452,99		25.492.280,67	133.242,59	25.359.038,08	- 1.109.442,08	460.580	57,47 $
Portugal	20.167.791,38	505.831,86	20.673.623,24	-	-	20.673.623,24	988.747,13	19.684.876,11	+ 1.863.718,32	674.693	26,41 $
Autriche/Austria	25.985.467,18	-	25.985.467,18	956.358,19	-	25.029.108,99	584.314,42	24.444.794,57	+ 597.412,41	605.980	39,35 $
Espagne/Spain											
- Cont.	73.142.415,50	255.707,40	73.398.122,90	729.324,65		72.668.798,25	4.026.352,33	68.642.445,92	+ 7.487.817,73	2.527.103	24,20 $
- Canaries	16.453.450,45	-	16.453.450,45	164.534,50		16.288.915,95	108.747,80	16.180.168,15	+ 2.865.557,05	628.324	21,19 $
Portugal, Santa Maria	8.843.647,24	272.371,00	9.116.018,24	-	-	9.116.018,24	1.480.334,40	7.635.683,84	+ 207.062,05	845.234	8,79 $

(1) Coûts relatifs au contrôle de Genève dans l'espace aérien français : 29.500.000 FS. / Expenditure in respect of Geneva ATC in French airspace : SF 29,500,000
(2) Coûts des services de route des îles anglo-normandes : 1.604.495 £.Stg. / Channel Islands en-route expenditure : £.Stg. 1,604,495
(3) Coûts civils / Civil costs
(4) Unités civiles / Civil units

16 SEP 1983

* Frais locaux inclus / Including local costs.

Table 5.12

SOURCE; EUROCONTROL, WORKING PAPER WP/GCRR/71/2752 FIN, SEPTEMBER 28, 1983

An additional complication arising with respect to exchange rates is the fact that the Eurocontrol costs which are allocated to the individual States (column 2 in Tables 5.11 and 5.12) are originally estimated in ECUs (European Community Units). Consequently, the exchange rates between ECUs and national currencies, as well as between ECUs and U.S. dollars, enter the picture in converting Eurocontrol costs to U.S.$.

An example of the computation of an over-or under-recovery entry in column 9 of Table 5.12, i.e., of the required adjustment to the reduced cost-base in column 8, is given by Table 5.13. The Table illustrates the computation of the amount over-recovered by Belgium/Luxembourg in 1982. Note the use of different exchange rates between the U.S.$ and the Belgian franc for December 31, 1982 vs. January 1, 1982 (footnotes 3 and 5), as well as the need to convert ECUs to Belgian francs (footnote 7). The total over-recovery for 1982 was BF 387,226,237; this amount was converted to U.S.$7,228,145.99 as shown in column 9 of Table 5.12 by using the exchange rate of U.S.$1 = BF 53.572 prevailing in August 1983, the last month before Table 5.12 was prepared.

5.4.2 Determination of National Cost-Bases

Having reviewed the overall computation of the rate per service unit for Eurocontrol States, we now turn to the determination by States of the national costs associated with enroute air navigation services (column 1 in Tables 5.11 and 5.12) and to the allocation of Eurocontrol costs among States (column 2 in Tables 5.11 and 5.12). The sum of these two items (minus costs asociated with exempt flights) is the cost-base for each State.

Table 5.13

State : BELGIUM-LUXEMBOURG

ADJUSTMENT REQUIRED IN NATIONAL CURRENCY

1. Income		
Cash received in national currency during 1982	1,620,379,163	2)
Add : a) Accounts receivable at 31.12.82 (converted at exchange rate ruling on that date)	+ 444,653,582	3)
b) Flights billed in respect of Dec. 1982	+ 94,377,114	4)
Add : write-offs [1] effected in 1982	+ -	
Less : a) Accounts receivable at 1.1.82 (converted at rate ruling on 31.12.81)	- 350,743,932	5)
b) Flights billed in respect of Nov./Dec. 1981	- 215,250,482	6)
Gross Income 1982 (A)	1,593,415,445	
Less : Allowance for doubtful accounts 1982 [1]	- -	
Net Income 1982 (B)	1,593,415,445	
2. Costs		
Established costs of State for 1982	1,303,923,564	7)
Less : Costs in respect of exempted flights in 1982		
- VFR	- -	
- others	- 97,734,356	
Costs of State to be recovered through route charges in 1982 (C)	1,206,189,208	
3. Under-/over-recovery		
In respect of 1982 to be carried forward to 1984 (B-C)	+ 387,226,237	
Less : Adjustments made to 1983 costs	- -	

1) According to national accounting practices
2) Excluding interest
3) US $ 9,476,845.31 at rate : US $ 1 = BF 46.92
4) US $ 2,011,447.44 at same rate
5) US $ 9,119,707.01 at rate : US $ 1 = BF 38.46
6) US $ 5,596,736.41 at same rate
7) Including costs in respect of EUROCONTROL : ECU 10,088,900 at rate ECU 1 = BF 44.7116 (1982)

Source: Eurocontrol, Working Paper WP.GCRR/71/2752 FIN, September 28, 1983

The States that participate in the Eurocontrol system have established a set of principles for establishing national cost-bases and for allocating Eurocontrol costs among States. These principles are described in Appendix 5C to this report.[5]

As is often the case with similar guidelines [cf., ICAO, Statements by the Council to Contracting States on Charges for Airports and Route Air Navigation Facilities: 1981 (Doc. 9082/2) and ICAO, Manual on Route Air Navigation Facility Economics (Doc. 9161)], the Eurocontrol principles are intentionally general and often vague, allowing sufficient flexibility to accommodate varying national practices by participating States.

While such generality and vagueness would seem to be unavoidable concomitants of the international environment within which enroute air navigation services are provided, a number of steps could be taken to improve the specificity and usefulness of Eurocontrol's principles for establishing cost-bases. The following list of suggestions has been compiled on the basis of discussions with both users and providers of airspace services in Western Europe.

a. Documentation requirements for national enroute air navigation costs are quite minimal at this time. States are requested to submit the schedule shown here as Figure 5.3. This schedule clearly aggregates cost data to an excessive degree. Users, for example, often complain about the difficulty of identifying at a useful level of detail those elements of a national cost-base that may have increased substantially from one year to the next. Improved reporting of costs would certainly help alleviate such problems.

In June 1982, IATA submitted to Eurocontrol a proposed alternative schedule for reporting national expenses for enroute air navigation. This

[5]The reader may wish to review that Appendix before reading further.

Figure 5.3

APPENDICE/APPENDIX II

Installation et services de route / Route facilities and services

Exercice financier de l'année - / - Financial year

Unité : monnaie nationale

Unit : national currency

Coûts annuels des installations et services

Annual costs of facilities and services

	Dépenses annuelles - Annual expenditure							
	Entretien/ Maintenance (1)	Exploitation/ Operation (2)	Frais de formation et de perfectionnement/ Cost of basic and advanced training of staff (3)	Dépenses d'études, d'essais et d'expérimentations/ Cost of studies, tests and trials (4)	Frais administratifs et divers/Administrative and miscellaneous costs. (5)	Amortissement des dépenses en capital/ Amortization of capital expenditure (6)	Intérêts appliqués aux dépenses en capital/ Interest on capital expenditure (1) (7)	TOTAL (1+2+3+4+5+6+7) (8)
ATS								
COM								
MET								
AIS								
TOTAL								

(1) Taux d'intérêt = ...
Rate of interest = ...

Source: See Appendix III

schedule is reproduced here as Appendix 5D. As can be seen, the proposed schedule consists of five parts and goes much beyond the form shown in Figure 5.3 in providing a detailed breakdown of national expenses for the various categories of aviation-related activities (ATS, COM, MET and AIS). Provisions are also made for separate reports on fixed-asset expenses and depreciation costs as well as on personnel.

While it is beyond the scope of this paper to take a position on the merits of the specific proposal submitted by IATA, its general thrust toward additional detail seems appropriate in view of the current situation. In injecting itself as an intermediate institutional "layer" between users and providers of air navigation services in Western Europe, Eurocontrol has had a negative impact on users' attempts to establish direct lines of communication to national ATC organizations. Eurocontrol, unintentionally, has served to insulate these national organizations from users seeking access to better information concerning costs. More stringent reporting requirements would help negate this effect.

b. Users are apparently of the view that States currently recover an excessive fraction of national meteorological (MET) costs through charges for enroute air navigation services. The Eurocontrol principles (§2.2.1.3, Appendix III) are particularly vague on this aspect. More precise and explicit guidelines for establishing the fraction of MET costs which should be allocated to civil aviation activities would seem necessary.

c. Problems also exist in the application of the principles applying to air traffic services (ATS) and communications (COM) costs. For example, the allocation of such costs between terminal area/airport services, on the one hand, and enroute services, on the other, is a persistent source of concern. Some States also do not even maintain separate records of COM costs but simply include them with ATS costs. Given the fact that ATS costs, by themselves, constitute the largest single cost element, in the first place, the practice of merging ATS and COM costs further aggravates the aggregation problem described above. Clarification of the relevant principles, §2.2.1.1 and 2.2.1.2, seems called for.

d. The treatment of the costs of VFR flights, circular flights and "exempted" (mostly military) flights [see columns (4), (5) and (7), respectively, in Table 5.12] seems to be non-uniform from state to state and even haphazard, according to some of the Eurocontrol users that we interviewed. Indeed, inspection of Table 5.12 indicates that widely-different estimates of these costs are submitted by different States. For example, whereas France reduces its recoverable costs by about $36 million to account for exempted flights, no other state has an entry of more than $6.1 million in this respect [column (7)]. Similarly, five States make no adjustments whatsoever for circular <u>and</u> VFR flights.

e. The interpretation of the guidelines on the recovery of interest on capital expenditures and on working capital (§2.1.3.2 and 2.1.3.3, Appendix III) apparently differs widely among States. Some States, for example, charge for interest (based on a "social discount rate") in connection with capital investments financed through <u>internal</u> funds (not through borrowing) as well as in connection with working capital; others do not. In a third instance, the social discount rate is also applied to interest costs of borrowed capital -- thus, effectively, imposing an "interest on interest". (This is usually done through the setting of a percentage "target" for return on investment.) Once again, considerable room for clarification of the principles would seem to exist in this respect.

<u>5.4.3 Differences in the Rates per Service Unit</u>

Having reviewed the principles for establishing national cost-bases and the method for computing rates per service unit, we can now turn to one of the most striking aspects of the Eurocontrol system of charges. This aspect is the large differences that exist among the rates per service unit that participating States charge.

Table 5.14 lists the rates per service unit by State for the 1978-1983 time period. Even after disregarding the Santa Maria FIR (whose characteristics are unique), the range of values that the rates take is surprising. In 1983, for example, these values extend from $64.15 for the United Kingdom to $27.58 for Portugal, a ratio of 2.33:1. For the rates that went into effect on April 1, 1981, that ratio was 5.19:1, with West Germany and Portugal at opposite extremes.

It is natural to wonder about the reasons for such differences. Why, for instance, would France charge in 1983 only $31.83 per service unit, while the United Kingdom charged $64.15? After all, both countries provide similar (high-quality) enroute air navigation services using equipment and facilities of similar (advanced) technologies. Questions of this type are most important to both the users and the participating States, for they bring into focus underlying issues related to productivity, efficiency, excessive costs, allocation of costs, etc.

Unfortunately, as in all cases where comparisons among States are involved, it is also extremely difficult to address these questions satisfactorily. At the root of the problem is the fact that highly-detailed national cost data are required for each of the States involved, but that such data are not readily provided by the States -- either because of a reluctance to share such information or because some States, simply, do not know or collect the required information, in the first place. Due to the fact that detailed cost data for Eurocontrol-participating States were unavailable to

	1.4.1978	1.4.1979	1.4.1980	1.4.1981	1.10.1981	1.4.1982	1.10.1982	1.4.1983
Belgium/Luxembourg	31.7721	46.2958	55.0833	65.8554	62.5362	50.1666	45.6515	42.49
Germany	38.6821	52.2117	62.6713	76.8574	73.0915	61.7320	61.0131	47.39
France	15.6329	18.8876	22.7143	32.9267	31.6406	34.7361	32.3665	31.83
United Kingdom	31.1190	38.3099	46.7303	63.8062	67.4920	73.5124	68.3990	64.15
Netherlands	32.3670	36.3816	44.1704	50.4479	47.9019	43.1606	42.9420	48.42
Ireland	9.9364	12.4935	19.6874	23.0979	21.9127	29.8397	28.4013	35.26
Switzerland	29.1752	34.3402	49.7956	62.2820	59.0011	53.3572	56.9808	59.00
Portugal	10.7297	10.7532	14.4802	14.8171	14.7718	29.7476	26.5297	27.58
Austria	28.3707	39.9102	43.1470	52.3182	49.6382	40.4259	40.3712	43.11
Spain - Continental	13.7221	17.3350	21.5145	21.9022	21.1149	35.4128	32.3570	30.29
Spain - Canaries	17.8593	22.8175	28.1362	29.5369	28.5033	33.3809	30.4952	29.24
Santa Maria FIR	3.1621	3.2497	3.0003	4.2815	4.2658	9.4681	8.4354	8.75

Table 5.14

VALUES AND DATES OF ENTRY INTO FORCE OF GLOBAL UNIT
RATES OF CHARGE (IN U.S. $).

(Source: Eurocontrol, Report on Operation of the Route Charges System in 1982, June 1983) the author of this report, the discussion here will be limited to general observations supplemented by illustrative examples. An on-going data-collection effort within Eurocontrol, that may in the future facilitate inter-State comparisons of the kind envisioned here, will also be described briefly.

It is important, at the outset, to warn against the uncritical use of unit rates as a means of measuring cost-effectiveness in different States. For, in addition to depending on the efficient use of resources ("economic inputs") that go into the "production" of air navigation facilities and services, the rates charged per service unit are also a function of a plethora of other factors -- many of which are beyond the control of the national agencies or organizations responsible for ATC.

In the discussion that follows, the term "national civil aviation authority" (NCAA) will be used to denote the government agency entrusted with providing enroute air navigation facilities and services. The factors that affect the national rate per service unit can then be placed into three categories:

a. Factors that depend on the characteristics of traffic.

b. Factors that depend on national characteristics.

c. Factors that depend on government policy regarding the NCAA and on the NCAA's management of ATC.

While the boundaries among these three categories are occasionally somewhat blurred, it is still helpful to discuss the various factors in the light of this classification.

a. Factors depending on traffic characteristics

Factors that belong to the first category include:

(i) Distances flown: On a "unit-distance" basis (e.g., "cost per 100 kms. of flight"), long-distance flights should be less costly -- from the enroute ATC point of view -- than short-distance flights. This is because long-distance flights (e.g. high-altitude overflights) are usually easier to handle than short-distance ones. Thus, everything else being equal, States in which the average enroute distance flown is large should enjoy some "economies of scale" relative to others. As Table 5.15 indicates (see column 1), Spain/Canaries, France, Spain/Mainland, Portugal, United Kingdom and West Germany, in this order, enjoy an advantage in this respect.

(ii) Aircraft weights: As observed earlier (Section 2), the workload imposed on enroute air navigation systems is largely independent of the weight of aircraft, especially in the case of aircraft flying at similar speeds (e.g., all commercial jet aircraft with take-off weights of 35 tonnes or more). For any given number of flights and sets of distances, it is therefore very advantageous for a State to serve heavier aircraft since, in this manner, that State is credited with more service units while performing the same amount of "work". This is a direct consequence of the unfortunate way in which the Eurocontrol charge formula treats aircraft weight.

It could then be expected that States serving heavier aircraft would again enjoy an advantage in terms of costs per service unit. Table 5.15, column 2 shows the average aircraft weights[6] for the 11 Eurocontrol participants: it is noteworthy that average aircraft weights in Austria, mainland Spain, Belgium/Luxembourg, United Kingdom, France, Switzerland, the Netherlands and West Germany, in decreasing order, are all in a rather-narrow range of 85.6 - 63.6 tonnes.

(iii) Volume of traffic: For a given area and a given route and

[6]Although Table 5.15 refers to 1982, it should be noted that all four statistics covered -- and especially distance, weight and no. of service units per aircraft -- have been very stable for all States involved throughout the period 1978-1983. The values indicated are therefore representative of that whole period.

Table 5.15

TRAFFIC CHARACTERISTICS FOR 1982

	Average Distance Flown (kms)	Average Weight per Aircraft (tonne)	Average No. of Service Units per Flight	No. of Flights Handled
Belgium/Luxembourg	165	75.9	1.97	348,000
France	465	67.0	5.17	1,118,000
Germany	280	63.6	3.10	823,000
Ireland	150	201.4	3.44	169,000
Netherlands	175	63.9	1.85	282,000
United Kingdom	270	74.2	3.44	907,000
Austria	185	85.6	2.42	251,000
Portugal	370	100.6	5.67	128,000
Spain-Mainland	400	81.1	5.27	487,000
Spain-Canaries	500	138.2	7.10	89,000
Switzerland	105	64.7	1.11	419,000
Santa-Maria FIR	1,340	201.3	26.90	38,000

Sources: Eurocontrol, Report on the Operation of the Route Charges System in 1982, June 1983. Column 1 computed from Appendix 5A.

ATC sector configuration, there are also economies of scale, up to a point, with increased traffic volume. Each ATC sector has a maximum capacity measured by the number of aircraft that can be handled simultaneously for a sustained period of time by the sector. For advanced ATC systems, this capacity is usually in the range of 5-10 aircraft, depending on the complexity of the travel patterns, the number of intersections in the sector, etc. Assume that the sustained capacity of some given sector is X aircraft. Then, the available capacity would be underutilized as long as the volume of traffic in the sector was less than X: without expending any additional resources[7] the ATC system would be capable of accommodating additional traffic, thus reducing per unit costs. [Of course, after a certain point, the capacity X would be exceeded and, then, either the quality of service might suffer (e.g., traffic delays), or in the long run the ATC system might have to be re-configured (e.g., the original sector might be sub-divided into two sectors). Analyses concerning economies of scale with respect to traffic volume must, therefore, proceed carefully.]

One might be tempted to divide the number of enroute flights handled (shown in column 3 of Table 5.15) by the area controlled by each participating State to compute "traffic volume per unit area" and claim that States for which this measure is high enjoy a certain advantage. This, however, would ignore the fact that traffic is not uniformly distributed over the controlled area. In the absence of more-detailed information, we shall therefore refrain from further pursuing any specific comparisons among Eurocontrol States with regard to volume of traffic per unit area controlled.

(iv) Complexity of traffic patterns: Regularly-spaced, constant-altitude traffic flying along non-intersecting routes is undoubtedly easier to

[7]This argument is over-simplified here for expository purposes.

handle than traffic at airway intersections or flights which land and/or take-off within a State's territory. In the latter cases, enroute ATC must resolve potential conflicts between aircraft, provide altitude clearances, "vectoring", etc.

While these points are obvious at a qualitative level, it is very difficult to measure quantitatively such "traffic complexity". The Federal Aviation Administration in the United States, for example, has repeatedly attempted to develop indices for measuring traffic complexity -- with only limited success. Recently the Directorate of Research (DR) of the Civil Aviation Authority, United Kingdom used the percentage of overflights in the total traffic as a proxy indicator of a State's traffic complexity. The rationale was that overflights "consume" less enroute air navigation effort per flight than inbound/outbound flights -- for the reasons outlined in the previous paragraph. In fact, DR estimated that the relative difficulty of handling an inbound or an outbound flight is approximately 1.75 times that of an overflight, for a given flight distance. This number was derived by comparing the average number of communications messages exchanged between an enroute control center and an overflight with the corresponding number of communications between an enroute control center and an inbound/outbound flight.

While this is clearly a very simplistic approach, it may have some merit as a very rough indicator of differences in traffic complexity among States. In any event, the ratio of overflights to inbound/outbound flights varies significantly among Eurocontrol's States, as Table 5.16 indicates (a low percentage of overflights presumably implies a high level of traffic complexity): If this indicator of complexity is accepted, the United Kingdom has the most complex traffic pattern, followed by Spain, West Germany and the

Table 5.16

PERCENTAGE OF FLIGHTS WHICH ARE OVERFLIGHTS

Belgium/Luxembourg	62.6%
France	42.2%
Germany	24.8%
Ireland	59.4%
Netherlands	34.4%
United Kingdom	11.7%
Austria	70.6%
Portugal	43.8%
Spain	21.8%
Switzerland	43.8%

[Source: A. Kennaway, Costs and Charges for Air Traffic Services Among Eurocontrol States, prepared for Directorate of Research, United Kingdom, April 1983 (mimeographed)]

Netherlands, in this order.

(v) Peaking patterns: As enroute navigation systems must be capable of handling demand at peak hours, unit costs will be lower, for a given volume of annual traffic, if traffic is evenly distributed -- by time of day, day of week, and season. Sharply-peaked traffic implies underutilization of resources during off-peak periods. In the case of Eurocontrol States, North Atlantic traffic, in particular, exhibits sharp peaking both by time-of-day and by season. For example, peak-hour traffic (mostly westbound) occurs in the 14:00-15:00 period (local time) at the Oceanic Area Control Center, Prestwick, United Kingdom, when the traffic volume is typically more than two times as high as the average traffic volume per hour during the day and, often, more than ten times as high as the traffic volume during the lowest hours of the day.

b. Factors depending on national characteristics

Rates per service unit also depend on a variety of economic, technological, geographic/meteorological and institutional characteristics of States. A number of these factors fall on the borderline between the present category and the following one, "factors that depend on government policy regarding the NCAA and on the NCAA's management of ATC", and will be discussed under the latter category. At this point, three factors will be mentioned:

(vi) Exchange rates of the national currency: This topic was discussed in detail in Section 4.1. The rate per service unit charged by Eurocontrol States varies in direct proportion to changes in the exchange rates between their national currencies and the U.S. dollar. For illustrative purposes, the following Table compares the relationship between Eurocontrol currencies and the U.S. dollar over the period January 1, 1982 - July 15, 1984. If the value of U.S. $1 versus each national currency on

January 1, 1982 were to be indicated by 1.00, then the corresponding values on July 15, 1984 were, at official exchange rates:

	Value of U.S. $ on 7/15/84
Belgium	1.521
France	1.534
Germany	1.274
Ireland	1.479
Netherlands	1.313
United Kingdom	1.391
Austria	1.262
Portugal	2.293
Spain	1.669
Switzerland	1.354

The impressive magnitude of the changes in the above list underscores the importance of currency fluctuations in recent years. For example, if the July 15, 1984 rate were to be used to compute the service unit rate to be charged in 1985, Belgium/Luxembourg's rate for that year would be 34% (1/1.521=0.66) lower than it was for 1982, everything else being equal, i.e. assuming that the cost-base and the volume of traffic for Belgium/Luxembourg were the same as those in 1982. Moreover, the rate per service unit of Belgium/Luxembourg, under this same set of assumptions, would have to decline by some 16% (1.274/1.521 = 0.84) relative to that of West Germany, as compared to their 1982 rates.

Changes in exchange rates -- coupled with the over-recovery of costs in 1982 due to these fluctuations -- are undoubtedly the most-important single cause for the reduction in unit rates that took place in 1984 relative to earlier years (compare, for example, the rates in the April 1, 1982 column of Table 5.14 with those in column 11 of Table 5.12).

(vii) National technological base and infrastructure: The reference here is to a State's access to advanced-technology facilities and equipment, as well as to the availability of the pool of highly-skilled individuals that are necessary to the implementation of a modern ATC system. In the particular case of the Eurocontrol group, this factor would not be expected to be particularly significant in differentiating among States because, with a few exceptions, the participating States generally have a fine tradition in the air transportation field, well-developed electronics, communications and computer industries and excellent educational and training institutions. Conceivably, though, this factor could put some of the States at a disadvantage, relative to others, in terms of unit costs.

(viii) Physical characteristics: Such aspects as geographical configuration, terrain, climatic and meteorological conditions, etc. may also affect per-unit costs of a State. These physical characteristics are certainly much more of a cost factor in the case of airport and terminal area ATC services than in the case of enroute air navigation. However, they may merit consideration in the latter case, as well — especially in instances such as those of Switzerland and Austria.

c. Factors that depend on government policy toward the NCAA and on the NCAA's management of ATC

Turning to the final category of factors we have:

(ix) Statutory position of the NCAA vis-a-vis cost recovery: The financial targets set by governments for their NCAA's obviously affect the size of the cost-base to be recovered. An interesting example, in this respect, is the contrast that exists between the policies of the United Kingdom and of France. In the United Kingdom, the Civil Aviation Authority (CAA) — which in 1971 was established as an independent agency with responsibility, among other things, for national air traffic services — is required by statute to recover all the costs incurred for ATC (apart from grants for the development of the "Highland and Islands airports" in

Scotland). According to the Civil Aviation Act of 1982, which currently describes the statutory position of the CAA, the Authority must so "conduct its affairs as to secure that its revenue (including any grant towards revenue) is not less than sufficient to meet changes properly chargeable to revenue account, taking one year with another". In addition to recovering operating costs, the CAA currently seeks to achieve a return of 5% per year after interest on average capital employed (including working capital) on a historic cost basis. Since the average interest charged on capital employed by the CAA — whether borrowed from outside lenders or obtained through internal funds -- is about 10% per year (The Monopolies and Mergers Commission, op. cit., p. 27), it follows that the CAA seeks a 15% return on investment before interest. During the 1982-83 fiscal year the CAA achieved a return on investment of 15.8%.

The Direction Generale de l'Aviation Civile (DGAC) in France is under no similar statutory constraints, although it does seek to recover costs. The DGAC does not seek a financial target involving a return on investment over and above recovery of interest on capital. Moreover, the interest which is charged on capital (and working capital) provided by the national government to the DGAC is equal to the average yield of loans guaranteed by the State[8]. In the case of France, this yield typically ranges from 1% below to 3% above the rate of inflation. In other words, the real interest rate (in constant prices) is minimal. In the United Kingdom by contrast, (real) interest rates on internally-provided capital are of the order of 10% in constant prices.

Clearly, policies as dramatically different as the two described above can have a significant effect on cost bases and will be so reflected in the associated rates per service unit.

[8]Source: Personal communication from the Directorate of Air Navigation, DGAC.

(x) Cost-allocation practices: This is one area which is very important in terms of effects on the rate per service unit and in which numerous and significant differences exist among States. Moreover, highly-detailed data are required in order to understand such differences precisely. In Section 4.2, we have identified several areas where there is currently much ambiguity in Eurocontrol's guidelines with regard to such allocation policies. They include practices on the allocation of: ATS, MET and COM costs between enroute air navigation and airport ATC services; MET costs between civil aviation users and all other users; ATS costs between military and civilian users; administrative and research costs among users and between airport and enroute services; joint facility costs among users and between airport and enroute services, etc.

No other subject has created more friction between service users and service providers in the Eurocontrol system than cost allocation. We have learned that such States as West Germany and the United Kingdom have or are in the process of developing sophisticated, computer-based cost-allocation systems. However, as long as the basic principles behind such allocation schemes are not generally understood or agreed to, this area will continue to be a problem. The recent report of the Monopolies and Mergers Commission (op. cit.) contains a detailed discussion of this topic as it pertains to the United Kingdom.

(xi) Personnel-related costs: These costs are, apparently, by far the most significant component of the overall cost-bases of participating States. For 1982, for instance, personnel-related costs (salaries and benefits) comprised 59% of total enroute air navigation costs in the United Kingdom (The Monopolies and Mergers Commission, op. cit, Table 5.11) and 65% in France (private communication from DGAC). (In both instances about twothirds of these costs went into salaries and one-third into benefits.)

Clearly, there are three areas where governments and NCAA's can exercise some controls over these costs: size of individual salaries and benefits; size of the workforce; and utilization of that workforce, e.g., as measured by the average number of hours worked per NCAA employee per year.

Once again, the cases of the United Kingdom and France can be used as examples. In the case of France, DGAC personnel are civil servants. Compensation is therefore tied to compensation in the civil service with special provisions, especially in the case of air traffic controllers, for overtime compensation, reduced working hours, etc. Typical basic salaries in the three main civil service grades for ATC controllers, electronics specialists and technicians (not including trainees) were in the FF144,000-160,000 range in 1983 (approximately $18,000-$20,000 at then-prevailing exchange rates) — a relatively-high salary for both the private and the public sector in France.

In the United Kingdom, despite the fact that the CAA is an independent agency, the salary scales of its employees are closely tied to those of counterparts in the civil service and, in fact, there is a one-to-one link between the salaries of the various classes of CAA employees and corresponding classes in the civil service. Basic salaries for 1983 for ATC operational controllers ranged between §8,600 and §15,600 (approximately $13,000-23,500), with generous supplements for weekend work, overtime and "shift disturbance". Over the last decade, these salaries have increased roughly equally with the Retail Price Index in the United Kingdom.

When it comes to the number of personnel, the DGAC in France had 1,771 employees[9] in its four enroute centers to provide enroute air navigation

[9] Sources: Private communication from DGAC and Report of the Monopolies and Mergers Commission, op. cit, Appendix 24.

services (as of October 1, 1982). The corresponding number for the CAA was 1,819 (as of May 1983). However, France handled about 25% more flights than the United Kingdom in 1982 (see Table 5.15) and controlled an airspace region about twice as large. Total staff was 4,849 for the DGAC (including electronics and communications specialists, other technicians, engineers and support and administrative staff in addition to ATC officers), and 5,743 for the CAA at the end of 1982. It should be noted, however, that the number of CAA employees has been slowly but steadily declining in recent years (from 6,082 in 1977 to 5,743 at the end of 1982) with a target of 5,400 for 1988.

Personnel costs are also much affected by how effectively available staff is utilized. This, in turn, is a function of the length of working weeks, personnel-rotating strategies, vacation and leave regulations, etc. For example, ATC officers in the United Kingdom have a nominal working week of 40 hours. However, a complicated set of rules on meal breaks, rest days, fatigue breaks, etc., results in an effective working week of 27-28 hours, according to the Monopolies and Mergers Commission (op. cit, p. 143). This, coupled with constraints on shift rotations, means that about 7 ATC officers are required in order to keep one controller position manned for 24 hours a day over one whole year. By contrast, in France where the nominal working week for ATC officers is 32-36 hours, approximately 5.5 officers are needed to accomplish this over a year.

We have reviewed, in varying degrees of detail, eleven different factors which are among the most important in determining national cost-bases and resulting rates per service unit. In the particular case of Eurocontrol, some of these factors are clearly more dominant than others.

A number of points need to be underlined. First, only a few of the factors are truly under the control of national governments and of NCAA managements. Notable among those are factors (ix), (x) and (xi). In the long run, NCAA policies may also be capable of affecting to some extent some traffic characteristics under factors (i) - (v). However, even in the cases of factors (ix), (x) and (xi), numerous political, legal and institutional constraints are likely to restrict severely the options and maneuverability of national governments and NCAA's.

A second point is that the subject of comparing unit costs, due to its complexity as described above and to the scarcity of data, has not, to date, received the kind of systematic attention and analysis it deserves. The most ambitious effort so far in this respect is the study which was recently sponsored by the Directorate of Research of the CAA [A. Kennaway, Costs and Charges for Air Traffic Services among European States, April 1983 (mimeographed)], which attempted to compare rates per service unit among Eurocontrol States after "normalizing" these rates with respect to some of the factors described above. The study used average distance flown (factor (i) above) as the principal explanatory variable and came up with linear-regression relationships, such as the one in Figure 5.4 (reproduced from the report cited above). States above the regression line are on the "expensive" side. The principal thrust of the report is that analyses such as the one shown in Figure 5.4 demonstrate that differences among rates per service unit among States are not as large as they might appear to be from the "raw" data, i.e. from the rates per service unit that each State charges in each period. The factors that have been used in normalizing the raw data -- before attempting the kind of regression analysis shown in Figure 5.4 -- were three:

- Exchange-rate fluctuations [factor (vi) above].

- Aircraft weight [factor (ii) above].

- Complexity of traffic pattern, using the percentage of overflights as the proxy indicator [factor (iv) above].

The CAA study, in our view, is not particularly convincing at this

Fig4.

Figure 5.4

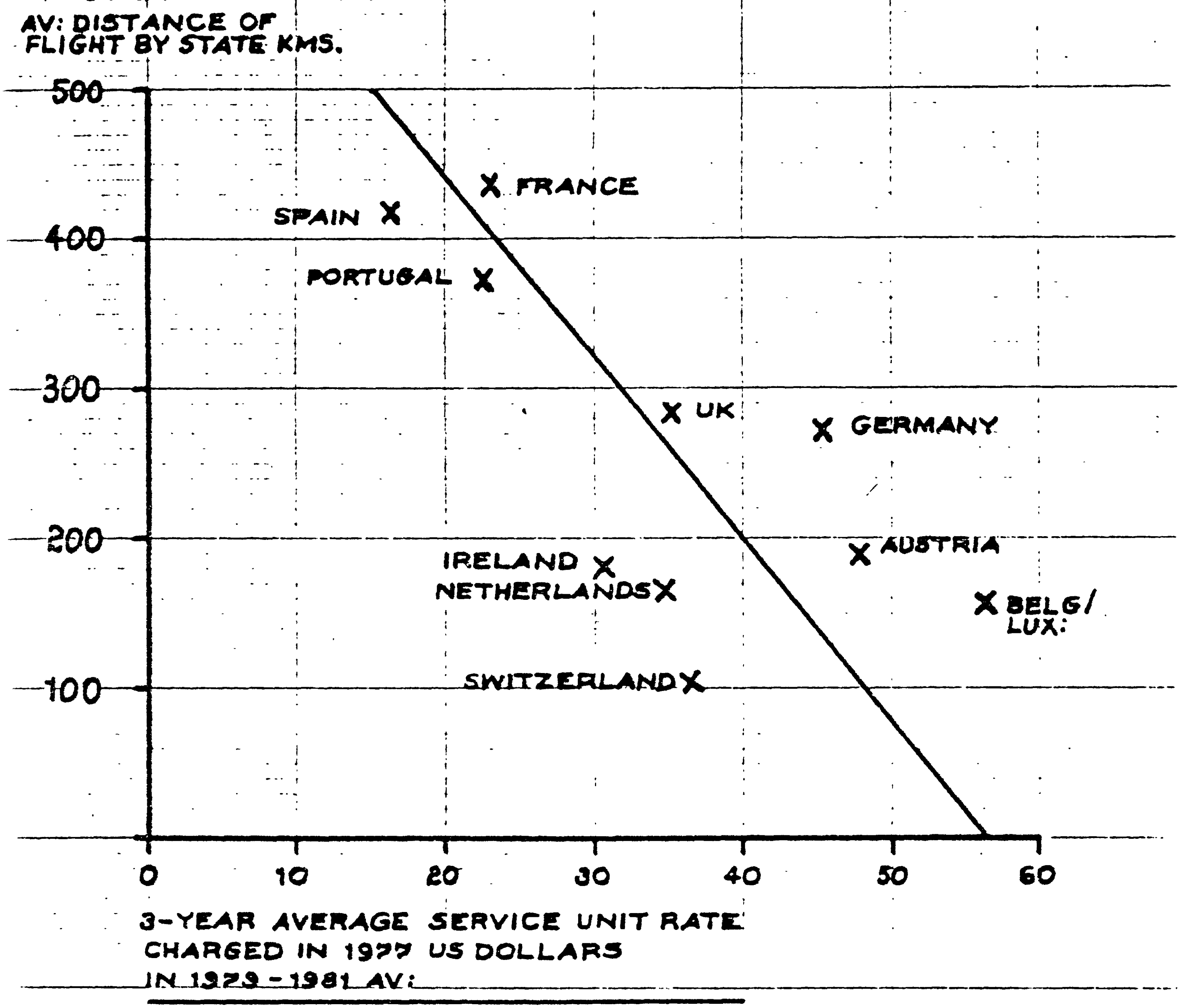


FIG4: SERVICE UNIT RATES vs AV: DISTANCE FLOWN 1979-1981

stage. (For example, there are strong correlations between two of the normalizing variables and the explanatory variable, which are ignored by the analysis). However, the study certainly represents a step in the right direction.

Finally, along these lines and indicative of the interest and controversy that this whole subject has generated, it should be mentioned that as of the end of 1983, the Eurocontrol States under the leadership of the DGAC, France, have undertaken an effort to collect some of the national cost data that would be necessary for a systematic and correct analysis of the issue of rate differences. If this data-collection effort proves successful, it will open the way for a much-more-detailed discussion of this problem than has been possible here.

5.5 SUMMARY AND CONCLUSIONS

This report consists of two main parts. In the first part, the distribution of Eurocontrol enroute air navigation charges among the operators of aircraft was examined. In the second, the cost-base of the charges was reviewed. The following are the main conclusions of this analysis.

a. The Eurocontrol formula, on the basis of which the distribution of the cost burden among users is determined, only manages to set charges in rough proportion to an aircraft's ability-to-pay. Charges are not related to the cost of providing service to users and, in fact, penalize the most-efficient users of airspace.

b. The distribution of costs among users is very sensitive to even minor modifications to the Eurocontrol formula. The effects of several such modifications have been quantified in Section 3. Any modification in the (proper) direction of de-emphasizing the importance of aircraft weight (as a factor in computing charges) will benefit heavier aircraft in the wide-body category and shift some of the cost burden toward aircraft with maximum take-off weight of 60 tonnes or less.

c. Despite the fact that there is ample justification for doing so, it will be difficult, in practice, to change the Eurocontrol formula. The formula has already been adopted by many States outside Western Europe and is consistent with the ICAO Council's guidelines on the topic. Any change in the formula requires the unanimous agreement of Eurocontrol States. Moreover, for obvious reasons, there is no identity of interests and views on the subject between the various groups of airspace users.

d. With reference to the cost-base which Eurocontrol charges are designed to recover, it was noted first that this cost-base has grown rapidly since 1971. The way in which the rate per service unit is computed was explained in detail and the influence of a variety of factors was reviewed.

e. The Eurocontrol guidelines to the participating States on establishing their national cost-bases are, in some of their aspects, imprecise and subject to varying interpretations. A need exists for: requiring States to provide more detailed information on the many cost elements that go into national cost-bases; clarifying the guidelines with respect to the allocation of ATS, MET and COM costs to enroute air navigation; treating interest costs on capital investments and on working capital in a more-consistent way across States; and offering improved guidelines for the allocation of costs between military and civilian users and the treatment of exempted flights.

f. The most interesting question regarding cost-bases concerns the large differences in the rate per service unit charged by the various participating States. Unfortunately, the data requirements for analyzing this issue properly are extensive. Such data are currently unavailable; the best way to obtain such information in the future will be on a government-to-government basis.

g. A number of factors play an important role in determining the rate per service unit charged by a State. Only a subset of those can be controlled by the States or the national agencies responsible for providing enroute navigation facilities and services. The factors in question include: traffic characteristics, such as distances flown, aircraft weights, traffic volume, traffic complexity, and peaking patterns; national economic, technological and institutional characteristics; currency exchange rates; and a plethora of items that affect directly national cost-bases, such as wage and benefit scales, technology used, work-hour regulations, utilization of personnel/rostering, policies vis-a-vis the treatment of capital costs and associated interest, etc. Comparisons among States cannot be performed properly unless most of these factors are taken into consideration. Data that might in the future permit systematic comparisons of this type are currently in the process of being collected by Eurocontrol States.

Chapter 6

GROUND HANDLING CHARGES

6.1 INTRODUCTION

The term "airport ground handling" refers to the set of services provided to aircraft, passengers and cargo for the purposes of embarking and disembarking passengers, loading and unloading the aircraft and preparing the aircraft for a flight -- excluding, however, such services as mechanical inspection/servicing, fueling, etc. IATA recommends classifying ground handling services into two categories, "traffic handling" and "ramp handling", consisting of six and ten separate tasks, respectively, as shown in Table 6.1.

The provision and cost of ground handling services have been at the center of considerable controversy in recent years. The issues here are "who provides the services?" and, in those instances in which an airline cannot or will not provide these services for itself, "how can it be ascertained that ground handling is performed efficiently and at a reasonable cost?". These two questions are addressed in Sections 2 and 3 below, respectively.

To date, ICAO has not issued any guidelines on ground handling services and charges. The "Statements by the Council to Contracting States on Charges for Airports and Route Air Navigation Facilities" (ICAO Doc. 9082/2, published 2/82) are notably deficient in this respect. This is both unfortunate and surprising in view of the fact (apparently not widely understood), that charges for ground handling services at international airports (or the cost of these services in the cases where these services are provided by an airline to itself) often are as large or larger than the <u>sum</u> of <u>all</u> other aeronautical charges imposed at these airports (landing fee, passenger service charges, parking and hangar charge, security charges, etc.). This will become clear from the data to be presented later in this chapter.

There are two likely reasons for this relative lack of attention to ground handling charges. First, unlike other aeronautical services where requirements, equipment and procedures are more-or-less standard across the entire spectrum of airports and airlines ("a landing is a landing", no matter where it takes place), in the case of ground handling services, wide differences exist in user needs, services offered and service quality from one airport to another. For example, at airports where nose-in aircraft parking is used or where passengers walk to the aircraft, no passenger transport services are required. Or, the extent of mechanization as well as the sophistication of any equipment used for the tasks of loading/unloading and/or of cargo handling will vary greatly, depending on the size and function of an airport and on the types of aircraft it serves. Similar variations will also exist for many of the other tasks listed in Table 6.1.

The second reason has to do with the fact that information on ground handling charges at airports is not generally published and, when it is, there is no standard form for this information or any standard unit of measure for these charges. A typical example illustrating this point is given in Figure 6.1 which shows a copy of the relevant section from the Rates and Conditions of Application guidebook provided to the airlines by Aeroport de Paris for 1983. This guidebook, which otherwise is voluminous (157 pages long) and highly detailed with respect to all other aeronautical and air terminal charges, offers practically no specific information when it comes to ground handling charges.

Table 6.1

IATA LIST AND CLASSIFICATION OF GROUND HANDLING SERVICES

A. Traffic Handling

1. Representational Services
2. Messages and Communications
3. Handling Documents and Load Control
4. Passenger Handling at Airport
5. Cargo and Mail Handling Services
6. Airport Information Services

B. Ramp Handling

7. Baggage Handling (at Baggage Sorting Area)
8. Loading/Unloading of the Aircraft
9. Catering Transport
10. Interior Cleaning of the Aircraft
11. Toilet Service
12. Water Service
13. Passenger Transport (to Aircraft)
14. Starting Service
15. Marshaling
16. Parking Assistance

Figure 6.1

TYPICAL INFORMATION ON GROUND HANDLING SERVICES

1 Presentation of airport handling services offered for combi aircraft

AEROPORT DE PARIS offers all airport handling services required by operators of combi aircraft in the terminal and on the ramp, in compliance with the recommendations defined in the IATA standard contract.

Services offered :

- Section 1	Representational services
- Section 2	Messages and communications
- Section 3	Traffic services
- Section 4	Loading/unloading
- Section 5	Catering services (per individual contract)
- Section 6	Aircraft cleaning (including water and toilets)
- Section 7	Aircraft handling
- Section 8	Aircraft servicing
- Section 9	Aircraft line maintenance (per individual contract)
- Section 10	Accommodation and material (Separate agreement) (per individual contract)
- Section 11	Flight operations
- Section 13	Surface transport (Separate agreement)

AEROPORT DE PARIS is able to sell these services either at package rates, or package rates plus additional services, or on request.

To meet the needs of air carriers AEROPORT DE PARIS offers many alternative arrangements of airport handling services. This selection enabled us to adapt our ratemaking.

The detail of services offered and their rating can be obtained from each customer relations representative.

Your customer relations representatives

Michel RAGOT	OE.Z.V1 Head Office 329.98.34	Jules HAYAMME	OE.Z.V2 ORLY SUD 852.44.50

Their assistants

at ORLY

Dialène NAZARE	OE.Z.V1 ORLY SUD 884.42.71	Pierre CHEINEY	OE.Z.V2 ORLY SUD 884.42.59
		assisted by : Colette MARTIN	884.42.58

at C.D.G.

Bernard BACCHETA	OE.Z.V1 C.D.G. 862.13.98	Bernard BACCHETTA	OE.Z.V2 C.D.G. 862.13.98
assisted by Jacques PAIN	862.39.26	**assisted by** Jacques PAIN	862.39.26

Indeed, we have been unable to locate any published materials on the subject of comparing ground handling charges at international airports. The contents of this chapter are therefore based on: information gathered during interviews; a recent internal study conducted by the International Civil Aviation Association (ICAA) which was made available under certain conditions of confidentiality; and data provided by a major United States carrier, again under certain limitations on disclosure.

6.2. PROVISION OF GROUND HANDLING SERVICES

There are four possible sources for the provision of ground handling services to any particular airline at any particular airport.

a) The airline itself ("self-handling").

b) Another airline under an inter-airline agreement/contract.

c) A third-party agent under contract to the airline.

d) The Airport Authority involved.

(Under alternative d the Airport Authority may wish to have its own personnel perform the ground-handling tasks or it may sub-contract with a third-party agent for this purpose.)

Airlines have long insisted that under no circumstances should an airline, at any given major airport, be faced with a monopolistic environment with regard to ground handling services -- be that an Airport Authority monopoly or a monopoly by another airline or third-party agent. The United States Government supports this view and attempts to discourage such monopolistic practices through its international agreements on commercial aviation. The following excerpt from the 1980 Air Transport Agreement between the United States and Belgium is typical of the language used in so-called "liberal" agreements that the United States has reached in recent years:

"[Article 8]" Commercial Opportunities ... (3) Each designated airline may perform its own ground handling in the territory of the other Party ("self-handling") or, at its option, select among competing agents for such services. These rights shall be subject only to physical constraints resulting from considerations of safety. Where such considerations preclude self-handling, ground services shall be available on an equal basis to all airlines; charges shall be based on the costs of services provided; and such services shall be comparable to the kind and quality of services if self-handling were possible.

However, this view is obviously not shared universally by other States (or Airport Authorities) around the world. Ground handling is, in fact, one area where practices in the United States (and Canada) differ considerably from those elsewhere. With only a few exceptions (e.g. Tampa International Airport), most Airport Authorities in the United States do not become involved in any of the services listed in Table 6.1, except possibly for airport information services. By contrast, practically everywhere else, the Airport Authority -- or a contracting agent responsible to it -- assumes at least some of the sixteen functions associated with ground handling. This fact is demonstrated in Table 6.2 which covers 37 international airports overseas, including some of the most important ones outside the United States. While the information available is partially (i.e., for some airports) incomplete for four services (representational services, communications, handling documents/load control, and cargo/mail handling), it is nonetheless clear that, very often, many -- and sometimes all -- ground handling services are provided by Airport Authorities. Moreover, in many such cases these services are offered on an exclusive basis by the Airport Authority in question. In several instances (e.g. Austria, Germany, Italy, Spain, Yugoslavia), national or local law in fact stipulates that the right to offer some or all ground handling services is limited solely to these nationally-, regionally-, or locally-owned Authorities. (On the basis of a long-standing agreement, TWA is allowed to self-provide ground handling services in Italy.)

Table 6.2

GROUND HANDLING SERVICES AT INTERNATIONAL AIRPORTS

KEY TO TABLE 6.2 (X = indicates service offered by airport authority; * = information not available)

(1) Representational Services
(2) Messages & Communications
(3) Handling Documents, Load Control
(4) Passenger Handling at Airport
(5) Cargo/Mail Handling
(6) Airport Information Services
(7) Baggage Handling (Sorting Area)
(8) Loading/Unloading
(9) Catering Transport
(10) Interior Cleaning
(11) Toilet Service
(12) Water Service
(13) Passenger Transport (to aircraft)
(14) Starting
(15) Marshaling
(16) Parking

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Amsterdam, Netherlands	*	*	*		*	X							X		X	X
Athens, Greece	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Belgrade, Yugoslavia		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Berlin, West Germany	X	X	X	X	X	X	X	X			X	X		X	X	
Birmingham, U.K.	*	*	*	X	*	X	X	X							X	X
Budapest, Hungary	X		X	X	X	X	X	X	X	X	X	X	X			
Copenhagen, Denmark	X	X	X	X		X	X	X		X	X	X	X	X		
Dublin, Ireland	*	*	*			*	X					X				
Dubrovnik, Yugoslavia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Frankfurt, West Germany						X	X	X		X	X	X	X	X	X	X

Table 6.2, continued

KEY TO TABLE 6.2 (X = service offered by airport authority; * = information not available)

(1) Representational Services
(2) Messages & Communications
(3) Handling Documents, Load Control
(4) Passenger Handling at Airport
(5) Cargo/Mail Handling
(6) Airport Information Services
(7) Baggage Handling (Sorting Area)
(8) Loading/Unloading
(9) Catering Transport
(10) Interior Cleaning
(11) Toilet Service
(12) Water Service
(13) Passenger Transport (to aircraft)
(14) Starting
(15) Marshaling
(16) Parking

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hannover, West Germany					X	X	X	X		X	X	X	X		X	X
Hong Kong	*	*	*		*	X		X					X		X	X
Johannesburg, South Africa	*	*	*		*	X	X								X	X
Las Palmas, Spain	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lille, France	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Lisbon, Portugal	*	*	*		*	X								X	X	X
London/Gatwick, U.K.	*	*	*	X	*	X	X				X	X	X		X	X
London/Heathrow, U.K.	*	*	*	X	*	X	X				X	X	X		X	X
Luxembourg	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Manchester, U.K.	*	*	*	X	*	X	X	X	X		X	X	X	X	X	X
Melbourne, Australia	*	*	*		*	X									X	X
Metz, France	X	X	X	X		X	X	X	X	X	X	X		X		X
Milan, Italy	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X

Table 6.2, continued (X = service offered by airport authority; * = information not available)

KEY TO TABLE 6.2

(1) Representational Services
(2) Messages & Communications
(3) Handling Documents, Load Control
(4) Passenger Handling at Airport
(5) Cargo/Mail Handling
(6) Airport Information Services
(7) Baggage Handling (Sorting Area)
(8) Loading/Unloading
(9) Catering Transport
(10) Interior Cleaning
(11) Toilet Service
(12) Water Service
(13) Passenger Transport (to aircraft)
(14) Starting
(15) Marshaling
(16) Parking

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Munich, West Germany	*	*	*	X	*	X	X	X		X	X	X			X	X
Nuremberg, West Germany	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Oslo, Norway	*	*	*		*											
Paris, France	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Prague, Czechoslovakia	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Reims, France	X	X	X	X	X	X	X			X	X	X	X	X		
Rio de Janeiro, Brazil	*	*	*		*	X								X	X	X
Rome, Italy	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Salzburg, Austria	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Singapore	*	*	*		*	X						X				
Toulon, France	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Toulouse, France	X	X	X	X	X	X	X	X	X	X	X	X	X			X
Vienna, Austria	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Zagreb, Yugoslavia	X	X	X	X	X	X	X	X		X	X	X	X	X		

The ground handling tasks listed in Table 6.1 obviously impose varying levels of workload on the provider of these services. For the purpose of developing some general standards for comparing the costs of these services, the Economic Fees and Charges Working Group of ICAA has recently assigned "weights" to each one of the 16 tasks to reflect the relative workload imposed by each. These weights are shown in Table 6.3. These weights have been derived primarily on the basis of the number of airport personnel assigned to each one of the various tasks at a "significant sample" of ICAA member airports. It was argued that the number of personnel was the best-available proxy for "workload". While one may argue that this method of assigning weights is overly simple (and certainly cannot be relied upon to an accuracy of two decimal places), the results -- in terms of the relative significance assigned to the tasks -- do conform to one's intuition.

In an attempt to obtain at least some measure of confirmation that roughly-similar weights might apply to the various ground handling tasks in the United States, we used the data provided by a major U.S. airline on its ground handling costs. The U.S. cost data were classified into categories which did not exactly correspond to (and were more aggregated than) the 16 IATA-defined tasks of Table 6.1. However, by regrouping the IATA tasks in the manner shown in column (2) of Table 6.4, a correspondence between the U.S. and the ICAA data could be established. [The correspondence between station administration costs (U.S.) and representational and communications costs (Tasks 1 and 2 of IATA) is tenuous.] Unfortunately, cargo and mail handling costs were provided by the U.S. airline in terms of units ("costs per ton processed") which were incompatible with the units used by ICAA ("cargo/mail cost per flight processed"). Consequently, cargo and mail handling costs (Task 5) were excluded from the cost comparisons. Since, according to the

Table 6.3

WEIGHTS OF GROUND HANDLING TASKS AS ASSIGNED BY ICAA

A. Traffic Handling		
1.	Representational Services	0.25
2.	Messages and Communications	1.43
3.	Handling Documents and Load Control	5.17
4.	Passenger Handling at Airport	18.00
5.	Cargo and Mail Handling Services	20.31
6.	Airport Information Services*	--
B. Ramp Handling		
7.	Baggage Handling (at Baggage Sorting Area)	10.88
8.	Loading/Unloading of the Aircraft	25.57
9.	Catering Transport	5.06
10.	Interior Cleaning of the Aircraft	6.68
11.	Toilet Service	1.21
12.	Water Service	0.33
13.	Passenger Transport (to Aircraft)	1.55
14.	Starting Service	1.96
15.	Marshaling	1.05
16.	Parking Assistance	0.55
		100.00

* = "airport information services" included in Item 4, "passenger handling at airport".

Table 6.4

COMPARISON OF WEIGHTS ASSIGNED BY ICAA WITH THOSE IMPUTED FROM U.S. DATA. Total is 79.69% due to exclusion of cargo/mail handling (20.31%)

Cost Categories in U.S. Major Airline's Data (1)	Corresponding Tasks in IATA Classification (2)	% Weight Assigned by ICAA Working Group (3)	% Weight Imputed from U.S. Cost Data (4)
A. Station Administration	Representational Services Messages & Communications (Tasks 1 & 2)	1.68	4.72
B. Handling Documents and Load Control	Handling Documents and Load Control (Task 3)	5.17	2.72
C. Passenger Handling (in-	Passenger Handling Passenger Transport Airport Information Service (Tasks 4 & 6 & 13)	19.55	22.85
D. Baggage Handling and Loading/Unloading	Baggage Handling (Sorting Area) Loading/Unloading (Tasks 7 & 8)	36.45	31.88
E. Interior Cleaning (including toilet and water service)	Interior Cleaning Toilet Service Water Service (Tasks 9 & 10 & 11)	8.22	11.02
F. Starting and Marshalling and Ramp Services Administration	Starting Marshalling Parking (Tasks 12 & 13 & 14)	3.56	1.06
G. Catering Transport	Catering Transport	5.06	5.44

ICAA, the weight of Task 5 is 20.31%, the U.S. and ICAA data comparisons in Table 6.4 (and in Section 3) were performed with respect to 79.69% (=100 - 20.31) of the cost base. Columns (3) and (4) of Table 6.4 compare the weights imputed for the various ground handling tasks from the U.S. cost data (column 4) to the weights assigned by the ICAA Working Group. The U.S. weights were imputed from the handling costs for a B727-200, the only aircraft for which data were available for all six airports covered by the information provided by the U.S. airline (see also Section 3). The weights in column (4) are "normalized" to the total of 79.69% to assure comparability with the ICAA weights.

The similarity between the patterns exhibited by the two sets of weights in Table 6.4 is remarkable, given the facts that (i) the two sets of data on which the weights are based come from two completely-independent and distinct sources and (ii) the U.S. data are sparse and have been obtained from a single carrier. The most glaring differences exist in the weights associated with items A, B and F in Table 6.4. With respect to A, it has already been pointed out that the correspondence between the IATA-defined Tasks 1 and 2, on the one hand, and the U.S. "station administration costs", on the other, is a weak one. With respect to B, it should be noted that, because the U.S. airline's costs are associated primarily with domestic flights and because only its own flights are involved, it is to be expected that the cost of handling-document processing and load control would be lower than in the case of international flights by numerous diverse carriers -- which is the case with the ICAA weights. Finally, with respect to item F, the data provided by the U.S. carrier indicate a cost of only $8.60 per aircraft ramp hour for starting and marshaling services -- a surprisingly-low figure, which may be incorrect, due, possibly, to a misunderstanding by the carrier of our inquiry regarding this particular item.

Having thus established the credibility of the ICAA weights as well as the comparability of the two sets of data (at least for purposes of a preliminary analysis), we now proceed to estimate in Table 6.5 what percentage of the total ground handling services "workload" is provided by each of the 37 international overseas airports covered by Table 6.2. For instance, since Milan assumes responsibility for all 16 IATA-defined tasks except from catering transport (weight of 5.06% in Table 6.3), a score of 94.94% (=100-5.06) is assigned to Milan. A few comments are necessary at this point.

First, the percentages shown for the 14 airports denoted with an asterisk in Table 6.5 are only lower bounds. This is because, as noted earlier, our data for these airports were incomplete with regard to four of the tasks (1, 2, 3 and 5) specified in Table 6.1. Since these tasks have a total weight of 17.73% in Table 6.3, the percentages indicated for these 14 airports have a maximum value of 82.27%. Second, even with this bias, Table 6.5 indicates that, on the average, the 37 airport organizations surveyed provide 65.5% of the ground handling services, as measured by the ICAA weights. (On the other hand, this is obviously a biased sample of airports -- with a large representation of airports from continental European nations, which tend to provide an unusually-large fraction of ground handling services. A large standard deviation of 37.6% also underscores the fact that the percentages indicated in Table 6.5 tend to be "bunched" at the two extreme ends of the 0-100 range.)

A third -- and important -- observation is that Table 6.5 indicates what undoubtedly is the principal underlying reason for the large differences that typically exist between United States airports and (many) overseas airports with regard to the number of Airport Authority employees. Ground handling services are, for the most part, labor-intensive. For example, of the

Table 6.5

PERCENTAGE OF GROUND HANDLING SERVICES PROVIDED BY AIRPORT AUTHORITIES THEMSELVES

Amsterdam*	5.65	Manchester*	71.33
Athens	100.0	Melbourne*	4.10
Belgrade	99.75	Metz	77.09
Berlin	86.16	Milan	94.94
Birmingham*	61.11	Munich*	67.82
Budapest	95.01	Nuremberg	94.94
Copenhagen	73.03	Oslo*	0.0
Dublin*	2.83	Paris	94.94
Dubrovnik	100.0	Prague	98.95
Frankfurt	50.22	Reims	67.77
Hannover	68.13	Rio de Janeiro*	6.06
Hong Kong*	31.22	Rome	94.94
Johannesburg*	14.98	Salzburg	98.40
Las Palmas	100.0	Singapore*	2.83
Lille	98.79	Toulon	98.45
Lisbon*	6.06	Toulouse	98.95
London/Gatwick*	33.57	Vienna	98.40
London/Heathrow*	33.57	Zagreb	93.34
Luxembourg	100.0		

* = due to partial information, maximum is 82.27%.

approximately 3,200 employees of Milan's Airport Authority (S.E.A.) in 1982, about 2,250 or 70% were involved in ground handling tasks. (As indicated in Table 6.5, Milan offers 94.94% of all ground handling services according to the ICAA weighting scheme.) As a result, the number of employees of several large European Airport Authorities that provide extensive ground handling services is in the thousands, as the list below indicates:

Airport	Airport Authority Personnel (1983)
Frankfurt	6,600
Rome (2 airports)	6,070
Paris (3 airports)	4,940
London/Heathrow	4,400 (1,100 in security)
Milan (2 airports)	3,190
Dusseldorf	1,530
London/Gatwick	1,500 (350 in security)
Brussels	1,370
Amsterdam	1,350
Munich	1,320
Manchester	1,200

By contrast, the corresponding number of Airport Authority employees at U.S. airports, that often serve considerably more traffic than most of the airports listed above, rarely exceeds a few hundred.

6.3. GROUND HANDLING CHARGES AND COSTS

One can now utilize the aggregate percentages of total ground-handling services listed in Table 6.5 to "normalize" ground handling fees charged by different airports and compare these charges. For example, suppose that an airport providing 80% of all ground handling services charges $1,000 for providing these services for a B727 aircraft. One can then project that, for 100% of the services, the airport would have charged 1,000/(.80) = $1,250.

While this kind of simple extrapolation may not always be justified, it is adequate for purposes of a rough comparison of ground handling charges.

Table 6.6 presents exactly such a comparison of "normalized" ground handling charges for the 23 non-starred airports of Table 6.5. ("Normalizing" in this case means projecting to a base of 100% of ground handling services.) A condition imposed by the ICAA on the release of the information contained in Table 6.6 was that the individual airports associated with each row of the Table not be identified. For this reason they have been labeled as A-W.

The most striking feature of Table 6.6 is the extremely-wide range of the ground handling charges at the 23 airports surveyed. For example, the ratios between the highest and the lowest charges at the 23 airports for DC-9, B727, B707, A300, DC-10 and B747 aircraft are 4.57, 4.54, 4.91, 6.88, 4.81 and 5.13, respectively! The large variation in the levels of the ground handling charges is also indicated by the size of the standard deviations in Table 6.7, which also lists the average values of these charges at the 23 European airports surveyed.

A second important aspect of the data in Table 6.6 is emphasized by Table 6.8, which indicates, for each of the airports surveyed, the ratio of the ground handling charge for each type of aircraft to the charge for a B747 at that airport. For example, for Airport A, the ground handling charge for a DC-9 (based on 100% of ground handling services) is $274.2 (from Table 6.6), while the charge for a B747 is $2,348.4, i.e., the charge for a DC-9 amounts to 22% of the charge for a B747, as indicated in the first row of Table 6.8. It will be noted that the range of ratios in the first five columns of Table 6.8 is 0.13-0.33 for the DC-9, 0.18-0.41 for the B727, 0.22-0.61 for the B707, 0.40-0.80 for the A300 and 0.60-1.00 for the DC-10. Thus, different airports

Table 6.6

"NORMALIZED" GROUND-HANDLING CHARGES
AT 23 WEST EUROPEAN AIRPORTS
(IN U.S. $: 1981 EXCHANGE RATES)

		DC.9	B.727	B.707	A.300	DC.10	B.747
AIRPORT	A	274,2	389,3	463,9	604,5	987,5	1248,4
"	B	306,7	374,9	438,8	766,9	—	—
"	C	322,1	448,3	542,6	990,6	1768,4	2460,8
"	D	329,8	468,3	558,0	727,1	1187,8	1501,6
"	E	375,0	375,0	512,1	712,0	1287,0	1718,9
"	F	474,0	673,0	802,0	1045,0	1708,0	2160,0
"	G	480,4	480,4	561,6	937,1	1598,2	2171,4
"	H	507,8	721,0	859,2	1119,5	1828,7	2311,9
"	I	519,4	678,2	826,5	972,4	1215,5	1701,7
"	J	523,3	624,6	702,6	1033,2	—	—
"	K	543,7	657,4	1290,4	1558,1	2461,1	3063,1
"	L	563,5	811,0	912,6	2169,3	2477,3	3155,8
"	M	569,8	841,9	1180,1	1517,9	1517,9	2015,9
"	N	570,1	745,9	1158,1	1158,1	1796,7	2251,9
"	O	591,6	874,0	1225,2	1575,8	2092,5	2935,4
"	P	642,8	856,8	964,6	1713,7	1741,5	2163,2
"	Q	651,2	755,4	1432,7	1432,7	1788,7	2448,7
"	R	752,0	970,4	1421,9	1811,3	2305,0	2305,0
"	S	786,4	1143,9	1544,6	1876,8	2475.4	4024,3
"	T	882,1	1071,1	1713,8	1713,8	2351,4	3316,7
"	U	903,5	1369,1	1596,8	3611,7	4083,6	4913,4
"	V	1092,3	1283,5	2155,3	2583,8	3767,5	4518,0
"	W	1251,9	1700,8	2069,7	4159,5	4749,5	6398,4

Table 6.7

STATISTICS FOR GROUND HANDLING CHARGES AT EUROPEAN AIRPORTS

Aircraft Type	Average Ground Handling Charge*	Standard Deviation of Ground Handling Charge
DC-9	$605	$248
B727	796	341
B707	1084	507
A300	1556	892
DC-10	2152	974
B747	2799	1228

* For the 23 airports in Table 6.6.

Table 6.8

RATIOS OF GROUND HANDLING CHARGES (B747=1.00)
AT THE 23 WEST EUROPEAN AIRPORTS

		DC.9	B.727	B.707	A.300	DC.10	B.747
AIRPORT	A	0,22	0,31	0,37	0,48	0,79	1,00
"	B	–	–	–	–	–	–
"	C	0,13	0,18	0,22	0,40	0,71	1,00
"	D	0,22	0,31	0,37	0,48	0,79	1,00
"	E	0,22	0,22	0,30	0,42	0,75	1,00
"	F	0,22	0,31	0,37	0,48	0,79	1,00
"	G	0,22	0,22	0,25	0,43	0,73	1,00
"	H	0,22	0,31	0,37	0,48	0,79	1,00
"	I	0,30	0,39	0,48	0,56	0,70	1,00
"	J	–	–	–	–	–	–
"	K	0,18	0,22	0,42	0,51	0,81	1,00
"	L	0,18	0,26	0,29	0,69	0,79	1,00
"	M	0,28	0,41	0,58	0,74	0,74	1,00
"	N	0,25	0,33	0,51	0,51	0,79	1,00
"	O	0,20	0,30	0,41	0,53	0,71	1,00
"	P	0,30	0,40	0,45	0,80	0,81	1,00
"	Q	0,26	0,30	0,57	0,57	0,71	1,00
"	R	0,33	0,42	0,61	0,78	1,00	1,00
"	S	0,19	0,27	0,37	0,45	0,60	1,00
"	T	0,26	0,31	0,50	0,50	0,69	1,00
"	U	0,18	0,27	0,32	0,72	0,81	1,00
"	V	0,24	0,28	0,47	0,57	0,83	1,00
"	W	0,19	0,26	0,31	0,63	0,72	1,00

seem to treat the various types of aircraft in dramatically-different ways in assessing their ground handling charges. For instance, Airport C accords much more favorable treatment to DC-9s and B727s (relative to the B747) than Airport R.

One can only speculate at this stage as to the reasons for such variations, as shown in Table 6.8. For example, it is possible that an airport's mechanical equipment for loading/unloading of aircraft might be especially well-suited for one particular type X of aircraft. This would mean that aircraft X would be processed more efficiently than other types of aircraft at the airport in question and thus might be charged at a lower (relatively speaking) rate than the others. It is also conceivable, however, that an airport might be tempted to accord favorable treatment with respect to ground handling charges to, say, those types of aircraft most used by a State's national airline -- or to exhibit other biases of this type in its charging pattern. We have noticed some indications of such biases in the case of the 23 airports covered by Tables 6.6 and 6.8. It would be interesting to investigate this question more systematically in the future.

Turning next to the data for ground handling costs of the major U.S. carrier, the following background information can be offered: The information covers seven airports. Of those, Airports A and B are major West and East Coast airports, respectively, Airport C is a large hub in the central part of the country, whereas Airports D, E, F and G are more secondary airports for this airline serving a considerably smaller number of its flights than Airports A, B and especially C, do.

As already indicated in the previous section (see Table 6.4), the data provided were not arranged under quite the same classification scheme as the one used by ICAA and as a result, some re-arrangement and re-processing of the data was necessary. In addition, in the cases of passenger handling and of airport information services, the data were in terms of "costs per passenger handled" as opposed to "costs per aircraft departure", which is the measure that ICAA used. In order to make the two measures compatible, it was necessary to use a standard seating capacity for each type of aircraft, as shown in Table 6.9, as well as to assume a typical load factor for the seven airports. The load factor is necessary in order to convert the U.S. airline's cost data into "costs for a typical flight" of each aircraft type and assure comparability with the ICAA data. The system-wide load factor used (60%) was assumed to apply equally well to all seven airports under consideration. The ground handling costs thus estimated were assumed to represent 79.69% of all costs for ground handling services (see Table 6.4) and were adjusted to 100% (by dividing by .7969) and listed in Table 6.9.

Although Table 6.9 is sparse and based on data from only a single U.S. carrier, it still provides some interesting preliminary indications regarding the magnitude of airport ground handling costs in Europe and the United States:

(a) The costs for U.S. airports shown in Table 6.9 are of the same order of magnitude as the costs for the corresponding or similar types of aircraft shown in Table 6.6 for Europe.

(b) It is impossible to infer that self-provision of ground handling services by the U.S. carrier resulted in costs lower than what the European airports surveyed are charging for services that these airports provide. For example, the average cost at the seven U.S. airports for the handling of a B727-200 is estimated, from Table 6.9, to be $1,134. This is about 42% higher than the average charge at the 23 European airports ($796 from Table 6.7). Even if one could adjust the figures for such factors as the lower labor costs

Table 6.9

GROUND HANDLING COSTS OF A U.S. AIRLINE AT VARIOUS U.S. AIRPORTS

	Aircraft (# of Seats)				
	B727-200 (145)	Super-80 (150)	B-767 (220)	DC-10 (280)	B-747 (400)
Airport					
A	$1,298	--	--	2,693	4,448
B	1,768	--	--	3,607	6,026
C	971	1,081	1,807	2,025	3,065
D	934	1,121	--	--	--
E	572	--	--	--	--
F	1,307	--	--	--	--
G	1,087	-	--	--	--

that prevail in some of the European nations involved (relative to the United States), it is doubtful that, at least, this set of data could demonstrate any significant cost advantage for the United States. Note also that the average ground handling costs for DC-10s and B747s (only 3 data points, in each case) are $2,775 and $4,513, respectively, for the U.S. carrier (from Table 6.9) or about 29% and 61%, respectively, higher than the corresponding averages in the ICAA survey (see Table 6.7).

(c) As in the case of the European airports in the ICAA survey, large differences among ground handling costs at different U.S. airports can be noted. For example, the ratio between B727-200 handling costs at the most (B) and least (E) "expensive" airports in the U.S. sample is 3.09. This ratio is all the more remarkable when one considers the fact that these are costs to one and the same airline. As another illustration of the same point, we note that the U.S. carrier estimated the average cost of passenger handling and airport information services (Item C in Table 6.4) as $4.21 per passenger in Airport B, $1.50 in Airport A and $0.53 in Airport C!

(d) There are a couple of interesting analogies between Tables 6.6 and 6.9. The most "expensive" airport in the U.S. sample (Airport B) exhibits a pattern and magnitude of ground handling costs (for the three aircraft types shown) which are quite similar to those for Airport W in Table 6.6, the most "expensive" airport in the ICAA survey. It turns out that Airport W plays a role in Europe's airport system (and serves types of traffic) similar to the role and traffic of Airport B in the United States. Airport W is also located in a country where labor and equipment costs are similar to those in the United States. Along the same lines, there are strong similarities between the costs and charges at Airport C in the United States and Airport R in Europe. The latter turns out to be the main hub of a major national European airline, with a fleet composition very similar to that of the U.S. carrier that uses Airport C as its hub. While such similarities may be purely coincidental, they also indicate that similar forces may be at work in determining the costs of ground handling services on both sides of the Atlantic.

6.4 SUMMARY AND CONCLUSIONS

This chapter reviewed briefly partial information on ground handling charges in Europe and the United States. While the material presented is clearly very preliminary, it is-to our knowledge-the first analysis on the subject that has appeared in the public domain and, if nothing else, serves to underline several important points as well as raise interesting questions for further research.

a. There exists little guidance from ICAO or other international avaiation organizations on ground handling services and charges. Information on ground handling is also difficult to obtain. Efforts to rectify this state of affairs are highly desirable because of the importance of ground handling services and costs to airport users.

b. There are wide variations among international airports with respect to the provision of ground-handling services by airport authorities. At one extreme, practically all airports in the United States rely on the airlines and on thrid-party agents to provide such services. At the opposite end, many airport authorities in Europe and elsewhere provide all or most ground handling services to users by using airport-authority personnel (or in some cases personnel of agents who are contracted directly to the airport authority).

c. The provision of ground handling services is a labor-intensive activity. The differences noted under item b above between European and United States airports are probably the single major explanatory factor for the disparities that exist in the number of personnel directly employed by airport authorities in the two continents. Typically the Airport Authority at a major European international airport employs a few thousand individuals whereas the number of employees at a United States counterpart usually amounts to only a few hundred.

d. The costs to airport users of ground handling services are large in absolute terms as well as in relation to other aeronautical charges paid at international airports.

e. The costs associated with the various types of ground handling services (traffic handling, ramp handling and sub-categories) seem - at least from the limited information available from the United States - to be similarly distributed on both sides of the Atlantic.

f. The costs of ground handling services for each given aircraft type vary widely from airport to airport in both Europe and the United States. The differences, if anything, seem even larger than the airport-to-airport differences observed in earlier chapters with respect to other types of aeronautical charges. In addition, there are major differences from airport to airport in the relative amounts that different types of aircraft are charged for ground handling.

g. On the basis of information available here, it is impossible to infer that self-provision of ground handling services by U.S. carriers results in costs lower than those at European airports where these services are often provided by the airport authorities themselves. A number of similarities were also observed between ground-handling cost patterns at European and United States airports (see Section 3). It is impossible, however, to comment on the true significance of these observations due to the sparsity of the available data from the United States. Further future research on these and similar observations would be highly desirable.

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STATEMENTS BY THE COUNCIL TO CONTRACTING STATES ON CHARGES FOR AIRPORTS AND ROUTE AIR NAVIGATION FACILITIES

INTRODUCTION

1. The two Statements which follow set forth the recommendations and conclusions of the Council which result from ICAO's continuing study of charges in relation to the economic situation of airports and route facilities provided for international civil aviation The Statements take into account the recommendations made in this field by the Conference on Airport and Route Facility Economics (CARFE), held in Montreal from 19 May to 5 June 1981 (Doc 9343), and thus supersede the preceding Statements which were prepared by the Council, and published as Doc 9082-C/1015, following the 1973 Conference on the Economics of Route Air Navigation Facilities and Airports (ERFA).

2. The present Statements were adopted by the Council on 27 November 1981, at the Ninth Meeting of its 104th Session, and are intended for the guidance of Contracting States.

I. STATEMENT BY THE COUNCIL TO CONTRACTING STATES ON AIRPORT CHARGES

General economic situation of international airports in relation to that of international air carriers

3. Since the last review in 1973 of the Council's recommendations on the subject of charges for aeronautical facilities provided for international civil aviation, the financial position of the scheduled airlines as a whole has been unsteady, their operating result fluctuating between minus one per cent and plus five per cent of revenues over the period 1973 to 1980 Revenues and expenses have been increasing rapidly, and, taking into account the situation regarding fuel prices, inflation and re-equipment needs, the outlook is for the economic situation of the air carriers to remain delicate in the foreseeable future.

4. Whereas many busy airports have reached the point where their revenues exceed their expenses, many others continue to make losses, particularly those with under-utilized capacity. Traffic growth over the long term has improved airport revenues, but it has also taxed existing facilities at many airports, particularly at peak periods. Alleviation of this situation has involved large additional costs, both in extensions to terminal buildings and related facilities in order to maintain the rapid flow of passengers and freight, and in additions to operational facilities (e g runways, taxiways, aprons) to accommodate the increasing volume of movements and the larger aircraft in service

5. Airports have also been affected by worldwide inflation and have had to cope with certain additional costs, including the costs of meeting greatly increased security requirements and, for certain airports, the cost of adopting noise alleviation or prevention measures. At the same time, reduced rates of traffic growth have resulted in reduced revenue growth.

6. Under these circumstances many airport authorities have found it necessary to increase their charges and to further develop revenues from non-aeronautical sources The Council, recognizing that users face restrictions with regard to their choice of particular airports, recommends that caution be exercised when attempting to compensate for shortfalls in revenue during periods of economic difficulty and that account be taken of the effects of increased charges on air carriers which may need to adjust their tariffs to deal with increases in cost arising from higher charges

7. The Council considers that there should be a balance between the respective interests of airports and airlines, in view of the importance of air transport in fostering economic, cultural and social interchanges between States. This applies particularly during periods of economic difficulty The Council therefore recommends that States should encourage a greater level of co-operation between airports and air carriers, to ensure that economic difficulties facing both of them are shared in a reasonable manner.

8. The economic situation of some airports in developing countries is particularly unsatisfactory Although traffic is increasing, these airports are still greatly under-utilized and revenues are far from covering even the cost of maintenance and operation The provision of capital for development constitutes a further problem, and difficulties are also experienced in finding qualified personnel The Council will therefore continue to take appropriate action for obtaining more assistance for developing States in planning and financing airport facilities.

9. The broader economic impact of international airports is a particular asoect of their operation which continues to deserve close attention. Airports by virtue of their function and location have effects extending beyond the users they directly serve, and the Council considers that in contemplating the establishment and development of such facilities Contracting States should carefully weigh their advantages and disadvantages from a cost-benefit standpoint. for example,

noise may be considered a disadvantage while, on the other hand, industrial development, transportation and communication may be considered as advantages. National policies in the matter of reducing or eliminating disadvantages will vary, but governments, when contemplating action in any particular situation, should however recognize that the responsibility for remedies does not necessarily fall solely on any one of the parties involved.

10 The Council will keep the subject of the economic situation of airports under review and make reports to Contracting States at appropriate intervals, assessing changes in the situation and forecasting developments in the foreseeable future.

The cost basis for airport charges

11. As a general principle it is desirable, where an airport is provided for international use, that the users shall ultimately bear their full and fair share of the cost of providing the airport. It is therefore important that airports maintain accounts which provide information which is adequate for the needs of both airports and users and that the facilities and services related to airport charges be identified as precisely as possible. In computing and allocating the total cost to be met by charges on international air services, the list in Appendix 1 may in general serve as a guide to the facilities and services to be taken into account. Airports should maintain accounts that provide a satisfactory basis for determining and allocating the costs to be recovered, should publish their financial statements on a regular basis and should provide adequate financial information to users in consultations The guidance on accounting contained in the ICAO Airport Planning Manual (Doc 9184 Part I) may be found useful in this general context although there are other approaches to this problem.

12. In determining the cost basis for airport charges the following principles should be applied:

(i) The cost to be shared is the full economic cost to the community of providing the airport and its essential ancillary services, including appropriate amounts for interest on capital investment and depreciation of assets, as well as the cost of maintenance and operation and management and administration expenses, but allowing for all revenues, aeronautical or non-aeronautical, accruing from the operation of the airport to its operators

(ii) In general aircraft operators and other airport users should not be charged for facilities and services they do not use, other than those provided for and implemented under the Regional Plan.

(iii) Only the cost of those facilities and services in general use by international air services should be included and the cost of facilities or premises exclusively leased or occupied and charged for separately should be excluded.

(iv) An allocation of costs should be considered in respect of space or facilities utilized by government authorities.

(v) The proportion of costs allocable to various categories of users, including State aircraft, should be determined on an equitable basis, so that no users shall be burdened with costs not properly allocable to them according to sound accounting principles.

(vi) Costs related to the provision of approach and aerodrome control should be separately identified.

(vii) Under favourable circumstances airports may produce sufficient revenues to exceed by a reasonable margin all direct and indirect costs (including general administration, etc.) and so provide for retirement of debt and for reserves for future capital improvements

(viii) The users' capacity to pay should not be taken into account until all costs are fully assessed and distributed on an objective basis. At that stage the contributing capability of States and communities concerned should be taken into consideration, it being understood that any State or charging authority may recover less than its full costs in recognition of local, regional, or national benefits received.

Airport charging systems

13 Charging systems at international airports should be chosen in accordance with the following principles

(i) Any charging system should, so far as possible, be simple and suitable for general application at international airports

(ii) Charges should not be imposed in such a way as to discourage the use of facilities and services necessary for safety

(iii) The charges must be non-discriminatory both between foreign users and those having the nationality of the State of the airport and engaged in similar international operations, and between two or more foreign users

(iv) Where any preferential charges, special rebates, or other kinds of reduction in the charges normally payable in respect of airport facilities are extended to particular categories of users, governments should ensure, so far as practicable, that any resultant under-recovery of costs properly allocable to the users concerned is not shouldered on to other users.

14. The Council recommends that governments and airport authorities consider inclusion of the following factors when establishing airport charging methods at international airports

(i) Landing charges should be based on the weight formula, using the maximum permissible take-off weight as indicated in the certificate of airworthiness (or other prescribed document) as the basis for assessment

(ii) The landing charge scale should be based on a constant rate per 1 000 kilogrammes or pounds in weight, but the rate may be varied at a certain level or levels of weight if considered necessary.

(iii) Where charges for approach and aerodrome control are levied as part of the landing fee or separately, they could take aircraft weight into account but less than in direct proportion

(iv) No differentiation in rates should be applied for international flights because of the stage length flown

(v) A single charge should be applied for costs of as many as possible of airport-provided facilities and services for normal landing and take-off of aircraft (generally excluding hangars and certain terminal-building and other facilities as are normally handled by leases or other usual commercial practices).

(vi) Where restrictions on aircraft payload are imposed by airport limitations, consideration should be given locally to adjusting the landing charge indicated by the weight scale in cases where the restrictions are of a severe and long-lasting nature.

(vii) The period of free parking time for aircraft immediately following landing should be determined locally by considering aircraft scheduling, space availability and other pertinent factors.

(viii) For the determination of charges associated with use of parking, hangar and long-term storage of aircraft, maximum permissible take-off weight and/or aircraft dimensions (area occupied) should be used so far as possible as the basis

(ix) Where charges are levied by different authorities at an airport, they should, so far as possible, be consolidated into a single charge or a very small number of different charges, the combined revenues being distributed among the authorities concerned in a suitable way.

(x) The ordinary landing charge should cover the use of lights and special radio aids for landing where these are required, since it is in the interest of safety that aircraft operators should not be discouraged from utilizing aids by the imposition of separate charges for their use. If separate charges are made for facilities of this kind, they should not be levied on the basis of optional use but should be uniformly imposed on all landings occurring during periods established by the airport operators.

(xi) Maximum flexibility should be maintained in the application of all charging methods to permit introduction of improved techniques as they are developed.

(xii) Airport charges levied on international general aviation, although needing to respect Article 15 of the Chicago Convention, should be assessed in a reasonable manner, having regard to the cost of the facilities needed and used and the goal of encouraging the growth of international general aviation.

Passenger-service charges

15. The Council reaffirms that passenger-service charges are not objectionable in principle and recognizes that the revenue accrued from such charges is essential to the economy of a significant number of airports. There are however practical objections to the collection of passenger-service charges directly from the passenger, especially at large airports, and the difficulties associated with that mode of collection will become more and more acute with the continuing growth of passenger traffic and the increasing number of high-capacity aircraft operated, especially at busy terminal buildings during peak hours. Methods to alleviate these difficulties have been found and are implemented at a number of airports, and the Council considers that these could serve as useful guides to other airports experiencing similar difficulties. The Council also emphasizes the need for consultations between airport authorities and airlines at the local level, with a view to alleviating collection problems.

Security charges

16. The Council notes that States are responsible for ensuring the implementation of adequate security measures at airports pursuant to the provisions of Annex 17 and that they may delegate the task of providing individual security functions to such agencies as airport authorities, airlines and local police. The Council also notes that States may determine in which circumstances and the extent to which the costs involved in providing security facilities and services should be borne by the State, the airport authorities or other responsible agencies. With reference to the recovery of security costs from the users, the Council recommends that the following general principles be applied:

(i) Consultations should take place before any security costs are to be assumed by airports, airlines or other entities.

(ii) The authorities concerned may recover the costs of security measures at airports from the users in a fair and equitable manner, subject to consultation.

(iii) Any charges or transfers of security costs should be directly related to the costs of providing the security services concerned and should be designed to recover no more than the relevant costs involved.

(iv) No discrimination should be exercised between the various categories of users when charging for the level of security provided Additional costs incurred for extra levels of security provided regularly on request to certain users may also be charged to these users.

(v) When the costs of security at airports are recovered through charges the method used should be discretionary, but such charges should be based either on the number of passengers or on aircraft weight, or a combination of both factors. Security costs allocable to airport tenants may be recovered through rentals or other charges.

(vi) Charges may be levied either as additions to other existing charges or in the form of separate charges but should be subject to separate accounting and appropriate explanation.

Noise-related charges

17. The Council recognizes that although reductions are being achieved in aircraft noise at source, many airports will need to continue the application of noise alleviation or prevention measures The Council considers that the costs incurred in implementing such measures may, at the discretion of States, be attributed to airports and recovered from the users and that States have the flexibility to decide on the method of cost recovery and charging to be used in the light of local circumstances In the event that noise-related charges are to be levied the Council recommends that consultations should take place on any items of expenditure to be recovered from users and that the following principles be applied

(i) Noise-related charges should be levied only at airports experiencing noise problems and should be designed to recover no more than the costs applied to their alleviation or prevention

(ii) Any noise-related charges should be associated with the landing fee, possibly by means of surcharges or rebates, and should take into account the noise certification provisions of Annex 16 in respect of aircraft noise levels

(iii) Noise-related charges should be non-discriminatory between users and not be established at such levels as to be prohibitively high for the operation of certain aircraft.

Consultation with users regarding charges and airport planning

18. The Council recognizes the desirability of consultation with airport users before significant changes in charging systems or levels of charges are introduced, it being understood that the purpose of consultation is to ensure that the provider gives consideration to the views of users and the effect the charges will have on them, that consultation implies discussions between users and providers in an effort to reach general agreement on any proposed charges; and that, failing such agreement, airport authorities would continue to be free to impose the charges concerned. It is not possible to lay down a specific procedure for consultations of this kind owing to the diversity in the administrative, financial and legal frameworks within which airports function, but the Council recommends that:

(i) when any significant revision of charges or imposition of new charges is contemplated by an airport operator or other competent authority, appropriate prior notice should, so far as possible, be given 4 to 6 months in advance to the principal users, either directly or through their representative bodies in accordance with the regulations applicable in each State.

(ii) in any such revision of charges or imposition of new charges the airport users should, so far as is possible, be given the opportunity to submit their views to and consult with the airport operator or competent authority For this purpose the airport users should be provided with adequate financial information.

(iii) reasonable advance notice of the final decision on any revision of charges or imposition of new charges should be given to the airport users.

19. The Council furthermore considers it desirable in the light of the enormous and ever-increasing cost of new airports and major developments at existing airports that the regular users or their representative organizations be consulted from the beginning of such projects. Equally, in order that airport authorities may better plan their future financial requirements, airport users, particularly airlines, should for their part provide advance planning data to individual airport

authorities on a 5 to 10-year forecast basis relating to future types, characteristics, and numbers of aircraft expected to be used, the anticipated growth of passengers and cargo to be handled; the special facilities which the airport users desire; and other relevant matters. Such planning could best be accomplished by two-way discussions between airports and airlines, either directly or through their respective representative organizations.

Development of revenues from concessions, rental of premises and "free zones"

20. The Council recognizes the continuing importance to airports of income derived from such sources as concessions, rental of premises, and "free zones". The Council recommends that, with the exception of concessions that are directly associated with the operation of air transport services, such as fuel, in-flight catering and ground handling, the full development of revenues of this kind be encouraged having regard to the need for moderation in prices to the public, the requirements of passengers, and the need for terminal efficiency. All possibilities for developing airport concession revenues should be studied and ICAO should be kept informed of practices and conclusions in this regard so that the benefit of experience may be made available to all.

Fuel "throughput" charges

21. The Council recommends that where fuel "throughput" charges are imposed they should be recognized by airport authorities as being concession charges of an aeronautical nature and that fuel concessionaires should not add them automatically to the price of fuel to aircraft operators, although they may properly include them as a component of their costs in negotiating fuel supply prices with aircraft operators. The level of fuel "throughput" charges may reflect the value of the concessions granted to fuel suppliers and should be related to the cost of the facilities provided, if any. The Council also recommends that any such charges where imposed should be assessed by airport operators in such a manner as to avoid discriminatory effects, either direct or indirect, for both fuel suppliers and aircraft operators and to avoid their becoming an obstacle to the progress of civil aviation.

II. STATEMENT BY THE COUNCIL TO CONTRACTING STATES ON CHARGES FOR ROUTE AIR NAVIGATION FACILITIES

General economic situation of international route air navigation facilities in relation to that of international air carriers

22. The global costs of providing route air navigation facilities and services for international civil aviation have continued to increase rapidly in recent years However the level of cost recovery is now greater than it was in 1971 This improved level of cost recovery is the result of the widespread introduction of route facility charges and increases in already existing charges, as States endeavoured to narrow the gap between revenues and expenses.

23 Since the economic situation of the air carriers is likely to continue to be delicate, States should exercise caution in their general policy on charges for route air navigation facilities and take into consideration the effect on the air carriers, which may need to adjust their tariffs to deal with increased costs arising from new or higher charges The Council considers that a balance should be maintained between the respective interests of route facility providers and airlines, and therefore recommends that States should encourage a greater level of co-operation between them

24 The problems involved in providing and maintaining the facilities required by Regional Plans are particularly serious for the developing countries, principal among these being the limited financial resources available for economic development generally; the higher priority assigned to other sectors of the economy whose needs are considered more urgent, and the high cost of obtaining equipment and operating personnel from other countries. The Council will continue to take appropriate action for obtaining more assistance for developing countries in planning and financing en-route facilities.

25 The Council will keep the whole subject of the economic situation of route facilities under review and will make reports to Contracting States at appropriate intervals, assessing changes in the situation and forecasting developments in the foreseeable future.

The cost basis for route facility charges

26 As a general principle, where route air navigation facilities or services are provided for international use, the providers may require the users to pay their share of the related costs, but international civil aviation should not be asked to meet costs which are not properly allocable to it The Council therefore encourages States to maintain accounts for the route facilities and services they provide in a manner which ensures that route facility charges levied on international civil aviation are properly cost based.

27. The Council considers that an equitable cost recovery system could proceed from an accounting of total route facility costs incurred on behalf of aeronautical users, to an allocation of these costs among categories of users and finally to the development of a charging or pricing policy system. In computing the total costs to be paid for by charges on international air services, the list in Appendix 2 may serve as a general guide to the facilities and services to be taken into account The guidance on cost accounting provided in the ICAO Manual on Route Air Navigation Facility Economics (Doc 9161) may also be found useful in this context.

28. When establishing the cost basis for route facility charges, the following principles should be applied.

(i) The costs should be the full economic cost of providing the route facilities and services, including interest, depreciation and administrative costs.

(ii) The costs to be taken into account should be those assessed in relation to the facilities and services provided for and implemented under the ICAO Regional Plan, supplemented where necessary pursuant to the recommendations made by the relevant ICAO Regional Air Navigation Meeting and as approved by the Council. Any other facilities and services, unless provided at the request of operators, should be excluded, as should the cost of facilities or services provided on contract or by the carriers themselves, as well as any excessive construction, operation, or maintenance expenditures.

29 Governments may also choose to recover less than full costs in recognition of local, regional, or national benefits. It is for each State to decide for itself whether, when, and at what level any such charges should be imposed, and it is recognized that States in developing regions of the world, where financing the installation and maintenance of route facilities is difficult, are particularly justified in asking the international airlines to contribute through user charges towards bearing a fair share of the cost of the facilities The approach towards the recovery of full costs should, however, be a gradual progression.

Allocation of route facility costs among aeronautical users

30. The allocation of route facility costs among aeronautical users should be carried out in a manner equitable to all users. The proportions of cost attributable to international civil aviation and other utilization of the facilities and services (including domestic civil aviation, State or other exempted aircraft, non-aeronautical users) should be determined in such a way as to ensure that no users are burdened with costs not properly allocable to them according to sound accounting principles. The Council recommends that States should·

(i) acquire basic utilization data in respect of route air navigation facilities and services, including the number of flights by category of user (i.e. air transport, general aviation, and other) in both domestic and international operations, and other data such as the distance flown and aircraft type or weight, where such information is relevant to the allocation of costs and the cost recovery system.

(ii) take into account the guidance on cost allocation contained in the ICAO Manual on Route Air Navigation Facility Economics (Doc 9161),* although they may use any accounting approach they consider meets their particular requirements.

31 Among alternative approaches to the allocation of the costs of route facilities and services between the different categories of users, the Council considers that one equitable method of allocating these costs among categories of users is for such costs to be allocated using the same rules as those used for the calculation of route charges, applying for both operations the same criteria to a given category of aircraft (i.e. allocation of costs and calculation of the charge per flight, or per flight weighted by distance, or per flight weighted by distance and by weight).

Route facility charging systems

32. States should ensure that systems used for charging for route air navigation facilities and services and any new or revised charges are established in accordance with the following principles.

(i) Any charging system should, so far as possible, be simple, equitable and suitable for general application at least on a regional basis. The administrative cost of collecting charges should not exceed a reasonable proportion of the charges collected.

* The guidance contained in Doc 9161 (1976 edition) is to be revised and further developed, with the intention of also including alternative approaches to the allocation of the cost of route facilities and services between the different categories of users.

(ii) The charges should not be imposed in such a way as to discourage the use of facilities and services necessary for safety or the introduction of new aids and techniques. The facilities or services provided for in the ICAO Regional Plan or in any recommendations of the relevant ICAO Regional Air Navigation Meeting as are approved by the Council, are, however, considered to be necessary for general safety and efficiency.

(iii) The system of charges must be non-discriminatory both between foreign users and those having the nationality of the State or States providing the route air navigation facilities and services and engaged in similar international operations, and between two or more foreign users.

(iv) Where any preferential charges, special rebates, or other kinds of reduction in charges normally payable in respect of route facilities and services are extended to particular categories of users, Contracting States should ensure, so far as practicable, that any resultant under-recovery of costs properly allocable to the users concerned is not shouldered on to other users.

(v) Any charging system should take into account the cost of providing route air navigation facilities and services and the effectiveness of the services rendered. The charging system should be introduced in such fashion as to take account of the economic and financial situation of the users directly affected, on the one hand, and that of the provider State or States, on the other.

(vi) Charges should be levied in such a way that no facility or service is charged for twice with respect to the same utilization. In cases where certain facilities or services have a dual utilization (e g. at the airport and en route), their cost should be equitably distributed in the charges (for airport or route facilities and services).

(vii) The charges levied on international general aviation, although needing to respect Article 15 of the Chicago Convention, should be assessed in a reasonable manner, having regard to the cost of the facilities needed and used and the goal of encouraging the growth of international general aviation.

33. The charge for route air navigation facilities and services should, so far as possible, be a single charge per flight; that is to say, it should constitute a single charge for all route facilities and services provided by a State or group of States for the airspace to which the charge applies. The charge should be based essentially on.

(i) the distance flown within a defined area;

(ii) the aircraft weight.

The element of distance flown, taken as one of the acceptable measures of the service rendered, should be applied by means of a distance scale using great circle distances or other commonly agreed distances. The element of aircraft weight should be applied by means of a weight scale using broad intervals which should be standardized so far as possible. This weight scale should take into account, less than proportionately, the relative productive capacities of the different aircraft types concerned.

34. Without prejudice to the guidelines provided above, which constitute a charging system for general application, the Council recognizes however that:

(i) the characteristics of a given airspace will determine the most appropriate charging method for that airspace, having regard to the type of traffic, the distances flown, and the characteristics of the aircraft in that airspace;

(ii) when the distance flown and/or the aircraft types are reasonably homogeneous, the distance and weight elements may be separately or jointly neglected as the case may be.

Charges for route air navigation facilities and services used by aircraft when not over the provider State

35. The providers of route air navigation facilities and services for international use may require all users to pay their share of the cost of providing them regardless of whether or not the utilization takes place over the territory of the provider State. Accordingly, wherever a State has accepted the responsibility for providing route facilities over another State, over the high seas or in an airspace of undetermined sovereignty (in accordance with the provisions of Annex 11 and Regional Air Navigation Agreements approved by the Council), the State concerned may levy charges on all users for the facilities and services provided.

36. The collection of route facility charges in cases where the aircraft does not fly over the provider State poses difficult and complex problems. It is for the States to find the appropriate kind of machinery on a bilateral or regional basis for meetings between provider States and those of the users, aiming to reach as much agreement as possible concerning the facilities and services provided, the charges to be levied and the methods of collecting these charges. A State may delegate to another State or to an organization the authority to levy such charges on its behalf.

Consultation with users regarding charges and route facility planning

37. The principles enunciated with respect to consultation over changes in airport charges in paragraph 18 are applicable also to changes in route facility charges, but in the latter case there may also exist a need for more specific consultation between providers and airlines since route facilities are generally provided by governments and it will therefore be easier to obtain a consultative opinion concerning their charges than in the case of airport charges where a number of conflicting interests may arise.

38. On the understanding that consultation implies no more than discussions between users and providers in an attempt to reach general agreement on any proposed charges, and that failing such agreement governments would continue to be free to impose the charges concerned, the Council therefore recommends that:

(i) when any significant review of existing charges or the imposition of new charges is contemplated by a provider of route air navigation facilities, appropriate prior notice should, so far as possible, be given 4 to 6 months in advance to the principal users, either directly or through their representative bodies, in accordance with the regulations applicable in each State.

(ii) in any such review, these users should, so far as possible, be given the opportunity to submit their views to and consult with the competent authority. For this purpose the users should be provided with adequate financial information.

(iii) reasonable advance notice of the final decision on any review of charges should be given to these users.

39. When major new route facilities or services are being planned it is desirable that the regular users of route facilities and services or their representative organizations be consulted as early as practicable. Equally, in order that route facility providers may better plan their future financial requirements, the Council considers that users, particularly airlines, should either directly or through their representative bodies, provide advance planning data relating to future types, characteristics and numbers of aircraft expected to be used; the special facilities which the users desire; and other relevant matters, to the extent possible on a 5 to 10 year forecast basis.

SOURCE: Representative to ICAO Letters, 17 September 1982, 22 September 1981

LANDING AND AIR NAVIGATION CHARGES

Basis: Maximum all-up weight in Certificate of Airworthiness giving a unit charge for each aircraft, together with a flight factor for each route or a multiplier related to the type of operations. Unit charge and flight factor vary with category of aircraft operation.

Category 1

For owners of aircraft operated by

a) holders of Australian airline licences (including Australian international licences) in the course of regular public transport operations and holders of Australian charter licences in the course of charter operations.

b) non holders of an Australian airline of charter licence operating a foreign registered aircraft in the course of charter operations.

I. INTERNATIONAL FLIGHTS

The unit charge for aircraft on international journeys, or aircraft operated by the holder of an international licence operating on domestic sectors is:

Aircraft weight (kg)	Unit Charge
Up to 700	8.6 cents
701 to 9 000	14.4 cents for each 450 kg or part
9 001 to 20 000	$ 2.88 + 34.6 cents for each 500 kg or part in excess of 9 000 kg
20 001 to 100 000	$10.49 + 42.6 cents for each 500 kg or part in excess of 20 000 kg
above 100 000	$78.65 + 39.4 cents for each 500 kg or part in excess of 100 000 kg

The flight factor or multiplier is determined according to the category of aircraft operation as follows:

a) Flights into or out of Australia: flight factors as prescribed in Part III of the Table of Flights of Schedule I of the Air Navigation (Charges) Act (Reproduced below)

Place in Australia	Factor applicable in the case of a flight commencing or ending at a place outside Australia in the Eastern Zone e.g., Auckland, Wellington, Honolulu, Fiji, Noumea	Northern Zone e.g., Port Moresby Tokyo	North Western Zone e.g., Manila, Hong Kong, Djakarta Singapore, Bombay, Kuala Lumpur	Western Zone e.g., Johannesburg, Mauritius
Townsville	6	5	7	10
Sydney	6	9	10	10
Melbourne	7	10	10	10
Brisbane	6	7	10	10
Perth	10	10	9	10
Darwin	10	6	5	10
Cairns	6	5	7	10
Hobart	7	10	10	10
Norfolk I	5	5	10	10

*Refer also to Section 3.

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b) Flights within Australia: flight factor as prescribed in Parts I and II of the Tables of Flights of Schedule 1 of the Air Navigation (Charges) Act.

Exemptions

- Test flights of aircraft or equipment.
- Flights connected with issue or renewal of C. of A.
- Flight crew check-flights.
- Route familiarization flights.
- Military flights.

II. DOMESTIC TRUNK FLIGHTS

A domestic trunk flight is any flight listed in Part II of the Table of Flights. These flights are primarily flights between capital cities e.g. Sydney, Melbourne, Brisbane, Canberra, Hobart, Adelaide, Darwin and Perth, or flights between capital cities and major provincial centres e.g. Cairns, Townsville, Proserpine, Mackay, Coolangatta Rockhampton, Mt. Isa, Launceston, Alice Springs and Gove.

The unit charge for an aircraft operating a trunk flight is:

Aircraft weight (kg)	Unit Charge
Up to 700	19.4 cents
701 to 9 000	34.1 cents for each 450 kg or part
9 001 to 20 000	\$ 6.82 + 81.2 cents for each 500 kg or part in excess of 9 000 kg
20 001 to 100 000	\$ 24.68 +1.001 cents for each 500 kg or part in excess of 20 000 kg
above 100 000	\$184.84 + 92.5 cents for each 500 kg or part in excess of 100 000 kg

The flight factors for domestic trunk flights are laid out in Part II of the Table of Flights.

III. DOMESTIC REGIONAL FLIGHTS

A domestic regional flight is any flight listed in Part I of the Table of Flights. These flights are primarily flights between capital cities and regional centres or between regional centres.

The unit charge of an aircraft operating a regional flight is:

Aircraft weight (kg)	Unit Charge
Up to 700	18.7 cents
701 to 9 000	32.9 cents for each 450 kg or part
9 001 to 20 000	\$ 6.58 + 78.6 cents for each 500 kg or part in excess of 9 000 kg
20 001 to 100 000	\$ 23.87 + 96.6 cents for each 500 kg or part in excess of 20 000 kg
above 100 000	\$178.43 + 89.4 cents for each 500 kg or part in excess of 100 000 kg

Category 2

General Aviation

For owners of aircraft in respect of aircraft registered under the Air Navigation Regulations, except those aircraft operated by the holder of an airline licence in regular public transport or charter operations under that licence.

The unit charge for aircraft in this category is:

Aircraft weight (kg)	Unit charge
Up to 700	16.1 cents
701 to 9 000	28.2 cents for each 450 kg or part
9 001 to 20 000	$ 5.64 + 67.6 cents for each 500 kg or part in excess of 9 000 kg
20 001 to 100 000	$ 20.51 + 83.1 cents for each 500 kg or part in excess of 20 000 kg
above 100 000	$153.47 + 76.8 cents for each 500 kg or part in excess of 100 000 kg

The annual flight factor is:

	Aircraft Weight	
	up to 9 000 kg	above 9 000 kg
Private aircraft (as defined by Air Navigation Regulations)	936	1 248
Aerial work aircraft (as so defined)	1 872	2 496
Charter aircraft (as so defined)	2 340	3 120

Category 3

For owners of foreign aircraft not operated by:

a) holders of airlines licenses; or
b) holders of charter licenses in the course of regular public transport operations or of charter operations; or
c) persons who are not the holders of airline licenses or charter licenses in the course of charter operations;

under Air Navigation Regulations, the multiplier is 18, for each week (or part) during which the aircraft is in Australia.

The unit charge applied is the same as in Category 1.

The AIR NAVIGATION CHARGE payable is

Category 1

The product of the unit charge and the flight factor for each flight into or out of Australia or over a sector within Australia.

Category 2

The product of the unit charge and the annual flight factor.

Category 3

The product of the unit charge and the multiplier calculated on a weekly basis.

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Rules

- "Australia" includes all territories of Australia.
- The charges payable as above are in respect of the use of aerodromes, air route and airways facilities, meteorological services and search and rescue facilities maintained, operated or provided by the Australian Government.

Payment of charges

- Category 1 - payment is usually effected on monthly accounts rendered on the licenced operators of Regular Public Transport Services.
- Category 2 - owners are required to pay charges due on the registration of the aircraft or on the annual anniversary of such registration.
- Category 3 - operators are required to pay the charges due at the first major port of entry into Australia, the charges being assessed on the estimated period during which the aircraft will be in Australia. If circumstances prevent payment on first landing, the amount due must be paid before departure from Australia. In cases where flights are operated regularly over a period, arrangements may be made for the charges to be paid on a monthly basis, either directly or through local agents.

Reduction

Provision exists in the legislation for remission or refund of the whole or part of the charges payable as may be deemed just, having regard to the nature, locality or extent of the operations involved.

TABLE OF FLIGHTS

The Air Navigation (Charges) Act contains details of the flight factors for all routes over which regular public transport services are operated in Australia.

Examples of flights from Part I of the Table of Flights

Route	*Factor*	*Route*	*Factor*
Between Sydney and -		Between Melbourne and -	
Broken Hill	3	Wynyard	2
Cooma	2	Between Derby and -	
Dubbo	2	Broome	1
Between Brisbane and -		Wyndham	1
Cunnamulla	2	Between Tamworth and -	
Birdsville	3	Armidale	2
Tamworth	6		

Examples of flights from Part II of the Table of Flights

Route	*Factor*	*Route*	*Factor*
Between Sydney and -		Between Perth and -	
Adelaide	5	Darwin	9
Alice Springs	8	Port Hedland	4
Brisbane	4	Between Brisbane and -	
Canberra	1	Cairns	5
Darwin	11	Darwin	9
Melbourne	4	Mt. Isa	5
Perth	13	Townsville	4
Between Melbourne and -		Between Darwin and -	
Adelaide	4	Alice Springs	4
Brisbane	8	Cairns	4
Canberra	3		
Darwin	11		
Between Adelaide and -			
Alice Springs	5		
Darwin	9		
Perth	8		

HANGAR CHARGES

Basis: Area occupied (wingspan x aircraft length)

Building Categories:

A: Buildings leased to civil airline operators or other organizations on a rental basis.

B: Buildings used for Department of Aviation purposes and remaining under the direct control of the Department, (i.e., buildings not leased to civil airline operators or other organizations), in which accommodation may be available from time to time for the housing of private aircraft.
Note.- The following charges are for Category B buildings only, and are currently under review.

Area (wingspan x aircraft lenght)	Daily $	Weekly $
Class "A" - Not exceeding 600 square feet (56 m^2)	1.00	5.00
Class "B" - Over 600 square feet (56 m^2) but not exceeding 1 050 square feet (98 m^2)	1.60	8.00
Class "C" - Over 1 050 square feet (98 m^2) but not exceeding 1 500 square feet (139 m^2)	2.20	11.00
Class "D" - Over 1 500 square feet (139 m^2) but not exceeding 2 000 square feet (186 m^2)	3.00	15.00
Class "E" - Over 2 000 square feet (186 m^2) but not exceeding 2 500 square feet (232 m^2)	3.75	18.75

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Hangar charges for Category B buildings *(cont.)*

Class "F" - Over 2 500 square feet (232 m^2) but not exceeding 3 000 square feet (279 m^2)	4.50	22.50
Class "G" - Over 3 000 square feet (279 m^2) but not exceeding 4 000 square feet (372 m^2)	6.00	30.00
Class "H" - Over 4 000 square feet (372 m^2) but not exceeding 5 000 square feet (464 m^2)	8.00	40.00
Class "I" - Over 5 000 square feet (464 m^2) but not exceeding 6 000 square feet (557 m^2)	9.00	45.00
Class "J" - Over 6 000 square feet (557 m^2) but not exceeding 7 000 square feet (650 m^2)	11.00	55.00
Class "K" - Over 7 000 square feet (650 m^2) but not exceeding 8 000 square feet (743 m^2)	12.00	60.00
Class "L" - Over 8 000 square feet (743 m^2) but not exceeding 9 000 square feet (836 m^2)	13.50	67.50
Class "M" - Over 9 000 square feet (836 m^2) but not exceeding 10 000 square feet (929 m^2)	15.00	75.00
Class "O" - Over 10 000 square feet (929 m^2)	An additional $1.00 per night for every 93 m^2 or part thereof by which its area exceeds 929 m^2.	

Reductions

- For private aircraft stored up to seven consecutive days the maximum charge will be five times the daily charge.

- Private aircraft stored for a period exceeding seven consecutive days will be charged in accordance with the following formula:

$$\text{Charge} = \frac{\text{No. of consecutive days in hangar}}{7} \times \text{weekly rate}$$

Rules

- Privately owned aircraft means any aircraft not owned by the Department of Aviation or the Armed Forces. It includes aircraft owned by other Australian Government Departments or authorities.
- Unless otherwise provided for hangar charges are payable in advance. If however the accommodation is not utilized for the full period paid for the aircraft owner will be entitled to a refund of the overpaid amount.

ORGANISATION EUROPEENNE POUR LA SECURITE DE LA NAVIGATION AERIENNE

SERVICE CENTRAL DE REDEVANCES DE ROUTE

EUROCONTROL

RUE DE LA LOI 72 - B-1040 BRUXELLES
TEL.: (02) 233.02.11
TELEX : 25595 CRCO B

EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

CENTRAL ROUTE CHARGES OFFICE

INFORMATION ON TARIFFS AND CONDITIONS OF APPLICATION OF THE ROUTE CHARGES SYSTEM

INFORMATIONS SUR LES TARIFS ET CONDITIONS D'APPLICATION DU SYSTEME DE REDEVANCES DE ROUTE

1. The annexed document includes tariffs and conditions of application of the route charges system introduced by the Member States (Belgium, France, Federal Republic of Germany, Ireland, Luxembourg, Netherlands and United Kingdom) of the European Organisation for the Safety of Air Navigation, "EUROCONTROL", as well as by Austria, Switzerland, Portugal and Spain, for the use of route air navigation facilities and services in the airspace of these States. The system of charges adopted by the States follows the recommendations of the International Civil Aviation Organisation.

2. The route charges applicable as from April 1, 1983 will be calculated on the basis of the costs of en route air navigation facilities estimated for the year 1983.
These charges will remain in force until December 31, 1983.

3. The EUROCONTROL Organisation is entrusted with the collection of these charges on behalf of the participating States.

4. Any further information may be obtained from the above address or by telephone :

   (02) 233.04.56 (accounts)
   233.04.45/46/47/48 (debt collection)
   233.04.49 (claims and information)

EFFECTIVE DATE : 01.04.1983

REF. : 1 R 1005

1. Le document ci-joint reprend les tarifs et conditions d'application du système de redevances de route, instauré par les Etats membres (Belgique, France, Irlande, Luxembourg, Pays-Bas, République Fédérale d'Allemagne et Royaume-Uni) de l'Organisation Européenne pour la Sécurité de la Navigation aérienne "EUROCONTROL", ainsi que l'Autriche, la Suisse, le Portugal et l'Espagne, pour l'usage des installations et services de navigation aérienne de route dans l'espace aérien de ces Etats. Le système de redevances adopté par les Etats est conforme aux recommandations de l'Organisation de l'Aviation Civile Internationale.

2. Les redevances de route applicables à partir du 1er avril 1983 seront calculées en fonction des coûts des installations et services de navigation aérienne de route estimés pour l'année 1983.
Ces redevances resteront en vigueur jusqu'au 31 décembre 1983.

3. L'Organisation EUROCONTROL est chargée de percevoir les redevances correspondantes au nom des Etats participants.

4. Tous renseignements complémentaires peuvent être obtenus à l'adresse ci-dessus ou en téléphonant au :

   (02) 233.04.56 (comptabilité)
   233.04.45/46/47/48 (recouvrement)
   233.04.49 (réclamations et information)

DATE D'APPLICATION : 01.04.1983

REF. : 1 R 1005

TARIFFS AND CONDITIONS OF APPLICATION OF USER CHARGES

TARIFS ET CONDITIONS D'APPLICATION DES REDEVANCES

Article 1

1° A charge, calculated in accordance with the provisions of Articles 5 to 11 hereof and hereinafter called "the charge" shall be levied for each flight by an aircraft made in accordance with the procedures laid down in application of the Standards and Recommended Practices of the International Civil Aviation Organisation in the airspace of the Member States of the "EUROCONTROL" Organisation, hereinafter called "the Organisation", and in the airspace for which air traffic services have been entrusted to those States by international agreement in which route air navigation facilities are operated and route services provided.

2° The charge shall be paid by the operator of the aircraft.

If the name of the operator has not been made known to the organs responsible for the collection of the charge, the owner is deemed to be the operator until he establishes that some other person is the operator.

Article 2

The charge shall constitute remuneration for services made available to users.

Article 3

1° The amount of the charge shall be payable at the Headquarters of the Organisation, in Brussels, in accordance with the conditions indicated by the Organisation and those which are set out in Appendix 2 * to this Tariffs and Conditions of Application.

2° The charge shall be paid not later than 30 days after the date of dispatch of the invoice therefor by the Central Route Charges Office of the Organisation.

Article 4

The amount of the charge shall be established on the basis of the French franc consisting of 200 milligrammes gold millesimal fineness 900 as declared to the International Monetary Fund on the 29th of December, 1959.

The currency of account used shall be the dollar of the United States of America at its parity, as fixed by the International Monetary Fund, to the French franc referred to above.

Article 1

1° Une redevance de navigation aérienne de route ci-après appelée "la redevance", calculée conformément aux Articles 5 à 11 des présentes dispositions, est perçue pour chaque vol effectué conformément aux procédures prises en application des normes et recommandations de l'Organisation de l'Aviation Civile Internationale, par un aéronef dans les espaces aériens des Etats membres de l'Organisation "EUROCONTROL", ci-après dénommée l'Organisation, ou pour lesquels les services de la circulation aérienne ont été confiés à ces Etats par accord international, dans lesquels des installations de navigation aérienne de route sont mises en oeuvre et des services de navigation aérienne de route sont fournis.

2° La redevance est due par l'exploitant de l'aéronef.

Au cas où le nom de l'exploitant n'est pas connu des organismes responsables des opérations tendant à la perception de la redevance, le propriétaire est réputé être l'exploitant jusqu'à ce qu'il ait établi qu'une autre personne a cette qualité.

Article 2

La redevance constitue la rémunération des services mis à la disposition des usagers.

Article 3

1° Le montant de la redevance est payable au Siège de l'Organisation à Bruxelles, selon les modalités indiquées par l'Organisation, et celles qui figurent dans l'Appendice 2 * des présents Tarifs et Conditions d'application.

2° La redevance doit être payée au plus tard 30 jours après la date d'envoi de la facture par le Service Central de Redevances de Route de l'Organisation.

Article 4

Le montant de la redevance est établi sur la base du franc français constitué par 200 milligrammes d'or au titre de neuf cent millièmes de fin, tel qu'il a été déclaré aux autorités du Fonds Monétaire International le 29 décembre 1959.

La monnaie de compte utilisée sera le dollar des Etats-Unis d'Amérique, dans sa parité fixée par le Fonds Monétaire International par rapport au franc français ci-dessus désigné.

Article 5

For the airspace of a given Member State of the Organisation (i) as well as the airspace for which air traffic services have been entrusted to that State by international agreement, the charge for a flight shall be calculated in accordance with the following formula :

$$r = t_i \times N$$

in which r is the charge, t_i the service unit rate and **N** the number of services units corresponding to such a flight within this airspace.

Article 6

The number of service units referred to in the foregoing Article, designated as **N** , shall be obtained by application of the following formula :

$$N = d \times p$$

where **d** is the distance factor of the flight within the airspace referred to in Article 5 hereof and **p** the weight factor of the aircraft concerned.

Article 7

1° The distance factor shall be obtained by dividing by one hundred the number of kilometres in the great circle distance between :

- the aerodrome of departure within, or the point of entry into, the airspace referred in Article 5 hereof, and
- the aerodrome of first destination within, or the point of exit from, that airspace.

These points shall occur where the air route crosses the lateral limits of the said airspace as set out in the national aeronautical publications. The air route taken is that most frequently used between two aerodromes or, where this cannot be determined, the shortest route.

The routes most frequently used within the meaning of the foregoing sub-paragraph shall be revised annually, not later than the 1st of April, so as to take account of modifications which may exist in the route or traffic structure.

2° In the case of flights exempted from Article 12 by paragraph 4° of that Article the point of entry into or, as the case may be, exit from the said airspace over the Atlantic Ocean shall be the actual point where the flight in question crosses the lateral limit of the said airspace.

3° The distance to be taken into account shall be reduced by twenty (20) kilometres for each takeoff and for each landing on the territory of a Member State of the Organisation

Article 5

Pour l'espace aérien d'un Etat membre de l'Organisation donné (i) ou pour lequel les services de la circulation aérienne ont été confiés à cet Etat par accord international, la redevance pour un vol est calculée suivant la formule :

$$r = t_i \times N$$

dans laquelle r est la redevance, t_i le taux unitaire de redevance et **N** le nombre d'unités de service correspondant audit vol effectué dans cet espace aérien.

Article 6

Le nombre d'unités de service désigné par **N** , visé à l'Article précédent, est obtenu par application de la formule ci-dessous :

$$N = d \times p$$

où **d** est le coefficient distance du vol effectué dans l'espace visé à l'Article 5 ci-dessus et **p** le coefficient poids de l'aéronef intéressé.

Article 7

1° Le coefficient distance est égal au quotient par cent du nombre mesurant la distance orthodromique exprimée en kilomètres entre :

- l'aérodrome de départ situé à l'intérieur de l'espace aérien visé à l'Article 5 ci-dessus, ou le point d'entrée dans cet espace, et
- l'aérodrome de première destination situé à l'intérieur dudit espace aérien, ou le point de sortie de cet espace,

ces points étant les points de franchissement par les routes aériennes des limites latérales dudit espace aérien tels qu'ils figurent dans les publications aéronautiques nationales, et étant choisis en tenant compte de la route la plus généralement utilisée entre deux aérodromes et, à défaut de pouvoir déterminer celle-ci, de la route la plus courte.

Les routes les plus généralement utilisées, au sens de l'alinéa qui précède, seront révisées annuellement, au plus tard au 1er avril pour tenir compte des modifications intervenues éventuellement dans la structure des routes et celle du trafic.

2° Pour les vols exclus du champ d'application de l'Article 12 en vertu du paragraphe 4° du même Article, le point d'entrée ou de sortie dudit espace aérien au-dessus de l'Océan Atlantique sera le point réel où chaque vol traverse les limites latérales de cet espace aérien.

3° La distance à prendre en compte est diminuée d'une tranche forfaitaire de vingt (20) kilomètres pour tout décollage ou atterrissage effectué sur le territoire d'un Etat membre de l'Organisation.

Article 8

1° The weight factor shall be the square root of the quotient obtained by dividing by fifty (50) the number of metric tons in the maximum certificated takeoff weight of the aircraft as set out in the certificate of airworthiness, the flight manual on any other equivalent official document, as follows :

$$P = \sqrt{\frac{\text{Maximum Take-off Weight}}{50}}$$

2° Where, however, an operator has indicated to the organs responsible for the collection of the charge that the fleet of which he disposes includes two or more aircraft which are different versions of the same type the average of the maximum take-off weight of all his aircraft of that type shall be used for the calculation of the weight factor for each aircraft of that type. The calculation of this factor per aircraft type and per operator shall be effected at least every year.

If, however, the operator has given no such indication the weight factor for an aircraft of any type shall be calculated by taking the weight of the heaviest aircraft of that type.

Article 9

For the calculation of the charge the weight factor referred to in Article 8 hereof shall be expressed to two places of decimals.

Article 10

Subject to the provisions of Article 4, the service unit rate for the airspace referred to in Article 5 hereof shall be, for the given State concerned, as follows :

SEE APPENDIX 3

Article 11

For a flight entering the airspace of several Member States of the Organisation, within the meaning of Article 5 hereof, the total charge (**R**) shall be equal to the sum of the charges (r) generated in the airspace of each one of the said States.

Article 12

1° Notwithstanding the provisions of Articles 5, 6, 7, 10 and 11 hereof the charge for flights entering the airspace referred to in Article 1 hereof and in respect of which the aerodrome of departure or of first destination is situated in any one of the zones set out in Column 1 of Appendix 1 to these Tariffs and Conditions of Application shall be fixed on the basis of real distances weighted by

Article 8

1° Le coefficient poids est égal à la racine carrée du quotient par cinquante (50) du nombre exprimant la mesure du poids maximum certifié au décollage de l'aéronef exprimé en tonnes métriques, tel qu'il figure au certificat de navigabilité ou au manuel de vol ou dans tout autre document officiel équivalent, ainsi qu'il suit :

$$P = \sqrt{\frac{\text{Poids maximum au décollage}}{50}}$$

2° Toutefois, pour un exploitant qui a déclaré aux organismes responsables des opérations tendant au recouvrement de la redevance que la flotte dont il dispose comprend plusieurs aéronefs correspondant à des versions différentes d'un même type, le coefficient poids pour chaque aéronef de ce type utilisé par cet exploitant est déterminé sur base de la moyenne des poids maxima au décollage de tous ses aéronefs de ce type. Le calcul de ce coefficient par type d'aéronef et par exploitant est effectué tous les ans au moins.

A défaut pour l'exploitant de faire la déclaration visée à l'alinéa qui précède, le coefficient poids pour chaque aéronef d'un même type utilisé par cet exploitant sera établi sur base du poids maximum au décollage de la version la plus lourde de ce type.

Article 9

Pour le calcul de la redevance le coefficient poids indiqué à l'Article 8 qui précède est exprimé par un nombre comportant deux décimales.

Article 10

Sans préjudice de l'application des dispositions de l'Article 4 ci-dessus, le taux unitaire de redevance pour l'espace aérien visé à l'Article 5 ci-dessus est, en ce qui concerne l'Etat donné, fixé à :

VOIR APPENDICE 3

Article 11

Pour un vol pénétrant dans l'espace aérien, au sens de l'Article 5 ci-dessus, de plusieurs Etats membres de l'Organisation, la redevance globale (**R**) est égale à la somme des redevances (r) engendrées dans l'espace aérien de chacun desdits Etats.

Article 12

1° Par dérogation aux dispositions figurant aux Articles 5, 6, 7, 10 et 11 qui précèdent, la redevance due pour les vols pour lesquels l'aérodrome de départ ou de première destination est situé dans les zones mentionnées en colonne 1 de l'Appendice 1 des présents Tarifs et Conditions d'application et qui pénètrent dans les espaces aériens visés à l'Article 1er ci-dessus, est fixée à partir de distances reference to traffic statistics compiled by the Organisation from the data supplied by the Control Centres responsible for route air navigation services in the North Atlantic.

2° The corresponding tariffs for an aircraft of which the weight factor is one (50 metric tons) are set out in the said Appendix.

3° Whenever military flights to which this Article applies are exempted from the charge for overflight of the national territory or territories of one or more Member States of the Organisation or Contracting States, as defined in Article 13 hereof, the weighted distances upon which the tariffs set out in Appendix 1 hereto are based shall be modified by the withdrawal therefrom of those weighted distances which correspond to overflight of the said State or States.

4° The provisions of paragraphs 1°, 2° and 3° of this Article shall not apply to flights referred to in paragraph 1° hereof so long as the aerodrome of first destination or of departure is not listed in column 2 of Appendix 1 * to these Tariffs and Conditions of Application.

Article 13

Flights referred to in the foregoing Article for which an equivalent charge is due by virtue of the legislation of a Member State of the Organisation or of a Contracting State shall be exempted from the charge provided for in Article 1 hereof.

For the purposes of these Tariffs and Conditions of Application a Contracting State shall be a State which is not a Member State of the Organisation but which has by way of special agreement entrusted the Organisation with the collection, on its behalf, of charges for route air navigation facilities and services provided by it in the airspace for which it has responsibility.

Article 14

The foregoing provisions shall not apply to flights falling within the categories set out in paragraphs 1° to 9° of this Article.

1° Flights by military aircraft of Member States of the Organisation.

2° Flights by military aircraft of a State other than a Member State of the Organisation in so far as there is in force, at the time the flight is made, a bilateral or multilateral agreement or other arrangement providing for exemption from the charge for overflight of national territory by such aircraft to which that State and the Member State of the Organisation concerned are parties.

3° Search and rescue flights performed on the responsability of a SAR body by one or more States.

4° Flights made entirely in accordance with the Visual Flight Rules between the aerodrome of departure and the aerodrome of first destination.

5° Flights terminating at the aerodrome from which the aircraft has taken off and during which no intermediate landing has been made.

* Section FAL 3

réelles pondérées sur base des statistiques établies par l'Organisation à partir des données de trafic fournies par les Centres de contrôle responsables des services de la navigation aérienne de route sur l'Atlantique Nord.

2° Les tarifs correspondants pour un aéronef dont le coefficient poids est égal à un (50 tonnes métriques), figurent dans ledit Appendice.

3° Au cas où des vols visés au présent article, et effectués par des aéronefs militaires, bénéficient d'une exonération de la redevance pour le survol du territoire national d'un ou de plusieurs Etats membres de l'Organisation ou Etats contractants au sens de l'Article 13 qui suit, les distances pondérées à partir desquelles les tarifs figurant dans l'Appendice 1 sont fixés, seront diminuées des distances pondérées correspondant au survol du ou desdits Etats.

4° Les dispositions des paragraphes 1°, 2° et 3° du présent Article ne s'appliquent pas aux vols visés au paragraphe 1° ci-dessus tant que l'aérodrome de première destination ou de départ ne figurera pas sur la liste en colonne 2 de l'Appendice 1 * des présents Tarifs et Conditions d'application.

Article 13

Sont exonérés de la redevance prévue à l'Article 1er ci-dessus, les vols visés à l'Article précédent et pour lesquels une redevance identique est due en application de la réglementation d'un Etat membre de l'Organisation ou d'un Etat contractant.

Est Etat contractant, aux fins des dispositions des présents Tarifs et Conditions d'application, tout Etat qui n'est pas membre de l'Organisation mais qui, par accord spécial, a confié à l'Organisation le soin de percevoir, en son nom, des redevances pour l'usage des installations et services de navigation aérienne de route qu'il fournit dans l'espace aérien relevant de sa compétence.

Article 14

Les dispositions qui précèdent ne sont pas applicables aux vols entrant dans les catégories indiquées aux paragraphes 1° à 9° du présent article.

1° Vols effectués par des aéronefs militaires des Etats membres de l'Organisation.

2° Vols effectués par des aéronefs militaires d'un Etat non membre de l'Organisation, pour autant qu'un accord bilatéral ou multilatéral ou toute autre disposition prévoyant l'exonération de la redevance pour le survol au-dessus de territoire national par ces aéronefs existe entre l'Etat membre de l'Organisation concerné et ledit Etat.

3° Vols de recherche et de sauvetage effectués sous la responsabilité d'un organisme SAR établi par un ou plusieurs Etats.

4° Vols effectués en totalité selon les règles de vol à vue entre l'aérodrome de départ et l'aérodrome de première destination.

5° Vols se terminant à l'aérodrome de départ de l'aéronef et au cours duquel aucun atterrissage n'a eu lieu.

* Section FAL 3

6° Flights made by non-military aircraft which are the property of a State provided that such flights are not made for commercial purposes.

7° Flights made for the purposes of checking or testing equipment destined for use as aids to air navigation.

8° Test flights performed exclusively with a view to obtaining, renewing or maintaining the certificate of airworthiness of aircraft or equipment.

9° Training flights performed exclusively with a view to obtaining, renewing or maintaining a pilot's licence or rating.

10° Flights made by civil aircraft of which the certificated maximum takeoff weight as set out in the certificate of airworthiness, flight manual or any other equivalent official document is less than two metric tons.

Article 15

The foregoing provisions shall not, furthermore, apply to flights made entirely within the airspace referred to in Article 5, in so far as such flights have not been made subject to the charge by the State concerned.

Article 16

These Tariffs and Conditions of Application shall be brought to the knowledge of users by the Member States of the Organisation in the manner appropriate to them and by publication thereof in the Organisation's Aeronautical Information Publication (A. I. P.).

6° Vols effectués par des aéronefs non militaires qui sont la propriété d'un Etat à condition que ces vols ne soient pas effectués à des fins commerciales.

7° Vols de contrôle ou d'essai des aides à la navigation.

8° Vols d'essais effectués exclusivement en vue d'obtenir, de renouveler ou de maintenir le certificat de navigabilité d'un aéronef ou d'un équipement.

9° Vols d'entrainement effectués exclusivement en vue d'obtenir, de renouveler ou de maintenir un brevet de pilote ou une qualification.

10° Vols effectués par des aéronefs civils dont le poids maximum certifié au décollage, indiqué au certificat de navigabilité ou au manuel de vol ou dans tout autre document officiel équivalent, est inférieur à deux tonnes métriques.

Article 15

Sont également exclus de l'application des dispositions qui précèdent, les vols effectués entièrement à l'intérieur de l'espace aérien visé à l'Article 5, dans la mesure où ces vols ne sont pas soumis à redevance par l'Etat intéressé.

Article 16

Les présents Tarifs et Conditions d'application seront portés à la connaissance des usagers d'une part par les Etats membres de l'Organisation dans les formes propres à chacun d'eux et d'autre part dans la Publication d'Information Aéronautique (A. I. P.) de l'Organisation.

APPENDIX 1 APPENDICE 1

CHARGES FOR FLIGHTS REFERRED TO IN ARTICLE 12 OF THE TARIFFS AND CONDITIONS OF APPLICATION FOR AIRCRAFT OF WHICH THE WEIGHT FACTOR EQUALS ONE (50 Metric tons)

REDEVANCES POUR LES VOLS VISES A L'ARTICLE 12 DES TARIFS ET CONDITIONS D'APPLICATION POUR UN AERONEF DONT LE COEFFICIENT POIDS EST EGAL A UN (50 tonnes métriques)

Aerodromes of departure (or of first destination) situated Aerodromes de depart (ou de premiere destination) situes	Aerodromes of first destination (or of departure) Aerodromes de premiere destination (ou de depart)	Amount of the charge in US \$ Montant de la redevance en US \$
1	2	3
ZONE I - between 14° W & 110° W and North of 55° N - entre 14° W & 110° W et au nord de 55° N with the exception of Iceland/excepté l'Islande	Frankfurt	957,38
	København	241,85
	Prestwick	329,09
ZONE II - between 30° W & 110° W and 28° N & 55° N - entre 30° W & 110° W et 28° N & 55° N	Amsterdam	625,91
	Athinai	646,80
	Belfast	166,97
	Beograd	874,67
	Bergen-Flesland	347,05
	Berlin-Schönefeld	609,68
	Birmingham	414,43
	Bordeaux	349,88
	Bruxelles	596,17
	Cairo	688,24
	Casablanca	95,70
	Dhahran	743,93
	Dublin	184,57
	Düsseldorf	633,90
	Frankfurt	714,72
	Genève	501,19
	Glasgow	249,99
	Göteborg	485,59
	Hamburg	778,17
	Jeddah	584,19
	København	602,34
	Köln-Bonn	712,87
	Lagos	254,10
	Las Palmas de Gran Canarias	153,80
	Lisboa	152,79
	Ljubljana	870,80
	London	438,91
	Luxembourg	669,95
	Lyon	481,22

Aerodromes of departure (or of first destination) situated Aerodromes de depart (ou de premiere destination) situes	Aerodromes of first destination (or of departure) Aerodromes de premiere destination (ou de depart)	Amount of the charge in US $ Montant de la redevance en US $
1	2	3
ZONE II (suite - continued)	Madrid	261, 81
	Malaga	278, 57
	Manchester	349, 79
	Milano	561, 43
	Moskva	508, 25
	München	709, 58
	Nice	561, 53
	Oslo	494, 89
	Paris	416, 52
	Praha	898, 11
	Prestwick	249, 99
	Roma	589, 97
	Santiago	113, 59
	Shannon	132, 93
	Tel-Aviv	714, 72
	Tenerife	98, 83
	Warszawa	569, 91
	Wien/Schwechat	918, 61
	Zagreb	874, 67
	Zurich	612, 81
ZONE III - West of 110° W and between 28° N & 55° N - à l'ouest de 110° W et entre 28° N & 55° N	Amsterdam	716, 06
	Düsseldorf	805, 93
	Frankfurt	877, 26
	København	472, 21
	London	628, 21
	Manchester	490, 74
	Paris	704, 78
	Prestwick	311, 96
	Shannon	127, 64
ZONE IV - West of 30° W and between the equator & 28° N - à l'ouest de 30° W et entre l'équateur & 28° N	Amsterdam	472, 77
	Bordeaux	189, 97
	Bruxelles	404, 59
	Düsseldorf	581, 04
	Frankfurt	576, 72
	Las Palmas de Gran Canarias	274, 27
	Lisboa	159, 69
	London	395, 26
	Lyon	329, 04
	Madrid	290, 11
	Manchester	334, 37
	Milano	434, 12
	Paris	304, 37
	Porto Santo (Madeira)	45, 51
	Praha	808, 47
	Prestwick	306, 53
	Rabat	95, 98
	Roma	575, 77
	Shannon	142, 10
	Tenerife	243, 86
	Zurich	437, 90

APPENDIX 2

APPENDICE 2

CONDITIONS GOVERNING PAYMENT OF THE CHARGE

MODALITES DE PAIEMENT DE LA REDEVANCE

Clause 1

1° The amounts set out in bills are payable, in accordance with paragraph 1° of Article 3 of the Tariffs and Conditions of Application of User Charges, at the Headquarters of the Organisation in Brussels.

2° The Organisation will nonetheless consider payment into the bank accounts opened in its name in the Member States of the Organisation and in the Contracting States as a good discharge of the payer's liability. This is to be regarded solely as a facility accorded to the debtor, which shall not operate to set aside the territorial jurisdiction of the Belgian courts flowing from the adoption of Brussels as the place of execution of the liability. In availing himself of the said facility the user shall, insofar as necessary, formally accept the jurisdiction of the Belgian courts, without prejudice to the jurisdiction of other courts under the relevant legal rules.

3° However, as regards a user who is a national of a Member State of the Organisation or of a Contracting State (Federal Republic of Germany, Belgium, France, United Kingdom of Great Britain and Northern Ireland, Luxembourg, the Netherlands, Ireland, Switzerland, Portugal, Austria, Spain) this facility is to be limited to the designated banking organisation of that State.

Clause 2

In application of Article 4 of the Tariffs and Conditions of Application of User Charges amounts due by users in respect of the charge shall be billed to them in the currency of account, which is the dollar of the United States of America.

Clause 3

1° Apart from the cases provided for at paragraph 2° of this Clause, the amount of the charge shall be paid in dollars of the United States of America.

2° Any user who is a national of a Member State of the Organisation or of a Contracting State may, whenever payment is made by him into a designated banking organisation situated in the State of which he is a national, discharge the debt in the currency of the said State.

3° Where a user avails himself of the facility referred to in the foregoing paragraph the conversion into national currency of the dollar amount shall be effected at the daily exchange rates appropriate to commercial transactions quoted for the day upon which payment is made and for the place at which payment is made.

Clause 1

1° Les montants facturés sont payables, conformément au paragraphe 1 de l'Article 3 des Tarifs et Conditions d'application des Redevances, au Siège de l'Organisation à Bruxelles.

2° L'Organisation considèrera toutefois comme libératoires les paiements effectués à ses comptes auprès des établissements bancaires désignés dans les Etats membres de l'Organisation et Etats contractants, étant entendu qu'il s'agit d'une simple facilité accordée au débiteur et qu'il n'en résulte aucune conséquence dérogeant à la compétence territoriale des juridictions belges, telle qu'elle découle de la fixation à Bruxelles du lieu d'exécution de l'obligation, et que l'usager qui ferait usage de ladite facilité accepte formellement, pour autant que de besoin, la compétence des juridictions belges sans préjudice de la compétence d'autres juridictions prévue par les règles juridiques en la matière.

3° Toutefois, en ce qui concerne les usagers ressortissant à un Etat membre de l'Organisation ou à un Etat contractant (République fédérale d'Allemagne, Belgique, France, Royaume-Uni de Grande Bretagne et d'Irlande du Nord, Luxembourg, Pays-Bas, Irlande, Suisse, Portugal, Autriche, Espagne) cette facilité est limitée au paiement à l'établissement bancaire désigné situé dans l'Etat en question.

Clause 2

En application de l'Article 4 des Tarifs et Conditions d'applications des Redevances, les montants dûs au titre de redevance seront facturés aux usagers dans la monnaie de compte qui est le dollar des Etats-Unis d'Amérique.

Clause 3

1° Hors le cas prévu au paragraphe 2° de la présente clause, les montants des redevances doivent être acquittés en dollars des Etats-Unis d'Amérique.

2° Les usagers ressortissant à un Etat membre de l'Organisation ou à un Etat contractant pourront, au cas où le paiement est effectué à l'Etablissement bancaire désigné situé dans leur Etat, s'acquitter en monnaie nationale des montants des redevances qui leur sont facturés.

3° S'il est fait usage de la faculté visée au paragraphe qui précède, la conversion en monnaie nationale des montants en dollars s'effectuera au taux de change journalier utilisé, aux jour et lieu de paiement, pour les transactions commerciales.

UNIT RATES OF CHARGE FOR THE 10th PERIOD : 1.04.1983 - 31.12.1983

TAUX UNITAIRES DE REDEVANCES POUR LA 10em PERIODE : 1.04.1983 - 31.12.1983

Member States :			Etats membres :
Federal Republic of Germany	U.S. $ 47,39	$ U.S. 47,39	pour la République fédérale d'Allemagne
Belgium	U.S. $ 42,49	$ U.S. 42,49	pour la Belgique
France	U.S. $ 31,83	$ U.S. 31,83	pour la France
United Kingdom	U.S. $ 64,15	$ U.S. 64,15	pour le Royaume-Uni
Luxembourg	U.S. $ 42,49	$ U.S. 42,49	pour le Luxembourg
Netherlands	U.S. $ 48,42	$ U.S. 48,42	pour les Pays-Bas
Ireland	U.S. $ 35,26	$ U.S. 35,26	pour l'Irlande

Contracting States :			Etats contractants :
Austria	U.S. $ 43,11	$ U.S. 43,11	pour l'Autriche
Switzerland	U.S. $ 59,00	$ U.S. 59,00	pour la Suisse
Portugal	U.S. $ 27,58	$ U.S. 27,58	pour le Portugal
Spain : - Continental	U.S. $ 30,29	$ U.S. 30,29	pour l'Espagne (FIR continentales)
- FIR Canary	U.S. $ 29,24	$ U.S. 29,24	pour l'Espagne (FIR Canaries)

STATISTICS ON NUMBER OF FLIGHTS BY COUNTRY FOR 1983

Information note

- The figures provided show the number of flights performed during the year 1983 by weight category and distance segment.
- Aircraft under two tons are not charged in the EUROCONTROL system. Therefore no figures appear in the first line.
- In respect of transatlantic flights, distances are weighted between different States and therefore do not always correspond to the real distance flown in each State.

COUNTRY: BELGIUM-LUXEMBOURG

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS	5526	7914	2163	1532															17135
5-10 TONS	7908	10540	2285	1245															21978
10-15 TONS	1148	2013	809	707															4677
15-20 TONS	4106	2213	1707	305															8331
20-30 TONS	5561	1252	533	228															7574
30-40 TONS	790	3363	2966	444															7563
40-45 TONS	116	4750	600	7520															12986
45-50 TONS	10384	13991	5511	5672															35558
50-60 TONS	30159	31745	5237	14524															81665
60-70 TONS	588	1151	60	1949															3748
70-80 TONS	664	879	54	136															1733
80-90 TONS	9171	9340	1227	4442															23180
90-100 TONS	2197	751	21	1118															4087
100-150 TONS	3668	1555	283	4580															10086
150-200 TONS	6683	6740	1505	4145															19073
200-250 TONS	1003	7672	36	6029															14740
250-300 TONS	5234	7899	767	377															14277
300-400 TONS	15585	9356	874	8504															34319
MORE 400 TONS																			
TOTAL :	111091	121524	26638	63457															

COUNTRY: GERMANY

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS	8313	10894	9142	5476	4303	2449	705	389	13										41684
5-10 TONS	13986	15003	10194	7630	3557	3600	646	865	15										55496
10-15 TONS	4084	1455	3792	1077	949	625	146	103											12231
15-20 TONS	2144	3273	1161	1076	480	165	111	36											8446
20-30 TONS	5824	1634	2941	2766	1106	1228	37	30											15566
30-40 TONS	3547	385	983	1149	224	109	95	765	1										7258
40-45 TONS	6639	5917	5204	898	4032	1825	117	64											24696
45-50 TONS	18107	28190	34118	29258	17610	15085	3048	724	2										146142
50-60 TONS	17271	38593	42534	22125	15722	18177	7271	12441	289										174423
60-70 TONS	886	1603	1108	149	509	295	272												4822
70-80 TONS	163	579	451	598	575	75	617	12											3070
80-90 TONS	14020	16785	28114	12683	6879	5699	1715	732											86627
90-100 TONS	239	1392	3298	2517	1003	1902	698	457	25										11531
100-150 TONS	1677	5785	7320	5666	3077	506	829	1400	4										26264
150-200 TONS	4191	5068	9657	6054	5735	1305	4304	793	1										37108
200-250 TONS	6566	3400	2263	1009	6265	846	54	1											20404
250-300 TONS	2183	7357	3048	2111	1225	66	1107	152											17249
300-400 TONS	6043	13582	10111	5164	7261	1089	3283	117											46650
MORE 400 TONS																			
TOTAL :	115883	169895	175439	127406	80512	55946	25055	19081	350										

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COUNTRY: FRANCE

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS			3	5				1	2										11*
2-5 TONS	9784	5417	5348	2811	1632	1880	1170	548	988	81	13	5	6						29683
5-10 TONS	17143	11197	6474	8775	3212	3305	3780	927	1620	257	35	130	42	1					56898
10-15 TONS	3089	2722	1028	1725	1982	1228	1487	601	849	105	9	42	33	3					14003
15-20 TONS	19051	3117	2635	877	529	991	603	203	288	32	15	10	2	13					28366
20-30 TONS	2271	494	462	295	381	418	322	115	231	20	14	16	2	17					5058
30-40 TONS	6668	6424	2618	4410	708	2769	963	552	1240	99	10	42	14	19	4				26531
40-45 TONS	7359	7410	350	569	1284	3948	7981	1138	6929	11	130	207	347						37663
45-50 TONS	2223	7852	6956	10269	5461	1420	10656	1002	9505	1368	60	99	84	1					56956
50-60 TONS	6804	15459	10246	22896	11300	16197	54997	5271	49409	7799	596	873	5598	241					207546
60-70 TONS	96	1415	675	138	70	3462	1873	60	1343	247	4	6	157						9546
70-80 TONS	753	329	755	175	497	403	1148	592	345	346	22	93	1	12					5471
80-90 TONS	1652	14463	11438	12140	13927	3731	22786	2635	8520	4962	935	339	55						97583
90-100 TONS	237	1328	672	773	440	160	1828	13	848	1085		2	81	2					7469
100-150 TONS	869	465	1327	2684	2313	1365	4368	394	5066	1003	11	278	585	4	2				20734
150-200 TONS	6280	8258	4308	4127	12570	1473	17797	2273	4757	3695	156	907	153	1045	4				67803
200-250 TONS	5956	3687	2311	1902	3230	602	4953	3400	2872	1618	199	838	121		5				31694
250-300 TONS	5358	908	4008	1676	732	1298	3034	904	2452	2143	242	1028	1	217	1				24002
300-400 TONS	21837	3829	8225	6341	8462	1416	6503	2920	4883	2278	3040	1052	2	690	2				71480
MORE 400 TONS																			
TOTAL :	117430	94814	69839	82498	67830	46057	146249	23549	102147	27149	5491	5967	7194	2265	18				

* Foreign military flights not exempted.

COUNTRY: UNITED KINGDOM

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS	14889	20967	13793	7769	4110	2775	378	197	54	16	20	27	2						64997
5-10 TONS	27472	37050	14285	8055	5056	3224	931	382	142	37	77	77	79						96871
10-15 TONS	7124	27489	9375	4448	1393	1013	341	647	35	3	32	14	10						51341
15-20 TONS	20245	15592	20241	7329	800	5500	186	25	25	11	15	15	13						69997
20-30 TONS	1926	8653	6832	2124	224	382	85	149	61	24	12	13	10						20500
30-40 TONS	2039	9932	8618	5461	2645	2569	540	135	27	12	7	11	5						31101
40-45 TONS	15700	30006	13600	19827	5672	12045	4115	29	1	4	4	2	5						101010
45-50 TONS	1661	19267	1070	5437	544	1972	88	84		1	4	4	1						30133
50-60 TONS	18723	64431	16260	33279	5480	18032	9738	706	221	4	10	344	29						167257
60-70 TONS	187	14730	5098	1900	10901	6336	204	1		1		1	2						39361
70-80 TONS	98	835	124	316	342	326	20	8	9	15	397	90	48						2628
80-90 TONS	2180	16594	535	3054	71	304	167	6	2			5	1						22919
90-100 TONS	230	4319	731	565	1575	917	159	10	2	3									8511
100-150 TONS	2869	8403	1711	1550	548	988	75	16	53	66	5	3	1						16288
150-200 TONS	2780	18815	1412	2203	1674	5395	860	1745	915	270	30	1040	17						37156
200-250 TONS	1506	13512	1312	1742	1366	5493	247	350	458	1632	151	6							28775
250-300 TONS	139	2356	1841	996	1179	4217	537	918	744	522	225	162	1						13837
300-400 TONS	3166	14665	7607	7818	4196	19359	1354	2694	4963	4605	693	2117	3						72240
MORE 400 TONS																			
TOTAL :	122934	326721	124449	113873	47776	90847	20025	7519	7712	7226	1682	3931	227						

COUNTRY: NETHERLANDS

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS	3239	4245	1693	1765	31														10973
5-10 TONS	4510	9915	2260	1075	179														17939
10-15 TONS	2000	3808	442	383	15														6648
15-20 TONS	1522	9325	317	151	8														11323
20-30 TONS	12541	7641	106	47	34														20369
30-40 TONS	3545	6235	1047	121	2														10950
40-45 TONS	92	7332	2663	3116	89														13292
45-50 TONS	8950	26016	4458	2970	215														42609
50-60 TONS	5285	12728	11071	16338	321														45743
60-70 TONS	636	4431	865	1137	6														7075
70-80 TONS	47	650	218	175															1090
80-90 TONS	1707	3364	2773	3390	4														11238
90-100 TONS	19	1216	588	2466	13														4302
100-150 TONS	821	938	477	1868	159														4263
150-200 TONS	1890	9043	1235	3127	4														15299
200-250 TONS	472	2258	964	36															3730
250-300 TONS	2893	8126	567	796	48														12430
300-400 TONS	6232	16645	1576	1634	8														26095
MORE 400 TONS																			
TOTAL :	56401	133916	33320	40595	1136														

COUNTRY: IRELAND

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS	4263	921	747	18	3		1												5953
5-10 TONS	6163	1287	404	80	7	2	4												7947
10-15 TONS	3205	1923	160	37	4	1	3												5353
15-20 TONS	2269	328	145	90	19	2	5												2856
20-30 TONS	134	298	210	221	19	4	3												889
30-40 TONS	5814	878	241	138	4	9	11												7095
40-45 TONS	3552	905	100	35															4592
45-50 TONS	4026	846	23	87															4982
50-60 TONS	16286	5239	99	452	53		1												22130
60-70 TONS	954	291	1	15															1261
70-80 TONS	21	113	108	76	53	5	2												378
80-90 TONS	221	118	25	28	2	2													396
90-100 TONS	334	68	111	92	6		2												613
100-150 TONS	383	618	437	124	4	4	10												1580
150-200 TONS	894	5080	5760	2078	1199	10	29	2											15052
200-250 TONS	2184	4618	5205	1206	2	1	5												13221
250-300 TONS	1113	5668	3716	221		2	2												10722
300-400 TONS	9777	25210	17805	4264	39	6	11												57103
MORE 400 TONS																			
TOTAL :	61593	54469	35317	9262	1402	45	89	2											

COUNTRY: SWITZERLAND

\ DISTANCE \ FLOWN \ WEIGHT \ CATEGORY \	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS	9112	4096	2498	134															15840
5-10 TONS	28822	11540	4077	559															44998
10-15 TONS	4508	714	893	79															6194
15-20 TONS	2952	382	373	65															3772
20-30 TONS	3573	125	1647	24															5769
30-40 TONS	4636	223	2040	1															6900
40-45 TONS	8254	247	1378	24															9903
45-50 TONS	27312	3200	15679	1141															47332
50-60 TONS	88881	19850	18942	2408															130081
60-70 TONS	4922	17	102																5041
70-80 TONS	1412	641	361	20															2434
80-90 TONS	21519	3077	13336	658															38590
90-100 TONS	3246	23	652	31															3952
100-150 TONS	8026	1189	2318	6															11539
150-200 TONS	21539	2817	5107	254															29717
200-250 TONS	9406	311	664	307															10688
250-300 TONS	9043	3808	1427	13															14291
300-400 TONS	21039	1532	1480																24051
MORE 400 TONS																			
TOTAL :	278602	53792	72974	5724															

COUNTRY: PORTUGAL

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS	70	644	273	272	36	33	7		2	3		7		1					1348
5-10 TONS	2401	416	407	220	56	62	22	15	1	48		8	6	25					3687
10-15 TONS	18	43	57	117	6	24	10	3				1		15					294
15-20 TONS	82	38	8	30	5	3	9	6				3	1	1					186
20-30 TONS	56	20	7	36	4	3	11	6						1					144
30-40 TONS	91	159	8	125	2	10	21	10						5					431
40-45 TONS	182	14	35	129	2	661	5	23						1					1052
45-50 TONS	1988	624	138	773	160	334	83	18											4118
50-60 TONS	6677	2274	1143	4137	1975	3935	2492	2042	233	680	3	1326	268	6557					33742
60-70 TONS	37	10		41	1	91	1	182						1					364
70-80 TONS	104	942	498	916	251	48	42	27	20	766		65	6	23					3708
80-90 TONS	7945	4137	1283	3300	2342	605	175	327	34	2454		188	17	337					23144
90-100 TONS	22	165	3	138	1	73	1	970						3					1376
100-150 TONS	687	122	29	139	357	374	58	872					1	673					3312
150-200 TONS	5216	1431	1227	2353	1138	1545	681	1613	48		1			652					15905
200-250 TONS	3151	507	561	532	1434	1176	412	8						488					8269
250-300 TONS	3831	671	1381	1378	325	624	1635	756						57					10658
300-400 TONS	16456	2392	522	412	728	192	1017	131					1	866					22717
MORE 400 TONS																			
TOTAL :	49014	14609	7580	15048	8823	9793	6662	7009	338	3951	4	1598	300	9706					

COUNTRY: AUSTRIA

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS	2882	813	1625	73															5393
5-10 TONS	5180	1221	3065	147															9617
10-15 TONS	532	216	872	41															1661
15-20 TONS	269	92	393	5															759
20-30 TONS	2446	118	265	6															2839
30-40 TONS	350	76	246	6															678
40-45 TONS	503	30	2152	177															2862
45-50 TONS	7108	8055	17255	3093															35511
50-60 TONS	21302	15656	36140	1749															74847
60-70 TONS	172	282	854	31															1339
70-80 TONS	96	933	721	4															1754
80-90 TONS	2295	7476	10159	106															20036
90-100 TONS	855	548	4662	1266															7331
100-150 TONS	576	4309	6172	10															11067
150-200 TONS	1400	8309	10483	142															20334
200-250 TONS	185	1788	7403																9376
250-300 TONS	145	2338	3923																6406
300-400 TONS	2353	7578	12816																22747
MORE 400 TONS																			
TOTAL :	48649	59838	119214	6856															

COUNTRY: SPAIN: -CONTINENTAL

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS	612	1264	996	1417	718	271	239	280	76	134	43								6050
5-10 TONS	578	855	1082	1843	1352	554	544	748	137	673	109	1							8476
10-15 TONS	310	268	178	710	268	63	181	261	45	145	34								2463
15-20 TONS	214	370	227	776	290	202	100	97	15	128	20		2		1				2444
20-30 TONS	3225	7858	708	1838	706	478	80	57	24	83	8								15175
30-40 TONS	903	391	156	1762	323	74	882	71	55	228	9	1		1	1				4857
40-45 TONS	1404	756	4091	3146	1738	490	238	2041	142	136	43								14225
45-50 TONS	3871	10238	7120	17072	9351	4036	3796	4615	1191	183	18								61491
50-60 TONS	9834	7607	28485	37981	21508	6768	5198	13665	1786	8060	872								141764
60-70 TONS	68	95	44	747	294	10	50	198	9	38	23								1576
70-80 TONS	39	310	37	1034	774	235	341	57	45	132	63		1						3068
80-90 TONS	4841	12159	14597	21276	21928	8027	9839	3799	3199	5993	1142								105613
90-100 TONS	12	131	235	1534	42	6	119	487	16	177	3								2762
100-150 TONS	733	226	3161	3318	1133	652	565	1556	180	618	84								12226
150-200 TONS	4544	997	3924	11660	6539	2519	2426	1793	265	3381	798		1		5				38753
200-250 TONS	4172	266	1933	1687	2568	22	2326	587	469	1087	49								15166
250-300 TONS	5135	379	955	5264	1829	1693	798	402	11	1127	304			1					17902
300-400 TONS	17648	4648	146	3765	1941	1239	1695	1542	14	1348	527		6		2				33621
MORE 400 TONS																			
TOTAL :	58253	48899	67989	116834	72393	27335	28417	32076	7679	23671	4149	2	10	2	9				

COUNTRY: SPAIN: -CANARIES

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS	214	387	71	253	114	16	1	174	6	7	4	4							1251
5-10 TONS	12	60	68	256	28	14	1	78	11	33	3	2	4	5					575
10-15 TONS		3	5	53	3	5	1	45	9										124
15-20 TONS	143	114	125	14	1			44		2	1		1	14					459
20-30 TONS	1095	1529	759	161	10	23	18	274		6	3	7	1						3886
30-40 TONS		1	1	26	2	3	3	43	1	4	4	1	3						92
40-45 TONS	53	9	4	310	219			26		2	1		15						639
45-50 TONS	2965	3275	2019	1820	110			130						1					10320
50-60 TONS	1073	1955	1061	15089	421	3	6	727	2	1	2	3	4	5					20352
60-70 TONS	46		8	961	39			215	3		83	1		12					1368
70-80 TONS		8	6	235	63	94		16		20				7					449
80-90 TONS	8661	10071	3434	37514	5063	718	12	2371		202	2	737	5	39					69029
90-100 TONS	87	168	18	1705	33			70	4	7	81	10		2					2185
100-150 TONS	443	119	21	6792	530	3		1083	3	115	29	2865	108	16					12127
150-200 TONS	1305	1149	966	13503	1314	196	1	5062	246	271	55	770	94	4180					29111
200-250 TONS	392	910	582	5525	121			1198	190	42		848		1395					11203
250-300 TONS	663	27	315	5598	19	99		1057	242	10		209	262	7763					16264
300-400 TONS	233		21	1126	4	26		478	307	528		40	5834	8905					17502
MORE 400 TONS																			
TOTAL :	17585	19794	9484	90941	8094	1255	43	13091	1024	1259	268	5497	6331	22344					

COUNTRY: SANTA MARIA

WEIGHT CATEGORY \ DISTANCE FLOWN	UNDER 100 KMS	100-199 KMS	200-299 KMS	300-399 KMS	400-499 KMS	500-599 KMS	600-699 KMS	700-799 KMS	800-899 KMS	900-999 KMS	1000-1099 KMS	1100-1199 KMS	1200-1299 KMS	1300-1399 KMS	1400-1599 KMS	1600-1799 KMS	1800-1999 KMS	MORE 1999 KMS	TOTAL
UNDER 2 TONS																			
2-5 TONS								25	114	22		6		142				22	331
5-10 TONS	3	19	4					14	62	33		2		76		1			214
10-15 TONS									22					23		2	7		54
15-20 TONS		6					43	24	31	21		13		43	46	7	23	2	259
20-30 TONS	8709	18719	1360	661	92				92	26	9	80		174	38	5	26	7	29998
30-40 TONS				3				3	73	8	14	24	10	104	37	7	37	21	341
40-45 TONS									17			3		22			11		53
45-50 TONS																			
50-60 TONS		1		1		7		99	25	464	26	14		32				9	678
60-70 TONS											30	30		6				35	101
70-80 TONS		1			5	1	5	75	132	327	152	110	3	162	14		12	4	1003
80-90 TONS		43						558	21	3491	296	212		35	14	8	8	8	4694
90-100 TONS		2							1			2	1	2			1		9
100-150 TONS						17			11		33	446	9	60	234	95	318	1205	2428
150-200 TONS			20		2	2083	9	1151	136	19	2244	1961	16	175	948	1173	689	4073	14699
200-250 TONS						6	6	25	3	90	502	514	43	407	127	4264	1662	1404	9053
250-300 TONS						55	353		2	12		14	81	256	918	371	1248	10855	14165
300-400 TONS			8			3	480	128	4	602	129	13	66	3263	5507	1172	2441	15301	29117
MORE 400 TONS																			
TOTAL :	8712	18791	1392	665	99	2172	896	2192	746	5115	3435	3444	229	4982	7883	7105	6483	32946	

EUROCONTROL

29 JUIN 1982

Consultative Group on
Route Charges

PRINCIPLES FOR ESTABLISHING THE COST-BASE FOR

ROUTE FACILITY CHARGES AND THE CALCULATION OF THE UNIT RATES

1. General

1.1. The principles for taking into account expenditure for route services are based on those described in the "Statements by the Council to Contracting States on Charges for Route Air Navigation Facilities" as contained in ICAO Document 9082-C/1015 and in the relevant ICAO guidance material on cost accounting practice and cost allocation in respect of en route air navigation facilities and services.

1.2. Account shall be taken of the whole of the en route air navigation facilities and services for which each State is responsible by virtue of the ICAO Regional Air Navigation Agreements and the associated ICAO Regional Air Navigation Plan on the basis of which national plans are established. (1) This precludes the incorporation in the cost-base of any facilities and services operated and maintained solely for military purposes, i.e. for military operational air traffic (OAT).

Costs in respect of facilities and services provided to flights which are exempted from the payment of route charges shall not be recovered from other users. The appropriate methods of adjustment of the cost-base are contained in Appendix IV.

1.3. The categories of costs to be taken into account shall be those defined in Appendix 2 of ICAO Document 9082-C/1015 and the relevant ICAO guidance material on cost accounting practice and cost allocation in respect of en route air navigation facilities and services, subject to any modification made in order to take account of other methods specific to the EUROCONTROL en route charges system.

1.4. National Administrations shall establish their cost-bases in order to account for the costs of the en route air navigation systems under their jurisdiction. Appropriate forecast operating accounts shall be established whereby the costs for year "n" shall be determined on the basis of available year "n - 2" actual costs updated according to available information, particularly budget forecasts relating to years "n - 1" and "n".

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(1) These principles do not apply to the Shanwick Oceanic Control Area.

1.5. In order to be taken into account, facilities and services shall either be in operation or be expected to be put into service, by the end of year "n".

Any temporary shut-down of a facility (i.e. failure or maintenance) shall be ignored for the purpose of determining whether the facility is operational.

1.6. The accounting period shall be 1 January to 31 December.

1.7. The cost-base shall be established by National Administrations in their national currency and shall be reported to EUROCONTROL's Central Route Charges Office (CRCO) not later than 1 July of year "n - 1" in accordance with the specimen table in Appendix II.

1.8. In order to establish a comon currency basis, the CRCO shall convert the reported amounts of the national cost-bases into US dollars. The exchange rate used for this purpose shall be determined by reference to official statistics (i.e. OECD statistics) by the competent bodies of the route charges system.

1.9. Adjustment mechanism

With a view to the forecast operating accounting system, provision shall be made for an adjustment mechanism as described in para. 4 below.

1.10. For the purpose of constituting the cost-base, expenditure in respect of EUROCONTROL shall be added to national expenditure. Expenditure in respect of EUROCONTROL shall be established in accordance with the same rules as those applicable to national expenditure (see para. 2).

2. Accounting principles to be applied by National Adminstrations

2.1. Investment expenditure

2.1.1. Investment expenditure comprises expenditure on equipment and buildings, expenditure on initial stocks of spare parts, expenditure on land, expenditure on works services and basic software expenditure.

Basic software consists of the integral standard software components of any computer system which are essential for its basic functioning but which do not by themselves enable the individual computers, or the system itself, to process specific data for a specialised task. Examples of the components included in this category are : operating systems, monitors and supervisors, compilers, service programs and interface between supervisor and monitors.

Taxes and/or customs duty payable on equipment shall be included in the amount of investment expenditure in States where such taxes are applicable.

2.1.2. The investment expenditure to be taken into account shall be that on facilities either in operation or expected to be put into service by the end of year "n".

2.1.3. The method of amortising investment expenditure shall be the straight line method.

2.1.3.1. The percentages to be applied in calculating the amortisation of capital expenditure are 5 % over 20 years in the case of buildings, 12.5 % over 8 years in the case of equipment and basic software components, and 20 % over 5 years in the case of vehicles used for ATS purposes, with a 0.5 % provision in each case for premature obsolescence.

No amortisation shall be calculated for land.

2.1.3.2. The interest rates to be applied to investment expenditure shall be no more than those in force in the National Administrations.

Such interest shall be aggregated with the initial value of the facilities if financial costs are involved, or applied annually to the net book value.

2.1.3.3. With regard to working capital, interest may be calculated on the basis of the average net available funds and short-term realisable assets, provided that such interest constitutes a real cost to the States.

2.1.4. Amortisation and interest on capital expenditure shall be calculated from the first day of the month for facilities put into service between the 1st and 15th day of any given month and from the first day of the following month for those put in service between the 16th and 31st.

Equipment or buildings still in service beyond the above-mentioned amortisation periods are regarded as fully amortised and no amortisation or interest shall be included in respect of them.

If changes (extensions or replacements) are made to equipment or buildings already amortised or in course of amortisation, the amount of the capital expenditure relating to these changes shall be amortised in accordance with the same rules.

Proceeds from the disposal of assets shall be credited against the cost base.

2.2. Operating expenditure

Gross operating expenditure shall be taken into account after deduction of receipts other than taxes.

2.2.1. Groups of facilities and services included in the cost-base

2.2.1.1. Air Traffic Services (ATS) costs

ATS operating costs are defined as the costs of air traffic services provided for en route aircraft.

Where the utilisation of ATS facilities as between en route services on the one hand and approach and aerodrome services on the other cannot be determined precisely, the said facilities shall be classified as follows :

- facilities used mainly by en route traffic (allocation of 75 % of the corresponding expenditure to route services);

- facilities used to virtually the same extent by en route and approach traffic (allocation of 50 % of the corresponding expenditure to route services);

- facilities used mainly by approach traffic (allocation of 25 % of the corresponding expenditure to route services).

Where the utilisation of an ATS facility as between civil and military purposes cannot be determined directly, its costs shall be apportioned according to the number of flights or the number of working positions appropriate to it.

2.2.1.2. Communication (COM) costs

COM operating costs shall comprise the operating costs of communications facilities and services and navigation aids.

Where National Administrations are not in a position to break down ATS/COM costs, an inclusive figure may be given as a basis for these two items when the table in Appendix II is being prepared.

With regard to point-to-point communications and in particular to landlines, where the costs cannot be allocated exactly, 100 % of costs shall be charged to route services or telecommunications centres where the link is between two route service centres, but only 50 % where the link is between an area control centre and an aerodrome or an approach control office.

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2.2.1.3. Meteorological (MET) costs

2.2.1.3.1. National meteorological costs comprise expenditure on the following meteorological functions : central (operational) core functions, central management functions, research and development, aeronautical meteorological functions.

2.2.1.3.2. Central (operational) core functions.
Central (operational) core functions consist of

- the national components of the global synoptic observation and the associated telecommunications networks as specified by the World Meteorological Organisation;

- general analysis and forecasting and the associated computer processing.

States who wish to recover some part of their costs of global synoptic observation from aviation users shall identify the proportion of aeronautical meteorological effort to their total meteorological effort on behalf of all users; that proportion should be applied to the costs of the national components of the global synoptic observation and the associated telecommunications networks. Before inclusion in cost bases the product of the application of the proportion of aeronautical meteorological effort to total meteorological effort shall be reduced in proportion to the number and value of "AIREPS" used by States as a contribution to the global synoptic observational system.

The costs of general analysis and forecasting shall be allocated to cost bases in the proportion of aeronautical meteorological effort to total meteorological effort.

2.2.1.3.3. Central management functions

The costs of central management functions shall be allocated to cost bases in the proportion of aeronautical meteorological personnel costs to total meteorological personnel costs.

2.2.1.3.4. Research and development

The cost of applied research projects related to civil aviation activities may be included in cost bases.

2.2.1.3.5. Aeronautical meteorological functions

The costs of the provision of aeronautical meteorological functions may be included in cost bases. These are listed as follows :

1. Services by Area Forecast Centres as specified in Annex 3 of the Chicago Convention;

2. Services by MET watch officers as specified in Annex 3;

3. Services by (Aerodrome) MET offices as specified in Annex 3;

4. Aeronautical MET observations;

5. Transmission and dissemination of OPMET data (including "Volmet" where applicable);

6. Internal airport MET transmissions;

7. Aeronautical MET automatic telephone answering service;

8. Specialist training of aeronautical MET staff;

9. Aeronautical climatological services as specified in Annex 3.

2.2.1.4. Aeronautical information Service (AIS) costs

Two methods of charging AIS expenditure may be applied, viz. charging AIS expenditure in its entirety to en route services or breaking down such expenditure between en route service and aerodrome or approach control services.

2.2.2. Classification of expenditure

2.2.2.1. Maintenance costs

This category of expenditure includes costs relating to staff (including trainees, supervisors and technical support staff) and equipment (spare parts - except for initial spares, which are entered under investment expenditure - operational equipment, etc.) used for the maintenance of facilities.

2.2.2.2. Operating costs

Operating costs comprise :

a) the actual cost of operating staff including those in central services, trainees, supervisors and technical support staff but excluding maintenance staff, covering not only salaries but also pension costs (e.g. payments to the Pension Fund in respect of serving staff) and insurance costs, etc.

b) the total actual rental for land transmission lines (excluding terminal equipment which is entered under investment expenditure),

c) any land rental costs,

d) the actual cost of energy,

e) the total actual rental for the Aeronautical Fixed Telecommunications Network (AFTN), less the appropriate percentage of the rental for the lines between control or communications centres and airports (see paragraph 2.2.1.1.) (the cost of the terminal equipment of ATC centres is to be entered under investment expenditure),

f) the total actual rental or operating costs of other operational and technical support facilities.

g) the cost of application software which is defined as follows:

Application software in the technical sense of the word and, in addition, the interface and system software which is produced to enable the standard computer systems, or elements thereof, to fulfil any air traffic services task. This category also includes maintenance and further development of the programs.

2.2.2.3. Costs of basic and advanced training

Costs of basic and advanced training shall comprise the expenditure on instruction at air traffic schools and cost of advanced training of maintenance and operating staff, including costs of accommodation and other facilities.

2.2.2.4. Costs in respect of studies, tests and trials

The costs included in this category of expenditure are actual annual costs in respect of personnel, equipment and buildings used for studies, tests and trials relating to en route services. Pre-operational application software expenditure is also included in this category. Expenditure on en route service studies which are in the nature of basic research should be excluded.

2.2.2.5. Administrative costs

2.2.2.5.1. The administrative costs are actual costs of administrative staff and facilities on the understanding that there is a clear connection between these costs to be allocated to users and the concept of services rendered by both operational and technical support staff.

2.2.2.5.2. These costs will be calculated according to the share of administrative support services in the overall activities related to en route services.

2.2.2.5.3. Insurance premia in so far as these constitute a real cost to administrations shall form part of administrative costs.

3. Expenditure in respect of EUROCONTROL

The list of expenditure in respect of EUROCONTROL to be added to national expenditure is given in Appendix I (*).

4. Adjustment mechanism

4.1. At the end of each financial year (year "n") the difference between the actual cost-base and receipts shall be determined in accordance with the method set out in Appendix III bearing in mind that costs in respect of exempted flights shall not be recovered from other users. Write-offs may be carried over and an allowance for doubtful accounts may be made depending on national accounting practices.

4.2. Under-recovery or over-recovery shall be carried over and included in the cost-base of year "n + 2". Amounts carried over shall be converted into US dollars at the rate of exchange applied to the other costs for year "n + 2".

5. Calculation of the unit rate

5.1. The national unit rate of States shall be calculated by dividing the amount of the cost-base, appropriately adjusted in accordance with paragraph 1.2. and the methods described in Appendix IV, by the number of chargeable service units (paragraph 3 of Appendix IV refers).

5.2. The regional administrative unit rate shall cover the collection of costs of States as well as the CRCO. It shall be calculated by the CRCO in accordance with procedures agreed upon by the Consultative Group on Route Charges (CGRC).

5.3. The national unit rate of States and the regional administrative unit rate shall form together the global unit rate of a State.

(*) Note : National expenditure should be presented in accordance with the specimen table at Appendix II.

APPENDIX I

EXPENDITURE IN RESPECT OF EUROCONTROL TO BE INCLUDED IN THE COST-BASE

1. EUROCONTROL expenditure to be added to national costs of Member States shall be established in accordance with the same rules as those applicable to national expenditure on route services.

1.1. They include the following :

a) the Agency's net operating expenditure (Headquarters, Brétigny Experimental Centre, Luxembourg Institute of Air Navigation Services);

b) the annual expenditure on investment for administrative purposes tests and trials at Headquarters, the EEC, the Luxembourg Institute;

c) amortisation and interest on the investment expenditure of Headquarters, the EEC and the Luxembourg Institute;

d) amortisation and interest in respect of the Brussels, Shannon and Leerdam secondary radars;

e) operating and investment expenditure in respect of the operational sections of the Maastricht, Karlsruhe and Shannon Control Centres.

1.2. In the case of installations made operational during a current year before their total cost has been paid, residual payments effected subsequent to the year in which the actual equipment was made operational shall be amortised over the prescribed period, which means that some payments may still be subject to amortisation even though the full amortisation period for the operational equipment has been completed : the residual payments will therefore be covered by a separate amortisation period.

2. The figures shall be established on the basis of the Agency's annual accounts submitted to the Permanent Commission's approval, in applying the same method as that mentioned in paragraph 1.4. of the principles for establishing national cost-bases.

Refunds to Member States by the Agency through the Investment Budget in respect of amortisation and interest on capital expenditure incurred at national level shall not be included in EUROCONTROL expenditure so as to avoid duplication of the figures included under the corresponding headings at national level.

Payments to Ireland shall not be included in EUROCONTROL expenditure either.

3. The various categories of EUROCONTROL expenditure are apportioned among the Member States as follows :

a) the Agency's operating expenditure (Headquarters, the Brétigny Experimental Centre, the Luxembourg Institute of Air Navigation Services) are apportioned among the Member States in accordance with the method used for calculating their contributions to the Agency's Operating Budget (Article 23 of the Statute);

b) operating expenditure in respect of facilities providing en route services (Maastricht, Karlsruhe and Shannon UACs) are allocated to the airspaces in which these facilities provide services;

c) EUROCONTROL investment expenditure (on investments in service during the reference year) are apportioned among the Member States :

- either by the method used for calculating the Member States' contributions to the Investment Budget (GNP), e.g. in the case of capital expenditure in respect of Headquarters, the EEC and the Institute of Air Navigation Services;

- or according to the regionalisation rule (i.e. expenditure is attributed to the airspace for which the facilities have provided services) in respect of amortisation of facilities providing route services (e.g. Maastricht UAC, Karlsruhe UAC, Shannon UAC, Brussels, Shannon and Leerdam secondary radars).

4. The Member States' shares of the EUROCONTROL costs shall be added to their national expenditure for the subsequent calculation of the service unit rate of each State.

5. Associated or Cooperating States' contributions to the Agency's budgets for services rendered shall be added to their national expenditure.

APPENDICE/APPENDIX II

Installation et services de route / Route facilities and services

Exercice Financier de l'année - / - Financial year

Unité : monnaie nationale
Unit · national currency

Coûts annuels des installations et services
Annual costs of facilities and services

	Dépenses annuelles - Annual expenditure							
	Entretien/ Maintenance (1)	Exploitation/ Operation (2)	Frais de formation et de perfectionnement/ Cost of basic and advanced training of staff (3)	Dépenses d'études, d'essais et d'expérimentations/ Cost of studies, tests and trials (4)	Frais administratifs et divers/Administrative and miscellaneous costs. (5)	Amortissement des dépenses en capital/ Amortization of capital expenditure (6)	Intérêts appliqués aux dépenses en capital/ Interest on capital expenditure (1) (7)	TOTAL (1+2+3+4+5+6+7) (8)
ATS								
COM								
MET								
AIS								
TOTAL								

(1) Taux d'intérêt = ...
Rate of interest = ...

APPENDIX III

ADJUSTMENT REQUIRED IN NATIONAL CURRENCY

1. Income

Cash received in national currency during year "n"	....
Add : Accounts receivable at close of collection year (converted at exchange rate ruling on last day)	+ ....
Add/less : write-offs[1]	± ....
Less : Accounts receivable at beginning of collection year (converted at rate ruling on last day of previous collection year)	- ....
Gross Income (A)	
Less : Allowance for doubtful accounts[1]	- ....
Net Income (B)	

2. Costs

Established costs of State for year "n"	....
Less : Costs in respect of exempted flights	- ....
Costs of State to be recovered through route charges (C)	....

3. Under-/over-recovery

In respect of year "n" to be carried forward to year "n + 2" (B - C)

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1) According to national accounting practices

APPENDIX IV

METHODS OF ADJUSTMENT OF THE COST-BASE TO TAKE ACCOUNT OF FLIGHTS EXEMPTED FROM PAYMENT OF ROUTE CHARGES

1. General

The allocation of costs for facilities provided and services rendered to flights which are exempted from the payment of route charges shall be governed by the principle that these costs are not to be recovered from users (paragraph 1.2. of the "Principles" refers). Consequently, when calculating the unit rates, an appropriate adjustment of the cost-base shall be made to take account of the following flights, which according to the Conditions of application of the system are exempted from the payment of route charges :

a) flights of military general air traffic (military GAT) of EUROCONTROL Member-States (where applicable);

b) flights of military GAT of EUROCONTROL non-Member States (where applicable);

c) search and rescue flights (SAR flights);

d) VFR flights;

e) flights terminating at the aerodrome from which the aircraft has taken off and during which no intermediate landing has been made (circular flights);

f) flights by aircraft registered in the name of a State, provided that such flights are not made for commercial purposes (flights of State aircraft);

g) flights made for the purpose of checking and testing equipment destined for use as aids to air navigation (navaid check flights);

h) flights performed exclusively with a view to obtaining, renewing or maintaining the certificate of airworthiness of aircraft or equipment (test flights);

i) flights performed exclusively with a view to obtaining, renewing or maintaining a pilot's licence or rating (training flights);

j) IFR flights made by civil aircraft of which the certificated maximum take-off weight as set out in the certificate of airworthiness, flight manual or any other equivalent official document is less than two metric tons (flights with aircraft by less than 2 metric tons);

../..

k) domestic flights (where applicable).

2. Adjustment Method

2.1. In the cases of paragraph 1. a), to c) and f) to k) an adjustment of the cost-base shall be made by a reduction on the basis of the proportion of the number of service units generated by these flights to the total number of service units.

2.2. In the case of paragraph 1.d) and e) where the number of service units cannot be established the following shall apply :

a) a direct deduction of the acutal costs shall be made in respect of facilities provided and/or services rendered to VFR-flights as listed in paragraph 1.d);

b) a deduction shall be made for circular flights (paragraph 1.e); the amount to be deducted shall be at the descretion of the State concerned.

Such direct deductions from the cost-base should always be effected before any further deductions for exemptions are made calculated on the basis of the proportional value of the service units.

2.3. Adjustments of the cost-base and establishment of the proportional values of the service units for exempted flights shall be compiled in accordance with the tables depicted in Attachments 1 and 2.

3. Establishment of service units and proportional values

3.1. Wherever applicable, the establishment of service units and proportional values serving for an appropriate reduction of the cost-base, as well as all related calculations, shall be carried out by the Central Route Charges Office (CRCO). To this end, National Administration shall transmit to the CRCO all necessary data. Data on exempted flights which are to be taken into account in the calculations shall be included in the normal traffic data which are transmitted to the CRCO at regular intervals (1).

3.2. The CRCO shall include the results of the calculations of proportional values of exempted flights and the resulting adjustments of the cost-base in the form of the tables in Attachments 1 and 2, in the working paper on "National cost-bases and establishment of unit rates" to be submitted to the Consultative Group on Route Charges (CGRC) for the preparation of the establishment of the new unit rate for the following charges period.

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(1) Under the forecast accounting system the number of exempted service units is extrapolated globally for all flight categories.

MODEL FORMAT - COST-BASE

STATE	National costs	EUROCONTROL costs	Non reduced cost-base	Reduction for VFR costs	Circular Flights	Cost-base attributable to IFR flights circular flights excepted	REDUCTION FOR EXEMPTED FLIGHTS								Total reduction	Reduced cost-base	Shortfalls/ surpluses	Cost-base chargeable unit
							GAT mil Member States	GAT mil. Non-Member States	SAR flights	Flights by State aircraft	Test and training flights	Navaid check-flights	Flights by aircraft 2 tons	Domestic flights				
	in $	in $	in $	in $	in $	in $	in $	in $	in $	in $	in $	in $	in $	in $	in $	in $	in $	in $
	(1)	(2)	(3)=(1)+(2)	(4)	(5)	(6)=(3)-(4)-(5)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)=(3)-(15)	(17)	(18)=(16)+(17)

MODEL FORMAT - SERVICE UNITS

State	Total number of service units	EXEMPTED FLIGHTS							Domestic flights	Circular flights	Total number of exempted units	Number of chargeable units to calculate unit rates
		GAT mil. Member States	GAT mil. Non-Member States	SAR flights	Flights by State aircraft	Test and training flights	Navaid check-flights	Flights by aircraft 2 tons				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)=(1)-(11)

EUROCONTROL

Organisation Europeenne pour la Securite de la Navigation Aerienne
European Organisation for the Safety of Air Navigation

RUE DE LA LOI 72
1040 BRUXELLES

TEL 233.02.11
TELEX 21173 EUROC B

NOTE DE TRAVAIL
WORKING PAPER

WP/CGRC/65/2526
18.5.82

GROUPE CONSULTATIF SUR LES REDEVANCES DE ROUTE
CONSULTATIVE GROUP ON ROUTE CHARGES

User consultation meeting : 16 June 1982

AGENDA ITEM 4 : SCHEDULES OF EXPENSE CLASSIFICATION PROPOSED BY IATA

As agreed at the CGRC/user ad hoc Group's 4th meeting (3.12.81; cf. CGRC/USR/5/18) the states' and user representatives will find attached a set of five schedules of expense classification proposed by IATA.

E U R O C O N T R O L

SCHEDULES OF EXPENSE CLASSIFICATION

SCHEDULE 1	:	Summary of Estimates and Variances
SCHEDULE 2	:	Estimates by Activity 1982
SCHEDULE 3	:	Comparison of Estimates 1982 with Estimates 1981 and Actual Costs 1980
SCHEDULE 4	:	Fixed Assets and Reserve for Depreciation
SCHEDULE 5	:	Statistics - Flight Activity/Personnel

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SUMMARY OF ESTIMATES AND VARIANCES

Country :

Unit : National Currency

SERVICE	ESTIMATES 1982	ESTIMATES 1981	1982-1981 VARIANCE	%	ACTUAL COSTS 1980	1982-1980 VARIANCE	%
ATS							
COM							
MET							
AIS							
TOTAL							

SCHEDULE 2 - 1

E U R O C O N T R O L

ROUTE FACILITIES AND SERVICES

ESTIMATES 1982

Country :

Unit : National Currency

PART A - OPERATIONAL EXPENSES	ATS	COM	MET	AIS	TOTAL
1. Salaries of Regular Personnel					
1.1 Regular salaries					
1.2 Personnel insurance					
1.2.1 Social insurance					
1.2.2 Accident/other personnel insurances					
1.3 Other payments					
1.3.1 Transportation time					
1.3.2 Night shift allowance					
1.3.3 Sickness replacement					
1.3.4 Other replacements					
1.3.6 Overtime					
1.3.7 Subsistance allowance					
1.4 Training					
Sub Total A1					
2. Working Expendables					
2.1 Fuel					
2.2 Radiosondes/balloons/transmitters					
2.3 Hydrogen and other expendables					
2.4 Teleprinter/recording paper/tape					
3. General Operating Expenses					
3.1 Electric power					
3.2 Teleprinter/telephone/telegraph services					
3.3 Heating					
3.4 Lighting					
3.5 Cleaning					
3.6 Stationery/miscellaneous supplies					
3.7 Rentals					
3.7.1 Land rent					
3.7.2 Office rent					
3.7.3 Equipment rent					
3.8 Housing expenses					
4. Transportation					
4.1 Personnel					
Sub Total A2.A4					
Total Operational Expenses					

	ATS	COM	MET	AIS	TOTAL
PART B - MAINTENANCE EXPENSES					
1. Salaries of regular maintenance personnel (included under PART A-1)					
2. Special labour employed in maintenance					
3. Material and labour used for maintenance					
3.1 Buildings and annexes					
3.2 Navigational aids					
3.3 Machinery/tools					
3.4 Storage tanks					
3.5 Communication equipment					
3.6 Cables					
3.7 Meteorological equipment					
3.8 Vehicles					
3.9 Office/housing equipment					
3.10 Miscellaneous material					
3.11 Radar - Primary					
3.12 Radar - Secondary					
4. Miscellaneous additional necessary maintenance expenses					
Total Maintenance Expenses					
TOTAL PARTS A AND B					

	ATS	COM	MET	AIS	TOTAL
PART C - INDIRECT EXPENSES					
1. Miscellaneous overhead, incl admin					
2. Depreciation					
2.1 Buildings and annexes					
2.2 Equipment					
2.2.1 Navigational aids					
2.2.2 Machinery/tools					
2.2.3 Communication equipment					
2.2.4 Cables - ordinary					
2.2.5 Meteorological equipment					
2.2.6 Vehicles					
2.2.7 Office/housing equipment					
2.2.8 Radar - Primary					
2.2.9 Radar - Secondary					
3. Interest - rate used ......%					
3.1 Buildings and annexes					
3.2 Equipment					
3.2.1 Navigational aids					
3.2.2 Machinery/tools					
3.2.3 Communication equipment					
3.2.4 Cables - ordinary					
3.2.5 Meteorological equipment					
3.2.6 Vehicles					
3.2.7 Office/housing equipment					
3.2.8 Radar - Primary					
3.2.9 Radar - Secondary					
Total Indirect Expenses					
TOTAL					

NOTE : Same schedule will be used for COM, MET and AIS Analyses

EUROCONTROL

ROUTE FACILITIES AND SERVICES

AIR TRAFFIC SERVICES

Country :

Unit : National Currency

COMPARISON OF ESTIMATE 1982 WITH ESTIMATE 1981 AND ACTUAL COSTS 1980

	Estimate 1982	Estimate 1981	1982 - 1981 Variance %	Actual Cost 1980	1982 - 1980 Variance %
PART A - OPERATIONAL EXPENSES					
1. Salaries of regular personnel					
1.1 Regular salaries					
1.2 Personnel insurance					
1.2.1 Social insurance					
1.2.2 Accident/other personnel insurance					
1.3 Other payments					
1.3.1 Transportation time					
1.3.2 Night shift allowance					
1.3.3 Sickness replacement					
1.3.4 Other replacements					
1.3.5 Overtime					
1.3.6 Subsistance allowance					
1.4 Training					
Sub Total A1					

	Estimate 1982	Estimate 1981	1982-1981 Variance %	Actual Cost 1980	1982-1980 Variance %
PART A - OPERATIONAL EXPENSES (cont)					
2. Working expendables					
2.1 Fuel					
2.2 Radiosondes/balloons/transmitters					
2.3 Hydrogen/other expendables					
2.4 Teleprinter/recording paper/tape					
3. General operating expenses					
3.1 Electric power					
3.2 Teleprinter/telephone/telegraph services					
3.3 Heating					
3.4 Lighting					
3.5 Cleaning					
3.6 Stationery/miscellaneous supplies					
3.7 Rental					
3.7.1 Land rent					
3.7.2 Office rent					
3.7.3 Equipment rent					
3.8 Housing expenses					
4. Transportation					
4.1 Personnel					
Sub Total A2-A4					
Total Operating Expenses					

	Estimate 1982	Estimate 1981	1982-1981 Variance %	Actual Cost 1980	1982-1980 Variance %
PART B - MAINTENANCE EXPENSES					
1. Salaries of regular maintenance personnel (included under PART A-1)					
2. Special labour employed in maintenance					
3. Material and labour used for maintenance					
3.1 Buildings and annexes					
3.2 Antennae/towers/counterpoises					
3.3 Machinery/tools					
3.4 Storage tanks					
3.5 Communication equipment					
3.6 Cables					
3.7 Meteorological equipment					
3.8 Vehicles					
3.9 Office/housing equipment					
3.10 Miscellaneous material					
3.11 Radar - Primary					
3.12 Radar - Secondary					
4. Miscellaneous additional necessary maintenance expenses					
Total maintenance expenses					
TOTAL PARTS A AND B					

SCHEDULE 3 - 4

PART C - INDIRECT EXPENSES	Estimate 1982	Estimate 1981	1982-1981 Variance Variance	% %	Actual Cost 1980	1982-1980 Variance	%
1. Miscellaneous overhead, incl admin							
2. Depreciation							
2.1 Buildings and annexes							
2.2 Equipment							
2.2.1 Navigational aids							
2.2.2 Machinery/tools							
2.2.3 Communication equipment							
2.2.4 Cables - ordinary							
2.2.5 Meteorological equipment							
2.2.6 Vehicles							
2.2.7 Office and housing equipment							
2.2.8 Radar - Primary							
2.2.9 Radar - Secondary							
3. Interest - rate used .....%							
3.1 Buildings and annexes							
3.2 Equipment							
3.2.1 Navigational aids							
3.2.2 Machinery/tools							
3.2.3 Communication equipment							
3.2.4 Cables - ordinary							
3.2.5 Meteorological equipment							
3.2.6 Vehicles							
3.2.7 Office and housing equipment							
3.2.8 Radar - Primary							
3.2.9 Radar - Secondary							
Total indirect expenses							
TOTAL							

E U R O C O N T R O L

NOTE : Same Schedule will be used for COM, MET and AIS

ROUTE FACILITIES AND SERVICES

AIR TRAFFIC SERVICES

Country :

Unit : National Currency

ITEMS	FIXED ASSETS					RESERVES FOR DEPRECIATION					BOOK VALUE	
	Cost 01 Jan 1982	Adjustments To Opening Balance	Additions At Cost During Year	Disposals During Year	31 Dec 1982	01 Jan 1982	Adjustments To Opening Balance	Depreciation 1982	Reductions	31 Dec 1982	31 Dec 1981	31 Dec 1982
1 Buildings and annexes												
2 Navigational Aids												
3 Processing Equipment - Computers												
4 Machinery and Tools												
5 Communications Equipment												
6 Radar Primary and Secondary												
7 Meteorological Equipment												
8 Vehicles												
9 Office/housing Equipment												
TOTAL												

Statistics - Flight Activity/Personnel

	ATCC	ATCC	ATCC	ATCC	Total
No. of controlled flights					
No. of ATC controllers*					
No. of sectors					

* No. of controllers should include, centre chiefs, supervisors, assistant controllers and trainers.