Attributable Aviation Costs: Review of Valuation Methods

Report

This report presents a review of the existing methodology for calculating attributable airport, airway and other related costs and an evaluation of alternative methods. These costs are used in the Department of Aviationís cost recovery program.

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Attributable Aviation Costs:

Review of Valuation Methods

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FOREWORD

In September 1982 the then Minister for Transport and Construction directed the Bureau of Transport Economics (BTE) to carry out a review of the methods used for valuing costs attributed to the aviation industry for cost recovery purposes and to identify alternative methods. The terms of reference which the Minister sent to the BTE for the study had previously been agreed to by his colleague the then Minister for Aviation. This arrangement was necessary because the Government's administrative arrangements specified that the BTE was to carry out aviation research although it reported to the Minister for Transport and Construction.

The terms of reference for the study limited the BTE to examining the methods used for valuing aviation costs. The study therefore does not address any issues concerning which costs should be taken into account by the Department of Aviation for cost attribution purposes or how those costs should be allocated among industry sectors. Nor does it deal with any matters concerning the level of particular aviation charges or the overall level of cost recovery. Therefore, the matters examined in this report cover only some of the issues involved in recovering costs from the civil aviation industry.

Draft copies of this report were provided to relevant Commonwealth Government Ministers and their departments in the first half of 1983 for comments on matters of fact and details. This report contains the final results of the study.

The study was carried out in the BTE's Financial Assessment Branch by Mr D.P. Baussmann and Mr P.J. McNamara under the direction of Mr A.J. Shaw.

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Director

Bureau of Transport Economics
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SUMMARY

This report presents a review of the existing methodology for calculating attributable airport, airway and other related costs and an evaluation of alternative methods. These costs are used in the Department of Aviation's cost recovery program.

The study was initiated following an expression of concern by the international aviation sector about the level of aviation charges in relation to assessed costs and the subsequent questioning of the methodology employed to calculate those costs. The study deals with questions of costing from an accounting and economic viewpoint. The terms of reference specifically stated that the method used in allocating costs among sectors of the aviation industry was not to be covered in the review.

The salient features of the existing methodology are:

- use of historic cost for the valuation of assets (including recording of assets at zero cost where they have been transferred from other government authorities);
- use of straight line depreciation methods; and
- charging of an imputed interest cost on the net depreciated historic value of each asset using the long term bond rate that prevailed in the year the asset was acquired.

There are also imputed interest charges calculated on the value of inventories and on what could be described as working capital. The other important costing practices are capitalisation of interest on new construction projects (but not on land acquired in advance of need) and calculation of an imputed superannuation cost for staff employed in the airport/airway system on the basis of a fully-funded scheme (whereas the scheme is actually operated on a pay-as-you-go basis). Otherwise, items classified as attributable costs are recorded as they are paid out by the Department of Aviation or on the Department's behalf. These costs are recorded using the standard government accounting system, which, as a cash-flow based system, has no provision for accrual of expenses and revenues.

The economic principles applying to valuation of aviation resources are examined in the report. Opportunity cost is identified as the important valuation concept. The valuation of current costs may require shadow pricing of inputs, to adjust for taxes, subsidies and market imperfections, where market prices do not reflect true opportunity costs of the expense items.

The two elements that comprise annual capital costs are depreciation (the extent to which capital assets are used up during the year) and interest (the opportunity cost of the funds invested in capital assets). The concept of opportunity cost is involved both in deriving asset values and in establishing an interest rate to represent the cost of capital.

The accounting approaches to resource valuation include cash-flow accounting, financial accounting (both historic cost and current cost) and management accounting. Financial accounting relates to the external reporting requirement of organisations and accordingly is subject to accounting standards designed to encourage comparability among reports and over time. These standards are generally based on historic costs, although proposals for current cost accounting are under consideration. It is notable that many companies, while adhering to the historic cost principle, do revalue assets (particularly land and buildings) from time to time to reflect rises in their values. Management accounting is concerned with internal

management decision making and employs a wide variety of techniques. Many of these techniques are similar to those used in economic analysis and are often, in effect, a practical application of the micro-economic theory of the firm.

It is apparent that the primary purpose for operating the aviation costing system is to provide useful information on costs in the airport/airway system, as one of several inputs into decisions concerning the setting of prices and cost recovery targets. Given this purpose, it is evident that the existing costing methodology has a number of shortcomings, particularly with procedures for valuing capital costs.

The terms of reference for this study required the BTE to identify alternative methods which might be adopted for the calculation of attributable aviation costs having regard to commercial practice. Commercial practice has, however, many variations depending on the objectives of the exercise being undertaken. If commercial practice for company reporting purposes was to be followed then there are several areas where the existing costing system would require changes. These include the procedures for the capitalisation of interest on land acquired before it is needed, superannuation payments, costing of services provided by other government departments, procedures for calculating interest costs and the periodic revaluation of assets such as land. However, commercial practices for management purposes have considerably more relevance than the commercial practices followed for company reporting given the primary purpose of the aviation costing system. Indeed, it is clear that the information produced following strict historical accounting practices for company reporting purposes has little use for decisions on pricing and cost recovery, either for a commercial enterprise or for publicly provided facilities. Although adoption of an economic approach is suggested in the report, this approach has a number of elements in common with current cost accounting methods and follows essentially the same basic procedures as used in commercial practice for management purposes.

The rationale for adopting an economic approach to guide the development of a costing methodology relates to the fact that the economic cost of the airport/airway system represents its true cost to society. The public utility aspects of the system, the existence of which are evidenced by its government ownership and operation and by the apparent existence of externalities, are also a strong argument for using the economic approach. In practice, however, constraints on the availability of data may mean that the procedures actually adopted will draw as much on management accounting concepts as on economics.

It needs to be emphasised that changing the costing base of the airport/airway system would not necessarily provide justification on economic efficiency grounds for changes in the charges levied on the aviation industry. The setting of charges should, in the short term, take more account of demand characteristics (including the ability of the industry to pay) and of the impact of externalities, than the level of costs. Over the long term, charges should be set to fully recover the replacement cost of assets employed, after allowing for externalities.

The economic approach suggested in the report is predicated on the importance of economic efficiency to Australian society. Even if non-economic objectives are important, or even perhaps dominant, information on economic costs remains essential to effective final decision making.

In the final chapter of the report a proposed costing methodology that represents a practical application of the economic approach to resource valuation is presented. The main features of the asset valuation methodology are:

- use of market values for land and some other readily saleable assets;
- use of indexed replacement cost for buildings, runways and other structures; and
- use of replacement cost for other assets.

In addition, it is suggested that the annuity method be used for calculating interest and depreciation for depreciable assets, in conjunction with a real interest rate. A real interest rate should also be used for calculating the opportunity cost associated with non-depreciable assets. Minor changes to the calculation of superannuation costs and the treatment of interest on non-operational assets (buildings under construction, land acquired before it is needed) are also suggested, but no changes are proposed for the treatment of inventories, current costs or asset lives. Adoption of the proposed methodology would provide a much better guide to the real cost to the community of providing and operating the airport/airway system. The proposed methodology is also consistent with important current accounting practices, involving in particular the revaluation of land and buildings to reflect market values. This demonstrates that practices followed commercially and in the costing of government provided services need not diverge markedly from one another.

CHAPTER 1—INTRODUCTION

ORIGIN OF THE STUDY

The Commonwealth Government through its Department of Aviation provides a significant proportion of the infrastructure for Australia's aviation industry. This infrastructure is subject to cost recovery policies. One input into the setting of aviation industry charges and cost recovery targets is the value of attributable aviation costs.

This study was initiated following expressions of concern by the international aviation sector about the level of aviation charges in relation to assessed costs and the subsequent questioning of the methodology used to calculate those costs. Terms of reference for a BTE review of valuation procedures for attributable aviation costs were agreed to in September 1982 after discussions among officers from the Department of Finance, Department of Aviation, the then Department of Transport and Construction and BTE.

The terms of reference for this study required the BTE to review the basis for assessing costs attributed to the civil aviation industry for cost recovery purposes. It was specifically stated that the allocation of costs among sectors of the industry was not to be covered in the review. The terms of reference were to:

(i) review the methodology for calculating the airport and airway and other costs currently attributable to the aviation industry for purposes of the aviation cost recovery arrangements;

(ii) having regard to commercial practice, identify alternatives which might be adopted for the calculation of costs referred to in (i) above; and

(iii) provide a report on these matters by 31 December 1982.

A draft report was completed in early 1983. A copy of the draft report was provided to the Department of Aviation because the work was largely based on information provided by that Department and authentication of some of the information was required. Following formal approaches from other Departments originally associated with reference of the study to the BTE, copies of the draft report were also provided to them.

SCOPE OF THE STUDY

The study was concerned only with the question of valuing currently attributable aviation costs. While alternative valuation procedures will affect allocation of total attributable costs among industry sectors, this aspect was not reviewed, as required by the terms of reference. For the same reason, the study did not examine the costs that should be taken into account for attribution purposes or the level at which industry charges should be set.

Possible modifications to existing valuation procedures or introduction of a completely new asset valuation methodology may be influenced by legal constraints, eg Section 92 of the Australian Constitution. Potential legal restraints on the implementation of various alternative valuation procedures were not explicitly considered in the study. It would appear, however, that there should be few legal problems in introducing changes to existing procedures provided that costs are calculated in a manner whereby no part of the cost could be regarded as a tax.

The core of this report consists of five chapters. Chapter 2 contains an outline of

current procedures for valuing attributable costs. Alternative approaches are discussed in Chapters 3 and 4, with Chapter 3 concentrating on an approach based on economic principles and Chapter 4 on a commercial/accounting approach. Philosophical considerations for valuing attributable aviation costs are presented in Chapter 5, along with an assessment of the existing methodology and a theoretical discussion of the relationship between revenues and the annual value of attributable costs. The final chapter contains practical suggestions for a methodology based on the economic approach.

CHAPTER 2—THE AVIATION COSTING SYSTEM

This chapter describes the Department of Aviation's costing system. Further details are given in Appendices I to IV. The chapter provides general background information on the costing system and its role in the cost attribution and cost allocation processes carried out by the Department of Aviation. A description of the methods by which certain attributable items are valued is also given. A more detailed description of the costing system is given in Appendix I, while Appendix II provides details of asset accounting methods. Appendix III gives a summary of the results of the Department of Aviation's costing system for 1980–81, and Appendix IV shows the calculations used to determine the aviation industry's share of the cost of providing meteorological services.

BACKGROUND

The Department of Aviation operates two accounting systems: the first system is based on the Department of Finance regulations for accounting by Commonwealth Government Departments; the second is a cost accounting system which provides an analysis of Departmental expenditures and revenues for cost recovery purposes. Nearly all of the Department of Aviation's receipts and expenditures are processed through both systems. Neither system uses any accrual accounting techniques but rather both systems are based on records of cash transactions, with the second system including certain imputed non-cash costs (described below).

The costing system presently used by the Department of Aviation was implemented in 1952 as a result of a court case concerning air navigation charges. No basic changes have been made to it since then, although there have been several changes in processing equipment over the period[1].

The introduction of an integrated financial system to prepare both the appropriation accounts required by finance regulations and the cost accounts used for cost attribution purposes has been under consideration for some years. The integrated financial system envisaged could also be capable of a number of subsidiary functions including stores control, debtors and creditors control, control of vehicle operations, and management of maintenance, installation and construction projects. Recently, the Department of Aviation commissioned a consultancy study of its financial system requirements and options for its enhancement[2].

Most Commonwealth Departments maintain only the Department of Finance system of accounting records. The Department of Aviation operates a second accounting system because the Department of Finance system does not provide a facility for suspense accounting or costing individual projects and services. For example, the Department of Finance system does have the capacity for recording salaries and expenses for Department of Aviation workshops, but such expenditures cannot be recorded in suspense accounts and then attributed to various capital and maintenance works and services.

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1. The costing system was originally designed for punched Hollerith cards and mechanical card sorters and has subsequently been operated on GE 225 and ICL 4/70 computers; it is currently being run on an ICL 29/60 machine.
2. The options available for implementing a new costing system include purchase of a complete software package off-the-shelf or development of the necessary software in-house by the Department's ADP Branch.

The primary objective of the Department of Aviation's costing system is to provide information for use in setting air navigation charges and for general management of the Department's operations and services. The system also provides data for management and control of workshops, vehicle fleets, equipment installation and construction, and maintenance projects.

The costing system is operated by the Department of Aviation's Central Office. The system is used to process expenditures and revenue data provided by its regional offices and by other Commonwealth Departments making aviation related expenditures, namely the Department of Finance (salary payments to Department of Aviation staff), Department of Administrative Services (purchases of land and residences) and Department of Housing and Construction (construction of airports, terminals and associated works). The cash payments made by the Department of Aviation to the Bureau of Meteorology for weather forecasting services provided for the aviation industry are also entered in the system. The Department of Aviation has estimated that its costing system handles about 1.5 million data entries annually.

The costing system also includes entries of imputed values for a number of indirect or non-cash costs, eg depreciation and interest on aviation assets. The methods by which these costs are calculated were the primary concern of this study. A description of the methods currently used to value these costs is given in the last section of this chapter.

COST ATTRIBUTION PROCESS

This section gives a brief description of the cost attribution process. A more detailed description of the Department of Aviation's costing system is given in Appendices I and II.

Table 2.1 shows the information entered into the Department of Aviation's computer system for each item of expenditure or revenue; items in the upper section of the table are entered for every transaction while those listed in the lower section are entered as required and otherwise are set at zero.

The financial data entered into the system from the various sources are consolidated by computer and then posted to appropriate accounts. The computer system is also used to maintain various suspense accounts. Posting transactions to the correct accounts requires a number of data files to be maintained in the system on code numbers for departmental locations, personnel numbers, works in progress on construction and equipment installation projects and registration numbers of departmental vehicles.

The Department's costing system provides several types of output. The primary output comprises an analysis of expenditures and receipts by account type and cost code which is generated for each region and for Central Office. A secondary output set includes cost analysis printouts for managers of workshops, field and technical work groups and vehicle fleets. The analysis of capital expenditure generated by the costing system is used, together with information from other sources, in compiling the Department's asset registers. These asset registers are maintained manually.

At the end of the financial year, information from the computer system is combined with figures from other sources to compile the Department of Aviation's annual accounts. These accounts include an analysis of the costs attributable to the aviation industry for cost recovery purposes and costs charged against consolidated revenue as part of general government services. The data from other sources comprise some of the costs from other departments making aviation related outlays, interest charges on assets and inventories, depreciation charges, and an estimate of that part of the present value of the Commonwealth's future superannuation liability for Department of Aviation staff which is attributable for cost recovery purposes. These cost items are discussed in more detail in the next section.

The costs attributed to the aviation industry are then allocated among the five sectors of the industry: international operations; licensed domestic trunk airlines; regional airlines; commuter operators (including supplementary airline operations); and the other general aviation sector.

In the allocation process, attributable costs are first divided into direct and indirect costs. Direct costs are those incurred at one of the Department's operational locations, such as airports or navigation aids, while indirect costs are taken as overhead costs incurred at the Central and regional offices, stores establishments and certain training establishments. Direct costs for each location are first allocated among the sectors of the industry, then the data on indirect costs are manually re-coded and a special

TABLE 2.1—SUMMARY OF DATA ITEMS RECORDED IN THE DEPARTMENT OF AVIATION'S COSTING SYSTEM

Data item	*Description*
	All entries
Cost period	13 x 4 week periods per annum
Region number	(1) Queensland (2) New South Wales (3) Victoria/Tasmania (4) South Australia/Northern Territory (5) Western Australia
Location number in region	A three digit code which together with region number uniquely identifies each location
Account type	(1) Capital (2) Maintenance and operations (3) Administration (4) Miscellaneous (5) Revenue
Cost account code	A three digit code indicating the type of facility eg airways facility, building, etc
	As required
Week number	Week number within cost period (1 to 4)
Labour costs	Work group number Employee number Normal hours worked Normal pay rate Normal pay value Overtime pay value
Vehicle costs (vehicles, aircraft, motorised plant, launches)	Vehicle class Registration number Type of maintenance (aircraft only) Vehicle hours or kilometres
Installation/maintenance	Job number Job type (16, 26, 36)
Materials value	Amount paid
Other expenses value	Amount paid

Note: See Appendix I for a more detailed description of information recorded in the Department of Aviation's costing system. Items listed in the upper part of the table are recorded for each transaction, while those listed in the lower section are entered as required.

Source: Department of Aviation (unpublished a).

computer program used to apportion it among the operational locations. The indirect costs for each Department of Aviation location are then allocated to the five sectors of the industry in the same ratio as similar direct costs. The Department of Aviation also receives revenues from various sources not directly associated with an individual sector of the aviation industry. Such revenues are allocated as credits among the sectors of the industry. The overall attribution and allocation processes are shown in Figures 2.1 and 2.2.

VALUATION OF ATTRIBUTABLE COSTS

The methods currently used by the Department of Aviation to value costs attributed to the aviation industry for cost recovery purposes are described below. Little documentation of the current valuation methods was available. The material presented below is largely based on information collected during interviews with staff from the Department of Aviation. There are no major difficulties in valuing those costs which involve regular cash payments. Therefore, attention is focused on the cost items which do not involve cash payments, which are presently valued using various accounting formulae.

Definitions

The valuation methods are based on the following definitions.

Gross book value of assets

In general, the gross book value of the Department of Aviation's assets, including land, is calculated as the cash price paid plus an amount equal to 50 per cent of the long term bond rate[1] in the year of purchase applied to the cash price paid. The book value of assets is based on the *cash price* paid for assets, which does not necessarily include all costs incurred in acquiring assets (eg costs of salaries for Commonwealth officers in Departments other than Aviation supervising purchase or construction of assets). The 50 per cent factor is based on the assumption that, on average, the expenditures made by the Department of Aviation occur half way through the year.

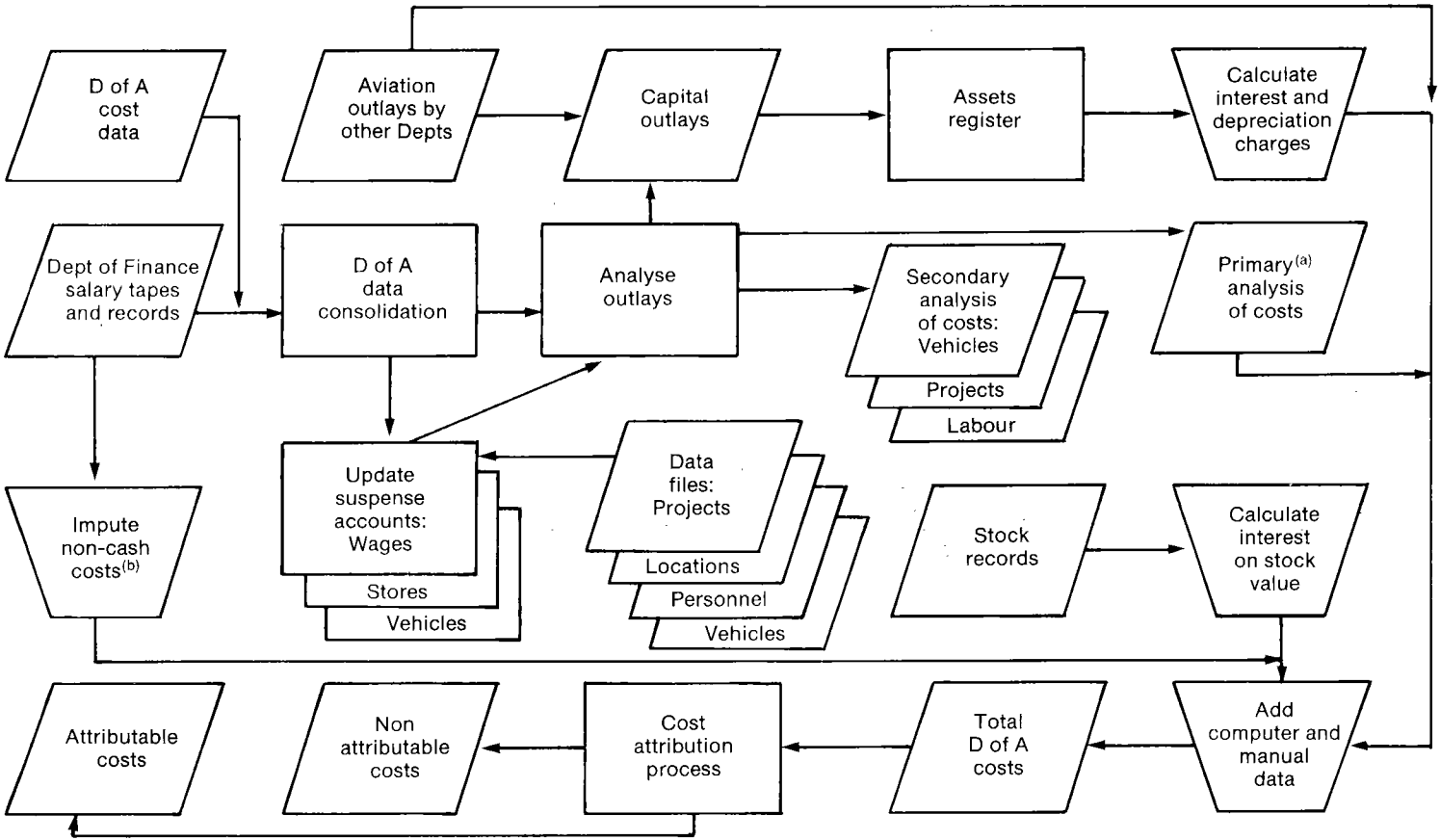
In cases where capital construction works, equipment installations, or additions to existing assets (eg fitting radios to vehicles) are carried out by private contractors, the entries in the asset registers show the full amount of cash payments involved, covering materials and equipment plus labour. Similarly, if the work is carried out by Department of Aviation staff, then the increase in capital values is shown as the cash paid for materials and equipment plus the cost of labour.

The gross book value of assets for which construction or installation works extend over more than one year, such as runways and buildings, is calculated in a slightly different manner. In the first year of construction interest is charged on the expenditure for that year at half the long term bond rate for the year. In each subsequent year, until the facility becomes operational, interest is charged on the original expenditure plus capitalised interest at the full long term bond rate applicable for the year of expenditure. When an asset becomes operational its gross book value is taken as the sum of cash expenditures for each construction year plus capitalised interest. After an asset becomes operational, interest is treated as a current cost. A more detailed description of the accounting procedures for assets under construction is given in Appendix II.

Net cash outlay

The net Commonwealth cash outlay on aviation is taken as the sum of cash outlays for aviation made by the Department of Aviation and other Commonwealth

1. Variations in procedures for selling Commonwealth bonds over recent years have required modifications to the empirical methods used to determine the value of the long term bond rate for asset valuation purposes; however, the method by which the long term bond rate is used to calculate interest charges has not changed.



(a) Cost x type x function x location
(b) Interest on net cash payments by D of A and superannuation liability

Figure 2.1—Cost attribution process

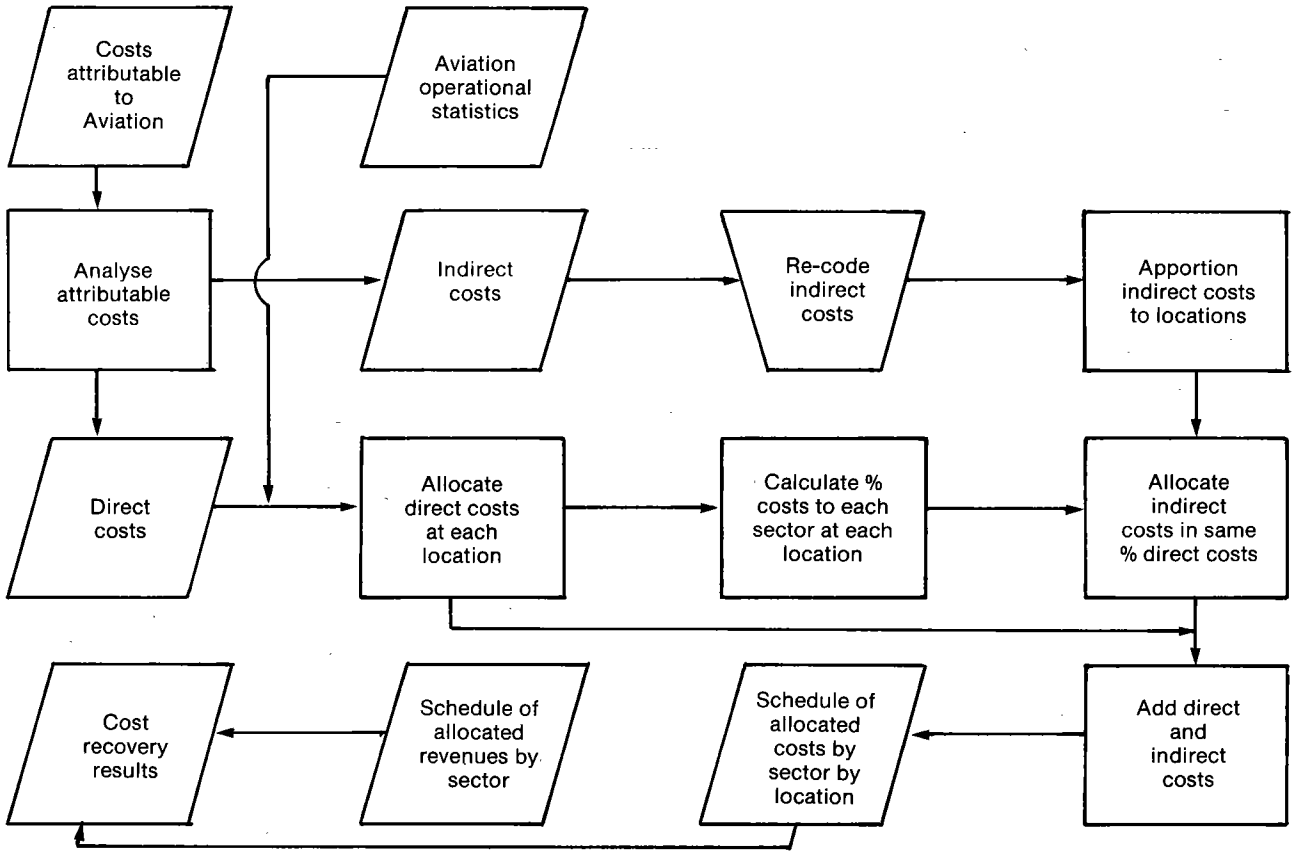


Figure 2.2—Cost allocation process

Departments, less revenue, less capital outlays. As discussed above in the definition of gross book value, total cash outlays on aviation do not include all aviation related costs, the major exception being salaries of officers from other Departments supervising the purchase or construction of assets for the Department of Aviation. The concept of net cash outlay is similar to the concept of working capital for a commercial firm.

Valuation methods

The following methods are used in valuing non-cash costs attributable to the aviation industry.

Depreciation

Depreciation charges are calculated, using historic costs, by the straight line method with the residual value of assets being taken as zero. Depreciation charges are levied on all Department of Aviation assets except land. The asset lives used by the Department in writing-off assets are based on the periods allowed by the taxation office for depreciation of similar assets by private sector firms. The depreciation periods for each asset type are shown in Table 2.2. Depreciation is not charged on land or on assets under construction.

Interest on assets

Interest charges on Department of Aviation assets are initially calculated as the product of the net depreciated value of assets and the long term bond rate in the year of purchase and subsequently at the rate of interest paid on the conversion loan which replaces the initial bond issue. Where expenditure on construction of a building or runway extends over more than one year, then interest for each year is capitalised until the asset becomes operational. Interest in future years is then charged separately on the amount of capitalised expenditure for each year of construction.

Interest on inventories

This charge is calculated as the product of the current long term bond rate and value of inventories on the first day of the current financial year. Interest on stores purchased during the year is included in the interest charged on net cash outlays (described below).

TABLE 2.2—DEPARTMENT OF AVIATION COSTING SYSTEM; DEPRECIATION OF ASSETS

Item	*Depreciation*	
	Period (years)	*Rate pa (per cent)*
Land	a	a
Runways, buildings and other improvements	40	2.50
Airways facilities	20	5.00
Fire service vehicles	20	5.00
Aircraft and equipment (general)	10	10.00
Aircraft and equipment (F28)	16	6.25
Marine craft and equipment	10	10.00
Stores, workshops and general equipment	10	10.00
Furniture and fittings	10	10.00
Computer equipment	10	10.00
Aerodrome maintenance equipment	8	12.50
Vehicles and vehicular plant	4	25.00

a. Land is not depreciated.

Source: Department of Aviation (unpublished a)

Land

Department of Aviation accounting procedures for land are similar to those for other assets except that it is not depreciated. The book value of land is taken as the actual cash paid plus 50 per cent of the interest in the year of purchase calculated as the product of the cash price and the long term bond rate. Land and assets transferred to the Department of Aviation at no cash cost from the Royal Australian Air Force or other crown authorities are entered in asset registers at zero value.

Interest is charged as a current cost on the value of landholdings from the year after the year of purchase, even where land will not be used for aviation purposes for several years. This differs from the practice adopted with other assets where interest on assets under construction is capitalised until the facility becomes operational. This practice is followed to avoid the accumulation of a large capitalised debt on which the aviation industry would be then charged interest when land came into operational use; in some cases it may be necessary to acquire land a decade or more before airport construction work begins. Revenue received by the Department of Administrative Services from land holdings for future aviation use is entered in the Department of Aviation's costing system as a credit.

Interest on net cash outlay

The concept of net cash outlay was defined at the beginning of this section. The interest on net cash outlay is calculated as 50 per cent of the product of the current long term bond rate and the net cash outlay.

Superannuation

A cost item is included in the annual accounts of the Department of Aviation to reflect the current value of the Commonwealth's future superannuation liability to employees of the Department of Aviation working in areas where costs are attributable to the aviation industry for cost recovery purposes. On the advice of the Commonwealth Actuary this amount is currently 20 per cent of the annual salaries paid to those staff contributing to the superannuation fund in the appropriate areas of the Department, although this percentage may vary from time to time.

The salaries of officers working in areas for which costs are regarded as attributable to consolidated revenue are not taken into account when calculating this charge; nor are salaries and wages paid to non-contributors to the superannuation fund. In recent years it has been necessary to calculate the superannuation charge for cost recovery purposes by an arbitrary 'rule of thumb'. This practice arose because the costing system did not provide an accurate allocation of salary costs between surface transport and aviation activities for common service areas, eg management services. In practice, the method used would not have resulted in superannuation charges being overestimated. In the future, estimates of the superannuation charge should be more accurate because accounts of the Department of Aviation will no longer include payments to surface transport personnel and hence it will not be necessary to base calculations on the 'rule of thumb'.

The superannuation figures recorded in the Department of Aviation's costing system are different from those published in the Department of Finance's appropriation accounts. The Commonwealth Government's superannuation payments are based on a 'pay-as-you-go' basis from consolidated revenue and hence figures published in appropriation accounts show actual current payments to retired staff of the Department of Aviation.

Aerodrome Local Ownership Plan (ALOP)

The Department of Aviation's capital and maintenance expenditures under the Aerodrome Local Ownership Plan (ALOP) are charged to the allocations for Local Ownership Development Grants (LODG) and Local Ownership Maintenance Grants (LOMG) respectively. LODG expenditure has, to date, involved only relatively small amounts which have been written-off as current costs attributable to the aviation industry. In future, major capital expenditures at locally owned airports will be

capitalised and depreciated in the same manner as assets at Government owned airports.

Before an asset is transferred to a local authority, the Commonwealth meets 100 per cent of capital expenditure necessary to bring facilities up to an agreed standard, except for expenditure on terminals which is shared equally between the Commonwealth and the local authority. After aerodromes are transferred to local ownership the Commonwealth meets 50 per cent of audited expenses for maintenance and, with two exceptions, 50 per cent of expenditure on approved capital works. The exceptions are: capital works involving improvements to movement areas necessary to introduce medium-sized jet services to country areas; and the upgrading of airports to meet a Commonwealth aviation policy requirement beyond the standard required for local operations. In both these cases the Commonwealth meets 100 per cent of the expenditure. In the latter case the Commonwealth may also agree to meet more than 50 per cent of subsequent maintenance costs on those facilities which have been improved to a point beyond local needs. These costs are paid from the LOMG and are attributed to the aviation industry.

When ownership of an aerodrome is transferred to a local authority, the net depreciated value of assets involved should, according to the Department's procedures, be written out of their books as a current expense attributed to the aviation industry. In practice these assets have not been written-off because the amounts involved so far have been small and difficulties have been encountered in calculating the value of assets involved. In the near future, however, it is expected that assets of much higher value will be involved in transfers and that these amounts will be written-off as the transfers take place.

Meteorological services

Meteorological services are provided to the aviation industry by the Bureau of Meteorology. The Department of Aviation specifies the services required and the Bureau decides how the services are to be provided. Cash payments are made by the Department of Aviation to the Bureau to cover the full cost of providing aviation meteorological services and the amounts involved are attributed to the aviation industry for cost recovery purposes. The cost of meteorological services is agreed by the Department and the Bureau to include all salary and wage outlays for staff directly involved in providing services to aviation, overhead costs attributable to such staff, costs of meteorology research for aviation and interest and depreciation on equipment used. In practice, the amount paid to the Bureau by the Department of Aviation is calculated by an agreed formula which gives total Bureau costs for providing aviation meteorology services as a function of wages and salaries for staff directly involved in meteorology work and other direct costs incurred. Appendix IV provides more details on the method of calculating meteorological charges.

CHAPTER 3—ECONOMIC PRINCIPLES AND THE VALUATION OF COSTS

This study was concerned only with methodologies for valuing attributable costs for purposes of the aviation cost recovery arrangements. It was not concerned with the question of what activities or use of assets should be regarded as attributable, or how the resultant costs should be allocated among sectors of the industry. It was also not concerned with the level and types of charges imposed on the industry. Accordingly, the economic principles discussed in this chapter are limited to those concerned with the valuation of resources that are regarded as attributable to the aviation sector under the existing cost recovery arrangements. While economic theory has particular relevance for the allocation of costs among user classes, for determining what items should be included as attributable and for establishing pricing mechanisms, these issues are not discussed in this report unless they impinge on questions of resource valuation.

DISTINCTION BETWEEN ECONOMIC AND ACCOUNTING CONCEPTS OF COSTS

It is important that there is a clear understanding of accounting and economic concepts of costs. Both accounting and economics are concerned with the best use of resources from the viewpoint of the accounting or economic entity. The economic entity may be an individual, a firm, a state or the country as a whole, while the accounting entity is restricted to bodies recognised as legal entities under the law; a partnership, company or government department or authority. Therefore, the economic viewpoint may encompass the accounting entity.

The accounting and economic valuation concepts used to measure resources also differ. Accounting focuses on the financial transactions of the entity and their manipulation in accordance with established rules. There are a variety of accounting methods available for use in different circumstances. These methods are discussed in greater detail in the next chapter but the essential element is the reliance on figures derived from financial transactions.

By contrast, the economic concept of resource valuation is concerned with the real value of resources used regardless of the financial transactions that may have taken place. The economic concept used is opportunity cost, which is the benefit foregone, or the opportunity lost, by not using the resource in its next best alternative use. Financial transaction values often reflect the economic opportunity cost of a resource, particularly when the viewpoint of the firm or individual is adopted and questions of externalities and taxes (for example) are not relevant. However, economic concepts give a much broader meaning to costs, including consideration of resources which have no market (and hence no financial transaction based value) and of the social costs of resources.

The approach to valuing attributable costs using economic principles depends on whether they are current or capital costs. Costs can be regarded as being of a current nature where they relate to a resource from which the benefit is exhausted within the accounting period. In terms of the existing cost recovery arrangements, the

accounting period is the financial year. The operating costs of the airport/airway system over this period can be regarded as being current costs[1].

Capital costs relate to resources which are expected to generate benefits beyond the accounting period in question and in most cases over a life of several years. These types of resources are commonly described as fixed assets. There are two elements to valuing capital costs: one is the change in the real value of the resources during the period (often termed depreciation); the other is the real opportunity cost of the resources tied up in the system (which can be regarded conceptually as an interest charge). Thus capital costs for any particular accounting period are the sum of the depreciation and the interest charge on the fixed assets in real terms over that period.

The value of current costs and both elements of capital costs for a specified period indicate the real economic cost of providing the airport/airway system for that period. Taken together these costs represent the real value of resources consumed and the benefits lost to the community from having resources committed to this, rather than some alternative, activity.

VALUING CURRENT COSTS

The valuation of current costs over a particular accounting period is, conceptually, relatively straightforward compared with the valuation of capital costs. The market prices of current inputs can be used provided that they are regarded as a reasonable approximation of the real opportunity cost to the entity under consideration (eg firm, organisation, state, nation). If it is considered that the market price does not properly reflect the real opportunity cost of an input for some reason, then appropriate adjustments should be made to the price. Market prices may, for example, be inappropriate when taxes or subsidies are involved (except when they are introduced to correct a market imperfection or to internalise externalities). In this case the subsidy or tax represents a transfer payment rather than part of the real value to society of the input, and market prices must be corrected for these distortions to derive actual opportunity cost.

If current inputs are supplied in a market where imperfections materially affect the price/quantity mix of the inputs and there are no taxes or subsidies to correct for these imperfections, there may be a case for adopting a shadow pricing approach to the measurement of their costs. The shadow price, if it can be calculated, represents the economic opportunity cost of an input where this cost diverges from market price and should be used if the intention is to adopt full economic costing.

VALUING CAPITAL COSTS

As noted above, the valuation of the capital costs of providing a facility over a specific time period involves two components. These are the depreciation element and the interest element. The economic approach to valuing each of these items is more complex than valuing current costs, although the ideas behind depreciation and interest charges are simple enough.

Depreciation

Depreciation is the difference in value (in real terms) of fixed assets at the start and end of an accounting period. These values would include the impacts of deterioration, obsolescence and changes in demand for the outputs of the fixed

1. In economic terms, current costs are conceptually similar to variable costs and are avoidable in the financial year period. They represent the minimum levels of costs that need to be recovered to justify on economic efficiency grounds the continued operation of the airport/airway system, or individual parts of it. In the long run, a higher level of costs, including capital costs, must be recovered to justify replacement of the fixed assets at the end of their lives.

asset[1]. The economic rule for obtaining the value of an asset has already been stated. Its value is its opportunity cost, ie the sum of the discounted benefits foregone from not employing the asset in its next best use.

Supply and demand forces in a perfectly competitive market for assets would ensure that the opportunity cost of an asset coincided with its capitalised value (ie the discounted sum of the future stream of net benefits in its existing use). Where market imperfections exist these two valuation bases, opportunity cost and capitalised value, might be expected to diverge. Reasons for their divergence include investment mistakes, the presence of monopoly power or government intervention affecting ownership and operation of certain types of assets. If these values should diverge then the appropriate one to take as the value of the asset is the higher of the two, since this will more closely reflect the benefits to be derived by society from the use of the asset.

Accordingly, two methods to derive the value of an asset are available, namely opportunity cost value or capitalised value. Calculating the capitalised value of a fixed asset will have practical difficulties, including estimation of length of life, discount rate, future price levels and demand patterns. There is also a circularity problem when the purpose of estimating the capitalised value of an asset is to determine depreciation, which in turn is an element of the costs which are being calculated as an input to setting prices for the use of the asset. The normal approach is to set prices in accordance with demand and marginal cost and to calculate the capitalised values that result from those prices, rather than, as here, attempting to use capitalised values as an input into the price determination process. The conceptual solution to this problem lies in the use of current market values for assets, since these will reflect economically efficient pricing policies for the asset (even if they are not currently being followed).

An alternative formulation of the depreciation problem is to regard it as a question of allocating the real capital cost of the asset over time. The solution to cost allocation problems, where, for example, an organisation's fixed and overhead costs are to be allocated among different products is well established: costs which are common to more than one product should be allocated to each product in inverse proportion to their price elasticity of demand, so that more is allocated to those products whose users are least deterred by higher prices and less is allocated to those products where demand is sensitive to higher prices. By analogy, the allocation approach to depreciation will apportion larger amounts of depreciation to those years when demand for the products of the asset is high and smaller amounts to those years with low demand for the product. such that, over the life of the asset, the full value is depreciated. In practical terms the allocation approach may, in an imperfect real world, be of greater use than the capitalisation approach since depreciation could be calculated by a throughput or turnover based 'rule of thumb'.

The capitalised value approach and allocation approach to calculating depreciation require estimates of the mean expected life for each type or class of asset. Using opportunity cost does not require an explicit estimate of asset life because the remaining life is implicitly part of the opportunity cost valuation. The length of life of an asset will be influenced by its physical deterioration, obsolescence, inadequacy to perform its functions in a technical sense and changes in demand for the output of the asset; all factors that, in terms of *ex ante* analysis, would be subject to considerable uncertainty.

Interest

The second element for valuing the cost of a fixed asset is the interest component or the benefits foregone from having the investment in the asset over the period

1. It is possible that these factors might operate in different directions resulting in the value of an asset appreciating in real terms over an accounting period.

in question; an investment that, if not tied up in this activity would be available for use elsewhere in the economy. In practical terms, the calculation of this component involves assessing the value of the assets and the benefits that would be derived if assets of this value were re-allocated elsewhere in the economy.

The same principles for valuing assets for depreciation purposes are applicable for deriving the value for interest calculations. The value should be the higher of opportunity cost or capitalised value. However, unlike depreciation, interest charges should not be restricted to fixed assets, but should also be applied to net working capital because this represents a real resource which also has a benefit in other uses. The value of current assets and liabilities that go together to make up net working capital would normally be their financial costs.

Deciding on the rate of return foregone from having assets in the airport/airway system is difficult and requires judgements about the alternative use of the investment in the system. If the alternative is investment by the Government in other parts of the economy, then the real long term bond rate or equivalent might be the appropriate measure of the real opportunity cost of capital investment in the airport/airway system. However, if the alternative is investment in the non-government sector of the economy, then the real cost of funds to the private sector, possibly in the transport industry, may be the appropriate opportunity cost measure. This issue is addressed further in Chapter 6.

CONCLUDING COMMENTS

The theoretical economic principles involved in resource valuation are relatively straightforward: the practical considerations are discussed in a later chapter. The general economic approach, as distinct from the accounting/commercial approach, involves the concept of opportunity cost, ie the benefits foregone by not using the resources in their next best alternative use. This concept has general application in the valuation of resources from an economic viewpoint.

Valuing current costs items, which are resources fully consumed in the accounting period, presents no real problems when market price properly reflects the true opportunity cost. When this does not occur the shadow price of the resource should be determined and used as the value.

Valuing capital costs over an accounting period is more difficult than valuing current costs. Capital costs relate to those resources that provide benefits over more than one accounting period and comprise the depreciation cost (the value of the resource used up over the period) and interest costs (the benefits foregone from having the investment in that asset) of the resources. Depreciation can be conceived in terms of either an asset valuation problem or an allocation problem over time. The interest cost also involves asset valuation, but over a wider definition of assets that includes working capital and land as well as depreciated fixed assets. The other element of interest cost is the interest rate that represents the real rate of return on the capital if it were employed in the next best alternative.

CHAPTER 4—COMMERCIAL AND ACCOUNTING CONSIDERATIONS IN THE VALUATION OF COSTS

The same issues of resource valuation that were considered in the previous chapter are addressed in this chapter from an accounting and commercial viewpoint in contrast to the economic approach. Both accounting and economics, as noted earlier, are concerned with the best use of scarce resources, but accounting often takes a narrower viewpoint of the accounting entity and involves the manipulation of data that are readily available and can be verified. The accounting definition of costs is also much narrower than the economic definition, as are the accounting concepts themselves, directed as they are to quite specific ends.

There are three main accounting approaches, each with its own purpose and procedures. These approaches are: cash-flow accounting which involves treating capital expenditure as if it were current expenditure; financial accounting for external reporting of an organisation's financial state; and management accounting to aid internal management decision making within the firm. The latter two approaches could be regarded as commercial approaches to resource valuation.

CASH-FLOW ACCOUNTING

Cash-flow accounting, which is used by the Federal Government to record its revenues and expenditures, is characterised by the absence of a balance sheet and balance sheet accounts. All expenditure and revenue, whether of a current or capital nature (as defined earlier), is recorded as current expenditure, there being no asset accounts, no inventory accounts, no deferred expenditure accounts and no work in progress accounts. Records of some balance sheet items such as debtors, loans and bank account balances may be kept for management control purposes, but are not formally brought together in a balance sheet.

As capital expenditure is written-off entirely in the year it is incurred, rather than over the life of the capital asset, questions relating to depreciation method, asset valuation and length of asset life, do not arise. Interest charges are restricted solely to payments actually made; if no interest payments are made then there is no interest expense. No provision is made for other expenses that may be incurred during a year but not actually paid until the following year. There is no problem distinguishing between repairs and maintenance costs of a capital nature and of a current nature as all such expenditure is treated as current. All inventory is regarded as used when purchased and is recorded accordingly, so there are no difficulties with inventory valuation.

The advantages of cash-flow accounting are that it is simple to implement and that it is objective, requiring no judgement or estimates on the part of the accountant because all figures in cash-flow statements are directly under-pinned by financial transactions and need no further manipulations. Cash-flow accounting can also be very useful for the management control function of an organisation, particularly as an aid to investment analysis and the analysis of funding requirements. This is recognised both in the role of cash-flow accounting for internal management purposes and in the presentation of statements of sources and uses of funds (which are conceptually similar) as part of the financial accounts of firms.

From an accounting viewpoint, the objection to the cash-flow accounting approach is that it diverges from the important accounting principle of matching costs and

revenues which is the foundation of accrual accounting. The matching principle requires that the expenditure incurred in earning revenue for any one period be brought to account in that period, rather than at the time cash payments are made[1].

An associated problem is that any organisation that undertakes capital expenditure in an uneven flow may, if the capital expenditure is significant, record cash-flow expenditures which vary markedly from year to year. If these costs were used as the basis for setting prices it would lead to prices that also varied markedly from year to year, with unpredictable effects on the welfare of users. There could also be a problem with inter-temporal cross subsidies, where the users of one period pay for a facility but users of later periods benefit from it.

FINANCIAL ACCOUNTING

The objective of financial accounting is to provide relevant and timely financial information about an organisation to people outside the organisation with an interest in it, such as shareholders, creditors, bankers and government agencies. This information is presented in the form of a balance sheet showing:

- the assets, liabilities and owners equity;
- a profit and loss statement detailing income and certain classes of expenditure; and
- a statement of sources and uses of funds, being basically a cash-flow statement for the firm.

The financial figures are normally supplemented by notes explaining methods used and providing additional information. These notes are often as important as the actual balance sheet statements themselves.

The most important aspect of financial accounting is that, to ensure comparability and consistent interpretation, financial statements are required to be prepared in accordance with normally accepted accounting standards. Ensuring that the standards are adhered to is the role of auditors who examine the accounts and, where they are acceptable, certify them as presenting a 'true and fair view' of the financial operations of the firm. These standards are in some cases set out by the Australian Society of Accountants and in other cases have been established by regular usage. The intention in applying these standards is to provide financial information that is relevant and consistent, both among firms and over time, so that users of the information can make informed decisions about the firm.

As with cash-flow accounting, the financial transactions of the firm form the basis of financial accounting figures. Unlike cash-flow accounting, however, the matching principle for revenues and expenses is adhered to, resulting in the need to consider questions of asset valuation and depreciation. The present standard provides for the valuation of assets on the basis of their historic cost, as supported by the financial transactions undertaken when the asset was originally acquired. The standard of the Australian Society of Accountants (AAS4) also allows for the revaluation of assets, either upwards or downwards, but does not provide any guidance as to when or how such revaluation should or should not be undertaken. The revaluation rule established by usage is that assets are valued at the lower of market value or historic cost, but it would seem that upward revaluations in response to the effects of inflation are also possible without prejudicing the 'true and fair view' requirement, providing the basis of revaluation is disclosed.

Accounting depreciation is regarded as a matter of allocating the historic cost of the asset over its life, rather than being an adjustment to the valuation of the asset

1. Similar conceptual objections to using a cash-flow accounting approach would also be raised from an economic viewpoint.

reflecting the using up of its service potential. Thus depreciation need not be related to the actual deterioration or obsolescence incurred in any one financial year, or to the market value at the start or finish of the year, although these factors may influence the choice of any one depreciation method.

The length of life of an asset will vary from asset to asset and may be expressed in terms of time, units of use or output. The guidance to length of life provided in AAS4 is that it would normally be the shortest of the physical, the technical (related to obsolescence), the commercial (related to demand for output) or where appropriate, the legal life of the asset. For tax purposes new plant, equipment and vehicles can now be depreciated over three or five years and new buildings over 40 years; however, the accounting lives of assets are supposed to be determined indepedently of tax considerations.

Once the asset value and length of life have been established the depreciation charge is calculated by one of several methods, the most common being straight line, declining value, sum of the digits and units of use or output.

The effects of the first three of these methods are depicted in Figures 4.1 and 4.2, which show, respectively, the annual depreciation charge and the depreciated value of the asset remaining in each period for an asset with a historic cost of $10 000

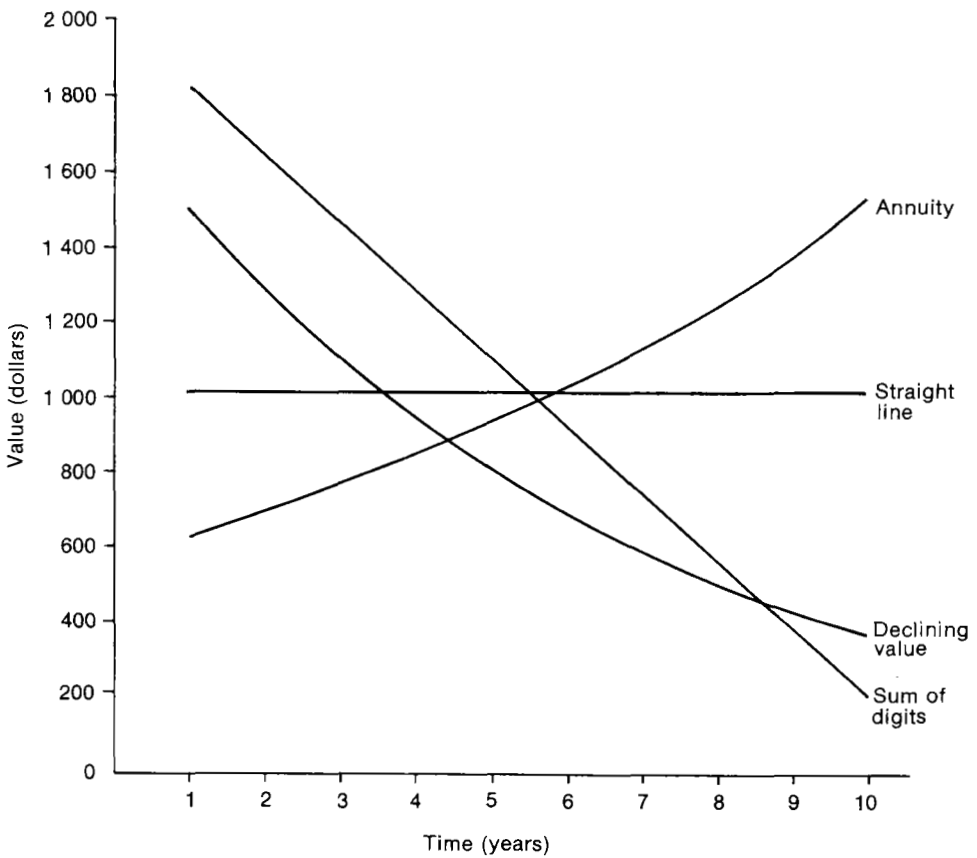


Figure 4.1—Annual depreciation charges

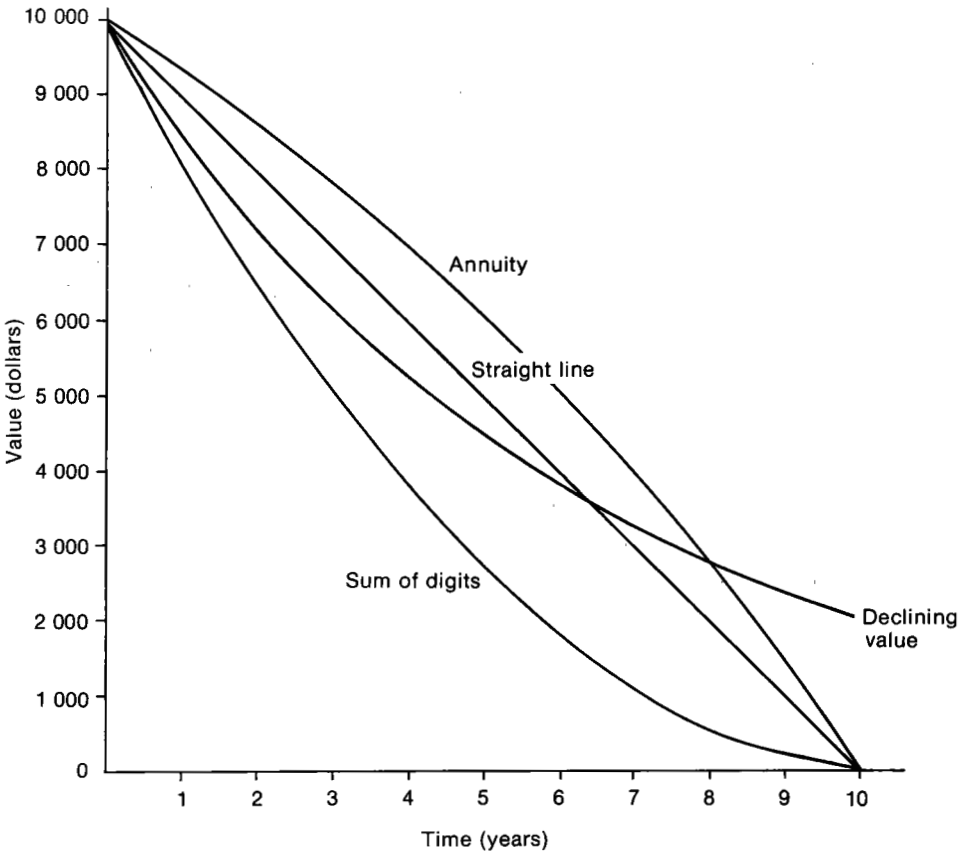


Figure 4.2 — Depreciated value of asset

and a 10 year life. Under the straight line method the asset is depreciated in 10 equal annual instalments over its 10 year life. The declining value method, for an asset with a 10 year life, requires depreciation to be calculated as 15 per cent of the depreciated value each year. This results in a charge that declines over time and in a residual value for the asset that remains positive irrespective of the asset life. The sum of the digits method also concentrates depreciation in the early years of the asset life, but results in a full write-off of the asset[1]. This method can also be used in reverse, with low charges in the early years and higher charges in later years. The methods involving units of use or output require further assumptions to be made before they can be shown diagramatically and can result in charges of varying levels, depending on use or output. Each of these depreciation methods are acceptable from an accounting viewpoint. The selection of one particular method to use in preparing a firm's accounts is largely an arbitrary one and is based on such considerations as consistency over time and among asset classes and the type of operation of the firm.

1. Depreciation is calculated using a fraction, the denominator of which is the sum of the numbers of the years of useful life and the numerator is the remaining useful life: in this case 10/55 in the first year, declining to 1/55 in the tenth year.

Figures 4.1 and 4.2 also show annual depreciation charges and depreciated values of assets as calculated by the annuity method. The annuity method, which is not normally used in financial accounting, is discussed further in the section on managerial accounting below.

One other standard of the Australian Society of Accountants relevant for this study is AAS9 because it gives guidance about expenditure carried forward to later accounting periods. This standard provides that expenditure should be carried forward by way of the balance sheet (or capitalised) if it can be clearly identified as contributing to future revenues of the organisation sufficient to cover the expense carried forward, or where the expenditure is associated with an asset with a realisable value at least as great as its book value: otherwise expenditure should be recorded as a current cost in the year incurred. Thus development expenditure for new facilities for use in the future production of goods or services would normally be accumulated until significant use of the facilities commenced. In the case of periodical major overhauls and renovations, however, the opposite approach should be applied. In these circumstances provision for the expense should be made during the period leading up to such overhauls and renovations, so that the expense is recorded in advance of being paid and written-off when the overhaul/renovation is actually undertaken. Standard AAS9 also provides that expenditure on spare parts base stock of significant value, held over the life of the equipment, should be capitalised and accounted for in the same way as the equipment itself.

In accordance with the matching principle and AAS9, interest costs in financial accounting are recorded as they are incurred rather than as they are paid, so that the capitalisation of interest is possible. However, all interest costs, whether capitalised or expended, are based on actual transactions.

Other formal accounting standards cover such areas as disclosure requirements, presentation of accounts, materiality, accounting for income tax and accounting for events after balance date. None of these are of direct relevance for the purpose of government valuation of attributable aviation costs.

Beyond the specific formal accounting standards set out by the Australian Society of Accountants, accountants are guided by generally accepted accounting principles, such as matching costs and revenue, consistency of treatment, prudence in the assessment of uncertainties, relevance to users and materiality.

INFLATION ACCOUNTING

While the accounting standards described above are those currently in force, the accounting profession in Australia is debating the adoption of some form of accounting that specifically allows for inflation.

The Australian Society of Accountants has issued a draft standard for current cost accounting, an inflation accounting system that involves, in brief, the replacement cost valuation of assets. Alternative inflation accounting methods that have been rejected include systems based on market selling values of assets and on historic asset costs indexed by changes in general price levels (so that values are presented in terms of current purchasing power). Similar current cost based accounting systems have been adopted, or proposed for adoption, in the United Kingdom, United States, Canada and New Zealand as a supplement to historic cost accounting. These systems are required either by stock exchange listing rules, or in the standards set by accountants' professional associations. One relevant example of the use of current cost accounting is the British Airports Authority where current cost accounting standards have been adopted completely for reporting purposes. The methods followed by this Authority are outlined in Appendix V. British nationalised industries and most large private sector companies in the United Kingdom generally apply current cost accounting standards to their accounts.

Current cost accounting defines capital as the operating capability of the accounting entity rather than the dollar value of the shareholders funds, as under historic cost accounting. It is only after the maintenance of this operating capability that a profit can be struck (assuming no new investment or disinvestment). The firm's operating capability in turn derives from the service potential of the resources available to it, service potential being defined as the economic utility of an asset to the firm, based on the total benefit expected to be derived from use of the asset. In this sense the value of an asset under current cost accounting has a conceptual similarity to the economic definition of the capitalised value of an asset, as described in Chapter 3. However, the practical interpretation by Australian accountants of the concept results in a replacement cost valuation rule, rather than the market sale value which is implied by the economic viewpoint. The market sale value (net realisable value) approach is rejected by accountants as reflecting the breakup value of the firm rather than its worth as an on-going operation and because it involves greater scope for subjectivity to enter into the valuation process.

Compared with historic cost accounting, current cost accounting basically affects asset valuation: it should have no influence on the length of asset life, nor the depreciation method adopted. Asset valuation is undertaken by reference to the current replacement cost or market buying price of the asset where this is available. If this is not available, it is permissable to use the historic cost indexed over time by a price index related to the class of asset concerned (not a general price index) or to calculate the cost on the basis of a standardised cost per unit of service potential for the type of asset. There is also provision for assets to be written down to their recoverable amounts (net realisable value) although it is envisaged that such a write down would only occur in exceptional circumstances. In the normal course of events, written down current cost is presumed to be recoverable and hence appropriate as an asset valuation base.

The coverage of the draft Australian standard for current cost accounting is more comprehensive than simply dealing with asset valuation. The standard also sets down rules for adjusting profits for gains or losses on holding monetary assets and liabilities (such as trade creditors and debtors and loans) that result from the effects of inflation, as measured by the Consumer Price Index or a similar index. Adjustments are also required to inventory valuations to record them at current replacement costs. However, most current expenditure items, including interest incurred, are accounted for on the same basis as in historic cost accounting, that is, using the actual transaction figures and accruing or deferring amounts where necessary to meet the requirements of the matching principle.

A number of Australian companies have adopted elements of inflation accounting although the draft standard for current cost accounting is still under review. The most notable is the Broken Hill Proprietary Company Ltd (BHP) which uses a fixed asset value adjustment, effectively valuing BHP's fixed assets at replacement costs for purposes of calculating depreciation. According to the *Australian Financial Review* 31 August 1983, page 48, CRA Ltd, MIM Holdings Ltd, E.Z. Industries Ltd and Alcoa of Australia Ltd also revalue their fixed assets every two years. Amongst Australian companies involved in the transport business, Brambles Industries Ltd, Ansett Transport Industries Ltd, Mayne Nickless Ltd, P&O Australia Ltd, Thomas Nationwide Transport Ltd and Trans Australia Airlines all note in their 1982 Annual Reports that freehold land and buildings have been revalued at some stage, either by the directors of the company or independently. In most cases other fixed assets continue to be valued at cost. Both Qantas Airways Ltd and East-West Airlines Ltd value properties at cost, although East-West Airlines did revalue its aircraft in 1980.

Thus the concept of revaluation of assets for purposes of financial reporting, as proposed under inflation accounting, has gained some acceptance in the Australian business sector, particularly for land and buildings.

MANAGEMENT ACCOUNTING

The purpose of management accounting is to provide financial information for internal management decision making as part of the firm's management information system. As with other forms of accounting, management accounting is based on financial transactions from the viewpoint of the accounting entity. Unlike financial accounting, management accounting is not bound by formalised accounting standards. A wide variety of financial analysis techniques can validly be used, depending, *inter alia*, on the particular decision that is being considered. The procedures of cash-flow accounting, financial accounting and the use of economic techniques (from the accounting entity's viewpoint) may all have a role to play.

Management accounting is used to provide information as an input to decisions about pricing, costing, the purchase, holding or disposal of assets, alternative methods of financing, wage rate negotiations, allocation of joint costs and similar matters.

As an example, most companies would be expected to use either market selling prices or replacement cost prices for assets in any consideration of buying, holding or selling those assets. Companies might also use such asset values in pricing decisions, although they are more likely to set prices in relation to direct operating costs plus a margin set at a level the market would bear, out of which fixed overhead and other non-cash costs would be met; fixed asset costs (depreciation and interest) may take little direct part in pricing decisions. At the same time companies would expect to recover at least the opportunity cost of holding the asset out of the margin above direct operating costs, because if they did not it would pay them to sell the asset and in fact earn the return that is available in the next best alternative use. In the long term, companies would be seeking to recover the replacement cost of fixed assets from revenue, otherwise it may not be worthwhile re-investing to replace them.

One specific management accounting example quoted to the BTE by a transport company involved the possibility of withdrawing certain transport services. In calculating the savings that would be made the equipment and vehicles used were valued at their second-hand market values. The benefits from the funds made available from the sale of these assets were valued at the interest that would be saved at the current bank overdraft interest rate. on the basis that the funds would be used in fact to reduce the company's bank overdraft. Both the asset values and the interest charges were calculated as hypothetical, estimated values, that may well have no relation to the written down historic cost book value of the assets, nor to the actual interest cost incurred by the company in the accounting period.

The above example demonstrates that management accounting makes use of principles similar to the economic concept of opportunity cost by bringing in the idea of market values of assets and marginal borrowing costs. An alternative approach, where funds used for investment or released from the disposal of an asset are not related to a specific loan, would be to calculate the weighted average cost of capital for a firm. This average is calculated using the cost of debt and the cost of equity financing, weighted in proportion to the debt/equity ratio of the firm. The cost of debt element would include both interest expense for the organisation and exchange losses or gains for overseas borrowings which are not hedged. The equity element could be calculated by reference to the Capital Asset Pricing Model, by which the cost of equity to a specific firm can be determined in relation to the expected return for the national share market as a whole, after allowing for the difference in assessment of risks. D'Ambrosio (1976) provides a more detailed explanation of the Capital Asset Pricing Model.

Management accountants might also make use of annuities to calculate annual capital costs, given asset value, asset life and the appropriate interest rate. Provided that the interest rate used over the life of an asset does not change, an annuity provides

for a constant annual payment. This payment comprises a principle component plus an interest component (or in a different application, depreciation plus interest) where the proportions of interest and principle vary over time, with interest declining as principle repayments are made and principle payments increasing to maintain the constant annual payment. Annuities employ the same concepts as discounted cash flow analysis, which is often used by companies for the analysis of new projects.

It is apparent that many of the techniques employed in management accounting utilise economic concepts. This result is not surprising given that management accounting can be regarded as the practical application of the economic theory of the firm.

CONCLUDING COMMENTS

The discussion in this chapter has focussed on the accounting considerations for asset valuation.

The cash-flow accounting system, as followed in government accounting, has little relevance for the valuation of attributable costs of fixed assets since it is really only directed at accounting for the actual use made of funds provided for the year. The advantages of this system are that data collection is easy and estimation problems are avoided. However, problems are encountered in this system with the matching of costs and revenues, with the irregularity of the flow of capital expenditure and with inter-temporal cross-subsidies.

Financial accounts ~~are prepared to~~ meet the external reporting requirements of organisations. To facilitate comparability, both inter-firm and over time, financial accounting standards have been developed. These standards include the historic cost valuation of assets (although re-valuation of assets is permitted) and guidance on depreciation, inventories and capitalisation of expenditure. Inflation accounting methods are also under active consideration and current proposals put forward by the Australian Society of Accountants provide for essentially the replacement cost valuation of assets, together with other appropriate adjustments to historic cost based figures. These proposals are currently the subject of debate in the accounting profession and it is not clear when, if ever, they might be implemented for external reporting requirements in Australia. Some Australian companies have already adopted elements of current cost accounting although they may also report their financial accounts using the historic cost valuation of assets.

The techniques of management accounting have been developed to provide information for management decision making within the organisation. The techniques used and information required depend very much on the particular decision under consideration. However, it is clear that, for pricing decisions, market values, or in some circumstances replacement costs, are of far greater importance than historic costs of fixed assets. In fact, in many respects the costs used in management accounting are similar to the economic concept of opportunity cost, as described in Chapter 3.

CHAPTER 5—IMPLICATIONS OF ECONOMIC AND COMMERCIAL ACCOUNTING VALUATION METHODOLOGIES

This chapter provides an assessment of the existing methodology and sets out a suggested philosophy for selecting guidelines for an improved valuation procedure. It concludes with a discussion of the relationship between the cost of providing aviation facilities and determining the price for the use of those facilities. The next and final chapter draws together the points made in the previous chapters to report on alternative practical procedures which could be followed to value attributable costs.

ASSESSMENT OF EXISTING METHODOLOGY FOR VALUING ATTRIBUTABLE COSTS

The costing methodology currently used to value attributable aviation costs has a firm basis in the historic cost accounting system. The values of assets are recorded at the historic cost of the transaction by which they were acquired; where assets were acquired at no cost, they are recorded on that basis. The depreciation of assets on a straight line basis over their remaining lives is also consistent with historic cost accounting requirements. However, the current Department of Aviation system diverges from historic cost accounting procedures with the imputing of interest charges on assets employed, as these interest charges are not supported by any underlying financial transactions by way of interest payments from the Department of Avation to the Department of Finance. The interest charges are, rather, a management accounting device that purports to represent the opportunity cost of the funds employed in the airport/airway system.

As there are no transactions underlying the interest charges, it is not possible to say from a financial accounting viewpoint whether interest charges should be made against inventories or net cash outlay or any other class of assets. Financial accounting standards do, however, provide support for the capitalisation of interest on buildings under construction and other assets for which payment is made before they become income-earning. Accordingly, with several exceptions, the non-capitalisation of interest on land acquired before it is needed does not follow financial accounting standards. The exceptions are where it is not expected that sufficient future income will be earned from the eventual operational use of the land to recover the capitalised interest cost and where the land is used to generate some income from non-airport uses until required for airport use. Whether the cost can be recovered or not, it seems clear that both land and buildings under construction should be treated in the same way. The treatment of superannuation is also likely to be unacceptable in financial accounting terms as it is not supported by financial transactions.

If the objective were to adopt historic cost accounting on a proper commercial basis, there are several other areas that may require attention. For example, some formal arrangement may be required to cover services provided at no charge to the Department of Aviation by other government departments, such as the planning and supervision of construction projects undertaken by the Department of Housing and Construction. Some of the more detailed procedures for calculating interest costs and the costs associated with new building construction may need to be altered because, while short-cut methods may be acceptable from a management accounting viewpoint, they may not be acceptable for the different requirements of financial

accounting. The absence of accrual accounting procedures would also need to be corrected to allow a proper balance sheet to be drawn up.

If the current cost accounting system proposed by the Australian Society of Accountants is ever implemented in Australia, the existing valuation methodology would suffer from all the criticisms to which it is subject in comparison with historic cost financial accounting, together with the absence of any provisions for the revaluation of assets. In fact, the divergences of the existing costing methodology from the standards of financial accounting, whether historic cost based or current cost based, are great enough to suggest that financial accounting practices for purposes of external reporting could not be regarded as the underlying philosophy behind the methodology.

It is more appropriate to regard the existing costing methodology as part of a management accounting system for which various analytical techniques can be used. The choice of technique depends on the management decision being undertaken, which in the case of the Department of Aviation costing system is related primarily to the setting of cost recovery levels and prices. The analysis should also be relevant for estimating the economic costs to society of new projects or operational proposals, which are in turn important considerations for economic efficiency and correct resource allocation. For cost recovery to have any relevance or meaning at all from a society viewpoint, it must be in terms of the economic value (as opposed to the historic transaction cost) of the resources employed in the activity; cost recovery being the relationship between actual resources employed and actual revenue raised from an activity. If the objective of maintaining the Department of Aviation accounting system is to produce relevant information for establishing meaningful cost recovery levels and setting prices it is clear that the existing costing methodology is irrelevant and counter productive. This is particularly so in an inflationary environment where it may lead to decisions being taken that are neither rational nor efficient in terms of the objectives of a profit or economic welfare-maximising organisation.

As noted in Chapter 4, there are considerable similarities between the concepts applied in management accounting and those applied in economic analysis. Accordingly, much the same criticism of the existing costing methodology would apply when viewed against either of these approaches. The use of historic cost asset valuation methods is of no use for economic decision making. Use of the long term bond rate which applied in the year of purchase or construction is also misleading, as it is unlikely to accurately reflect the current real opportunity cost of the resources employed. The factors affecting depreciation levels were discussed in Chapter 4: it seems unlikely that economic depreciation would take the form suggested by the straight line method used in the existing methodology.

In short, there are significant divergences between the existing methodology for valuing attributable costs and the requirements of an economic approach to the costing of resources, or even of an efficient and relevant management accounting approach. At the same time, it needs to be acknowledged that an ideal economic approach will be constrained by data availability problems and that simplified 'rules of thumb' may be required. The problem is to identify those simplified rules for which data are available and which produce valuation results which approximate those obtained using the economic principles.

PHILOSOPHY FOR ASSESSING THE VALUE OF ATTRIBUTABLE COSTS

In Chapters 3 and 4 of this report various possible approaches or philosophies for assessing the level of attributable costs in the airport/airway system were identified. These approaches include the economic method, cash flow accounting, financial accounting based on historic costs and financial accounting based on current costs. Of all approaches, only the economic one will provide a guide to the total economic cost to society of providing the airport/airway system in terms of the value to society

of the resources used. The other approaches may be appropriate for various specific objectives (such as monitoring use of funds, historical records or external reporting) but they cannot provide a true indication of the costs to society of operating the system. It is accepted that in applying an economic approach some deviation from an economically pure methodology may be required to overcome the inevitable problems of information availability. A practical costing methodology may have elements in common with financial accounting based on current costs and with managerial accounting.

One important consideration is the nature of the relationship between the Department of Aviation (which administers the airport/airway system) and the Department of Finance (which provides the finance for the system and monitors the use of those funds). Finance for the airport/airway system, notably for capital works, is provided in the form of appropriations to the Department of Aviation or to the Department of Housing and Construction which carries out capital works for the Department of Aviation. For Government accounting purposes these appropriations are written-off as expenditure entirely in the year the appropriation is made. Revenues derived from users of aviation facilities are passed directly into general government revenue. The current procedures for valuing attributable costs are, therefore, essentially a management accounting exercise, with the output being used by the Government as one factor in establishing cost recovery policies and in setting charges for the use of the airport/airway system.

It could be argued that a more formalised commercial lender-borrower relationship between the Department of Aviation and the Department of Finance should be established, so that the Department of Aviation faced an interest and principle repayment each year. If such a commercial argument is accepted, however, it is difficult to avoid its extension into the realm of pricing, in the sense that prices should also be set on a commercial basis that fully recovered at least all cash costs (including interest and principle repayments)[1].

The difficulty with adopting a commercially-based lender-borrower policy is that it does not allow for the inclusion of the economic effects of externalities, to which considerable value may be attached. The viewpoint of a commercial, profit-oriented entrepreneur is his own self interest. He can legitimately ignore the external effects of his actions so long as their effects are not explicitly internalised to him by way of taxes or subsidies or, possibly, market pressures brought to bear to force him to take account of some social responsibility. In contrast, one role of Government is to be responsive to the economic impact of factors external to the firm but internal to the economy. If externalities are accepted as existing to a significant degree in the airport/airway system, it does not seem appropriate to adopt a strict financial/commercial approach to the financing of that system or to establish any commercial borrower-lender relationship between government departments.

The Australian airport/airway system is part of the public sector and it is appropriate that public utility costing and pricing concepts be applied; otherwise society may not reap all of the available benefits from owning the facilities. If a financial/commercial viewpoint to their operation is favoured then the most appropriate course of action is to place them in the private sector or at least set full cost recovery and self financing targets. Adopting public utility costing and pricing concepts for the airport/airway system does not mean that it should be operated without the financial control and discipline that is supposedly automatically present in the private sector because of the effects of competition. Rather, it means that such control and discipline needs to be exercised in a way that is compatible with the economic impact of the airport/airway system.

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1. Such a policy need not imply 100 per cent cost recovery from each sector, only full recovery from the industry as a whole, with each sector contributing the share that it could bear in relation to its demand.

Economic effiency requires asset valuation on the basis of opportunity cost, that is the benefit foregone in the next best alternative use of the asset. It is sometimes argued that such a concept is not appropriate to the airport/airway system where there is no intention to sell the assets. This argument, however, is not consistent with the objective of economic efficiency. In the interests of economic efficiency an economically rational community would, through its government, regularly review the allocation of resources to various activities. This would ensure that they are employed in a manner that provides the greatest return (including intangibles, etc, which may not be valued in the market) at least cost to the community. The dedication of particular resources to a specific activity indefinitely into the future, no matter what the changes in economic circumstances, clearly cannot be justified if economic efficiency is to be sought as an objective.

When computing the level of attributable costs in the presence of externalities, there is the question of whether such externalities should be brought to account by adjustments to the value of resources or by adjustment to the cost recovery targets. If the costs of resources are to be adjusted then it follows that full 100 per cent cost recovery over the life of the asset should be the target for the Department of Aviation insofar as demand for the airport/airway system allows it. In this case the level of attributable costs would be lower (higher) than the direct economic costs of providing the facilities by the amount of the net surplus (deficit) of external benefits over external costs. However, in the interests of informed managerial decision-making and to ensure the most efficient use of resources in the system the full opportunity cost value of the resources, unadjusted for externalities, should be included in the attributable cost calculations; any adjustments that may be required should be made to the cost recovery or pricing targets. Following this approach allows costs to be calculated in accordance with an acceptable costing methodology and the value of externalities to be considered by government in the determination of cost recovery levels.

The reasons for valuing attributable aviation costs according to economic principles instead of by traditional accounting practices can be summarised as follows. Although a variety of methods for the calculation of attributable costs exists, only the application of economic concepts of costs will indicate the true costs imposed on society by the airport/airway system. It is appropriate for economic costs to be used, rather than commercial/accounting costs, because the system is provided by society in an environment that involves significant externalities, the costs and benefits of which can not be recovered in the market place. It is particularly clear that the use of historic costs in terms of current management decisions is not only irrelevant, but could be dangerous in its consequences for economic efficiency. Informed rational decision making is dependent upon current costs and future prospects and should have no regard whatever for historic costs; the 'bygones are bygones' argument. In short, the use of economic cost concepts is essential if informed, rational decisions about the use of current resources and new investment in the airport/airway system are to be made.

RELATIONSHIP BETWEEN REVENUE AND ATTRIBUTABLE COSTS

The calls for governments to 'cost recover' or adopt a 'user pays' approach in the provision of certain services are seldom accompanied by statements as to exactly what is meant by these terms. It seems generally accepted, however, that these demands refer to recovering the full economic costs of providing the services. It needs to be understood that while economic efficiency considerations suggest that full recovery of economic costs over the life of a facility should be the target, the full economic costs of providing a facility and the revenue obtained through charging for the use of it on an annual basis need not match one another. Indeed, there are compelling economic reasons why these two annual amounts may often differ and why the relationship between them should change over the life of a facility.

The principles that should be used as guidelines for establishing prices in the transport sector are clearly identifiable (Shaw 1982). These include: the adoption of short-run marginal costs as a base for setting prices; raising prices to clear the market when demand substantially exceeds capacity; and generating any additional revenue that may be required to meet a particular cost recovery target by increasing the prices for those users who are least deterred by higher prices.

From an economic efficiency viewpoint, the cost recovery target before a facility is operational should at least be to fully recover the (real) costs of providing the assets over their lives. If, once the facility is operational, demand conditions make this impossible, it indicates that the assets should not be replaced at the end of their lives. Alternatively, if the demand conditions result in the cost of providing an asset being more than fully recovered, this indicates that the assets should not only be replaced but a case may also exist for their expansion. However, one thing is clear; prices need to be set taking account of demand conditions. Therefore, in any one year it may be economically efficient for prices to be set at levels that fall short of fully recovering economic costs or at levels that exceed full cost recovery. The importance of knowing the level of economic costs is in the setting of the cost recovery target over the life of the assets and in providing signals for the desirability of expansion, replacement or reduction of the level of investment in the activity involved. It is evident that the use of historic costs in the setting of prices is unlikely to provide any useful information on long-run cost recovery levels and whether further investment is socially desirable.

In establishing prices the commercial, profit-oriented entrepreneur should also operate in a way that is conceptually similar to the economic theory presented above. In setting his prices, the entrepreneur's objective will be to at least recover his direct cash costs and to earn beyond that as large a contribution as possible to his overheads, indirect and non-cash costs. The cash costs form a price floor, as do the marginal costs in economic theory, and prices will be set as far above this floor as different classes of customers can be encouraged to pay. This form of price discrimination is neither unfair (in an economic efficiency sense) nor evidence of cross-subsidisation, provided no-one is charged below the price floor.

A commercial entrepreneur will also be concerned to know the economic cost of providing a particular service or commodity or holding a particular asset over various periods. To assess whether he should continue to operate an asset he will compute his opportunity cost of owning the asset for the period. This is simply the amount he is losing because the asset is depreciating plus the revenue he is foregoing by not realising the market value of the asset and investing it elsewhere. If the amount he is losing by holding the asset is greater than his revenue less operating costs then he may consider selling the asset. The decision to sell will, however, be based on what he expects the real market value of the asset to be in the future and whether he expects that future demand characteristics will allow him to increase the net revenue received from operating the facility. If the amount he is losing by holding the asset is less than his revenue net of operating costs then he may consider investing more capital in the facility to expand its capacity.

The calculations by the entrepreneur will necessarily be based on current costs. The fact that the entrepreneur purchased the building some years ago for a specific amount does not enter into the equation (although the level of his current overdraft may, of course, reflect the amount he had to borrow to acquire the asset and will influence how long he is prepared to receive less than the economic costs from holding the asset in the expectation of demand changes). In addition, the fact that he may prepare his annual report for external reporting purposes based on the historic cost of his assets is also irrelevant to the calculation. Should, however, he continue over time to maintain the asset on his books at its historic value, the company may eventually be the subject of a take-over offer. This may occur because other entrepreneurs would see that this practice had resulted in an unrealistic relationship

between share prices and asset backing and that profits could be obtained through the purchase of the company and the sale of its assets. This is one of the reasons why many companies revalue their assets from time to time (as discussed in Chapter 4).

The discussion so far on the relationship between revenue and attributable costs has ignored the existence of externalities. As noted earlier, externalities are costs or benefits which are not brought to account within the firm or economic entity, often because no market exists, so that inclusion of their values in the costing/pricing process becomes very difficult. Aviation examples include the benefit of access to remote areas, the search and rescue capability of the aviation industry, the value of civil aviation from a defence viewpoint and the potential availability of aviation services for emergency travel (even if they are not in fact used). Perhaps the best known example of an external cost associated with the airport/airway system is the noise disamenity suffered by those who live in close proximity to airports; other external costs could include the danger to innocent parties from aviation accidents and air pollution.

If external benefits outweigh external costs then adequate economic justification is provided for achieving less than full recovery of the costs from the users of a facility over its life, even if it were possible to reach this level in terms of the demand situation. However, because of the technical difficulties in valuing many external costs and benefits in the public sector, judgements about their relative importance must often be made by governments. It may be that the existing charges on the aviation industry already implicitly recognise that there are external benefits and costs associated with its operations.

The discussion so far has also ignored the question of particular income distributional goals which governments may wish to achieve through airport/airway charges. It may be that governments want to redistribute income between air transport users and other groups in the community and consciously set charges for the system so as to achieve that redistribution goal. Even if the charging policy was directed to achieving such an objective, it is still important that decision makers have full knowledge of the economic costs of providing airport/airway facilities.

Thus, altering the costing methodology for attributable costs need not necessarily affect the levels of charges for the airport/airway system because the sensitivity of demand to changes in prices and the value of externalities may be more important considerations. In fact, in terms of economically efficient pricing for a particular time period during the life of an asset, these considerations would be expected to predominate.

CHAPTER 6—ALTERNATIVE PROCEDURES FOR VALUING ATTRIBUTABLE COSTS

This chapter presents a practical approach to the valuation of attributable aviation costs using economic principles to formulate a methodology.

The terms of reference for this study required the BTE to identify alternative methods which might be adopted for the calculation of attributable aviation costs having regard to commercial practice.

In previous chapters it has been demonstrated that 'commercial practice' has many variations depending on the objectives of the exercise being undertaken. Comparison of alternative procedures that could be followed by the Department of Aviation with 'commercial practice' therefore require a clear statement of the purposes of the aviation costing system. The system could be operated for three primary purposes: to enable financial balance to be achieved; to permit a comparison of the 'financial performance' of the aviation system with commercial enterprises or to provide a measure of actual costs incurred in providing and operating the airport/airway system.

A strict interpretation of the financial balance objective would involve the use of cash flow accounting for the determination of costs; this presents a number of difficulties as previously discussed. The financial balance objective is, however, inappropriate for activities which involve significant acknowledged externalities. The economic approach to pricing and cost recovery decisions is more suitable in these circumstances. Even if financial balance is adopted as the goal in setting the pricing structure, then the parallel computation of economic costs will allow identification of the degree to which the economic welfare of the community has been traded-off in the interest of balancing the books. The way in which the current system operates suggests, however, that obtaining information to achieve financial balance is not the overriding objective of the Department of Aviation's internal costing system.

The costing system could be maintained simply to provide a comparison of the financial performance of the aviation system with commercial enterprises. If this was the objective then there are several areas requiring attention (as set out at the beginning of Chapter 5). These include the capitalisation of interest on land acquired before it is needed, superannuation payments, the costing of services provided by other government departments. procedures for calculating interest costs and costs associated with new building construction. However, it seems unlikely that such a purpose could be justified since the comparison gives little information about the actual value and cost of aviation to the community and does not provide particularly useful information on which to base pricing and cost recovery decisions.

It is apparent that the primary purpose for operating an aviation costing system is to provide information for use in setting cost recovery targets and determining prices. Commercial practice is, therefore not appropriate for calculating attributable aviation costs because data produced by using historical accounting methods is of little relevance in making decisions on pricing and cost recovery; nor are the accounts prepared to meet any external reporting requirement.

Commercial practice in valuing assets and determining costs for management decisions (eg pricing, the buying, selling or holding of assets) generally is to use current values. This is certainly so for non-depreciating assets such as land, although the historical costs of items which depreciate fairly quickly may often be used for

convenience instead of current values. The discussion in previous chapters demonstrated that the valuation procedures used in many management accounting exercises are very similar to the valuation procedures dictated by economic efficiency considerations where the welfare of society is the prime concern. In both cases the valuation concepts followed are opportunity cost and changes in the value of resources over time. Therefore, following economic principles to formulate a methodology for valuing attributable aviation costs will involve the adoption of an approach which is essentially the same as commercial practice for management purposes.

The approach suggested below for the valuation of attributable aviation costs uses economic concepts of costs but takes account of the practical limitations of data availability. Consequently, while use of opportunity cost is the appropriate rule for establishing values, lack of information in some areas means that less desirable methods may be required.

The main issues in valuing attributable costs over an accounting period that have been identified in this study relate to capital costs. There are two elements making up capital costs over a period, such as a year, which can be described as depreciation and interest. The calculation of these cost items involves consideration of the questions of asset valuation, depreciation method, asset life, and interest rate. The central concern in calculating attributable costs is arriving at appropriate values or procedures for these four factors for different asset types. Other issues concern calculation of superannuation costs, treatment of new assets under construction and treatment of inventories and working capital. The following sections of this chapter address each of these issues in turn.

Earlier parts of this report have referred to deviations between financial market prices and real opportunity costs resulting from problems of market imperfections. While it is conceded that current financial costs may not strictly represent the economic values of some resources used up during the accounting period, any distortions are likely to be insignificant in relation to the total level of attributable costs. Accordingly, financial costs of current cost items can be accepted as sufficiently accurate for a practical, workable valuation procedure.

ASSET VALUATION

The economic approach to the valuation of an asset requires measurement of either its opportunity cost or its capitalised value (discounted flow of net future benefits). The problem is to find a practical way of estimating the value by either method.

One practical solution to this problem would result in procedures that vary from asset class to asset class. For example, land, aircraft and most vehicles could be valued on a market valuation basis since there are established markets for them and values are readily available. Sources of information on land values include professional property valuers, rating values of unimproved land in surrounding local authority areas and the valuation service of the Commonwealth Taxation Office[1]. (In such cases it should be sufficiently accurate to revalue this type of asset at regular intervals, say every three to five years, rather than annually.) Published guides to the value of motor vehicles are also available. If there is any problem in establishing the market value of depreciable assets then the methods described below may be followed to arrive at an approximate value.

Current values are difficult to obtain for airport buildings, runways and other structures because there is no real market. This is an example of the situation where the next-best alternative to the opportunity cost concept needs to be identified as a result

1. One method to derive a value for airport land in a capital city would be to value the area using the average rated value per hectare (including public areas) of similar land in that city. This value would adjust for the presence of non-rated areas associated with roads, schools, sports ovals, etc.

of the restrictions imposed by data availability. A practical approach suggested for this asset class is to use indexed replacement cost. Construction work could be valued by professional valuers when it first comes into service on the basis of the replacement cost as if built on a normal commercial basis and the value indexed upwards on an annual basis in accordance with a construction industry cost index. This procedure would avoid the need to calculate the replacement cost of all building assets each year. It would also avoid the problem of a less than full accounting of construction costs which occurs when another government department is involved in the design and supervision of construction works. An alternative approach, if suitable standardised costs were available, would be to maintain accurate records of the physical characteristics of the structures at each airport/airway system location and estimate the current replacement cost of these assets using standardised current construction cost figures. For example, runways could be valued using a cost per metre length for a particular width and load bearing capacity.

The third major class of assets comprises communication equipment and other types of specialised plant and equipment. These assets could generally be valued on a replacement cost basis. Although second hand markets for these types of assets may be limited, current new purchase prices should be available in most cases. A practical valuation rule for items that have been superseded by more advanced technology and are no longer in current production is to value them at their scrap value. This should reflect at least their value as spare parts.

Should the Australian Society of Accountants' proposals for current cost accounting be adopted at some future date the problems associated with the types of valuation methods described above will have to be overcome. The experience of the British Airports Authority (see Appendix V) shows that workable valuation methods can be derived.

DEPRECIATION METHODS

The two elements making up the annual cost of owning a capital asset are the extent to which the asset is used up (depreciation) and the opportunity cost of funds tied up in the asset (interest). Depreciation represents the change (normally downwards) in the value of an asset as a result of wear and tear, obsolescence and changes in demand for the asset's output. Land and working capital should not be regarded as depreciable assets because they are not normally subject to obsolescence or wear and tear.

The question of choosing between depreciation methods would not arise if market values alone were used for depreciable assets. In this case the real value of assets at the end of a financial year could be deducted from the real opening value to give an accurate measure of the depreciation. However, where indexed historic costs or replacement cost are used to calculate current values, depreciation methods become important.

The most common methods for deriving depreciation values for fixed assets were summarised in Figure 4.1. The choice of method for deriving depreciation values is largely a matter of subjective judgement. The existing system for calculating the annual value of attributable costs uses the straight line method and the continued use of this method is acceptable. However, a preferable method from an economic viewpoint is the annuity formula which includes both depreciation and interest in a single calculation. The main advantage of this method is that, in the absence of inflation and changes in the interest rate, the annual capital charge remains constant over the life of the asset rather than falling (as occurs with the straight line or other common depreciation methods). Therefore, the identical replacement of a particular asset would result in no change in the annual capital charge. Another advantage is that while the annual cost of the asset remains constant the depreciation element is increasing with age. As the demand for aviation facilities would be expected to

increase over time with rising real incomes the annuity method would allocate capital cost more in accordance with demand than other depreciation methods. Such an allocation should assist in promoting economic efficiency, although the pattern of depreciation charges over time produced by the annuity formula may only approximate the expected pattern of demand in a very crude manner. Notwithstanding these attractions of the annuity approach there is no technical reason why other methods of calculating interest and depreciation charges should not be adopted.

ASSET LIVES

Asset lives, like depreciation methods, would not be an issue in valuing attributable costs if market values could be used to value depreciable assets. However, asset lives assume considerable importance where depreciation methods are used as a second best alternative.

Asset lives should be established taking account of the future obsolescence of an asset, wear and tear and changes in demand. These factors all have to be estimated against a background of uncertainty. Since it is likely that assets of a similar type might have lives of varying lengths, probabilistic analyses may be required to produce accurate estimates.

The asset lives used in the existing accounting system were shown in Table 2.2. A detailed analysis of the lives of airport/airway assets was not undertaken for this study. Therefore, independent advice cannot be given on whether the lives used at present are appropriate. The current assumptions on asset lives appear to be consistent with those adopted in other studies (eg Dienemann and Lago 1976) and there is no other readily available evidence to suggest that different lives should be used. However, it is acknowledged that further study of this question is required before definitive statements can be made on appropriate asset lives to use for attributable cost valuation purposes.

INTEREST CHARGES

Interest charges represent the opportunity cost of the resources invested in the airport/airway system. The interest rate should be applied both to depreciable and non-depreciable assets. It is suggested that one practical procedure for depreciable assets is to introduce interest charges via an annuity calculation (see the section above on depreciation methods). Interest charges for non-depreciable assets could simply be calculated as the product of the interest rate and the value of the assets.

Selection of the appropriate interest rate to use for both calculations requires judgements about the prevailing opportunity cost of funds in real terms over the period, ie after allowing for inflation.

Specification of one particular interest rate to use in deriving the value of attributable aviation costs on an annual basis is difficult. In addition, the appropriate rate may vary from year to year. One approach is to take the real long term bond rate for the year in question as representing the opportunity cost of alternative investments in the Government sector. This rate fluctuates in real terms but has recently been of the order of 2 to 4 per cent.

An alternative approach is to base an annual interest rate on the cost of equity capital to companies in the private sector. This approach might be justified on the grounds that private sector investment is the alternative use of funds to the Government sector, rather than other uses of funds within the Government sector. Using this argument, Clare (1982) develops a case for adopting the 10 per cent real interest/discount rate that is commonly used in Australian public sector cost-benefit analyses. This figure could be regarded as representing the upper bound of the range of rates that might be considered as the opportunity cost of funds invested in the airport/airway system.

The current real cost of borrowed funds to private sector firms is about 4 to 6 per cent for companies with a good credit rating, which represents a mid-way point within this range of interest rates. By way of comparison, the British Airports Authority (see Appendix V) has been set a Government target of a 6 per cent real return on the net replacement cost value of the assets it employs, implying an opportunity cost of 6 per cent for the Authority's funds in the United Kingdom context.

The real rate of return that represents the opportunity cost of funds invested depends on the point of view taken. However, if funds are made available for airport investment through the issuing of long term bonds then, from an economic viewpoint, the real long term bond rate may be the most appropriate rate to use for valuing attributable aviation costs. It should be noted that the rate calculated for each year should be applied to all assets in the airport/airway system in that year, not just the new assets brought into operation (as is done under the existing methodology). Thus only one rate is applied in any one year, rather than a variety of rates.

SUPERANNUATION

Under the existing system of accounting within the Department of Aviation, the cost of the employer's contribution to the superannuation scheme for attributable staff is calculated on a fully funded basis (although actually paid on a pay-as-you-go basis) at a rate equal to 20 per cent of contributor salaries. If valuing superannuation on a fully funded basis is accepted as the best practical approach, in accordance with a report by the Government Actuary (Australian Government Actuary 1982) the rate should be increased to 21.5 per cent. This approach would appear to be consistent with adopting an annual shadow price of labour.

TREATMENT OF NON-OPERATIONAL ASSETS

In the current accounting system interest is charged on non-operational assets. These are principally land acquired before it is needed and facilities and buildings under construction. In the case of land interest is calculated as a current cost and in the case of new construction it is capitalised and depreciated on an historic cost basis over the life of the asset.

The accounting treatment of interest on non-operational assets requires that it be capitalised provided that sufficient future revenue to recover the interest is expected to be earned in the interests of matching revenues and expenditures. The economic treatment, however, requires that the interest be brought to account as a current cost in the year incurred, since it represents the opportunity cost of resources that were not available for use elsewhere in the economy in that year, rather than in later years when the asset comes into productive use. Therefore, following the economic approach would mean that interest costs on non-operational assets should no longer be capitalised and depreciated over the operational life of the asset concerned, but should be treated as a current cost.

INVENTORIES

Under the existing system inventories are valued at historic cost and imputed interest charges calculated on the value of inventories existing at the beginning of the financial year. To be consistent with other asset categories the economic approach requires that inventories be revalued to current costs and interest calculated using the real rate of interest on this current cost value. However, it is clear that revaluation of inventories would require considerable effort and produce results that are, at current rates of inflation, probably within 10 per cent of the historic cost valuation (assuming that stock items are normally turned over fairly quickly, at least within 12 months on average). Further, this imputed interest charge would generally be of minor significance in the total attributable cost, under current procedures amounting to

only 0.5 per cent in 1980–81. Accordingly, one practical approach is to continue to use historic costs for inventory valuation purposes.

The standard accounting procedure for a spare parts base stock for aircraft or other vehicles and equipment is that it should be capitalised and accounted for in the same way as the equipment itself. The economic approach would treat this spare parts base stock in the same way as any other asset. The spare parts base stock should not therefore be considered part of the normal inventory of stores.

SUMMARY OF PROPOSED METHODOLOGY

The proposed methodology for measuring the economic cost to the community of providing facilities for the aviation industry is summarised in Table 6.1, together with details of the existing methods.

The philosophy underlying the recommended valuation methodology is that all assets should be valued at market price because this value gives the best guide to the real worth of assets to society excluding the effects of taxes, subsidies and externalities. Where market prices are difficult to obtain due to thin or non-existent markets, quasi market values can be derived using approximation rules.

TABLE 6.1—COMPARISON OF EXISTING AND PROPOSED METHODOLOGIES FOR VALUING ATTRIBUTABLE COSTS

Cost element	*Existing method*	*Proposed method*
Asset valuation		
Land, vehicles, etc	Historic cost	Market value
Buildings, etc	Historic cost (including capitalised interest during construction)	Replacement cost on entry into service, then indexed
Equipment, etc	Historic cost	Replacement cost
Depreciation	Straight line (nil residual value)	Continued use of existing method is acceptable but preferred method is the annuity using real long term bond rate for year of analysis (nil residual value)
Asset lives	Various	No change (subject to further study)
Interest charges	Nominal long term bond rate (in year of entry into service)	Real long term bond rate for year of analysis for all assets
Non-operational assets	Interest capitalised for buildings etc, but not for land	No capitalisation of interest
Superannuation	Fully funded at 20 per cent of salaries	Fully funded at 21.5 per cent of salaries[a]
Inventories	Valued at historic cost	No change

a. The proposal to increase the then Department of Transport's imputed superannuation liability from 20 to 21.5 per cent was made by the Australian Government Actuary (1982). The BTE has not investigated this matter.

The market value method can be applied directly to assets such as land, aircraft and vehicles for which current market values can be more readily obtained. For types of assets not regularly traded where current market values are not easily identifiable, it may be necessary to use an alternative method such as replacement cost valuation. This method could be applied to assets such as runways, airport buildings, fire-engines and airways equipment. In practice, the replacement cost method involves ascertaining the current cost of replacing assets and then estimating their net depreciated value at current prices in order to calculate interest charges.

The replacement cost method should give acceptable estimates of current market prices in cases where asset values could be regarded as a function of current purchase price and accumulated depreciation. In other instances, however, difficulties may be encountered using this method. Examples are situations where electronic equipment has been rendered obsolete by technical developments or where airport facilities are constructed well before the level of demand has reached a point which would justify construction on purely commercial criteria. In both of these examples, the market value for the assets concerned, if a market existed, would probably be substantially less than the net depreciated value as calculated by the replacement cost approach. One practical solution to the technical obsolescence problem is to value the equipment involved at its scrap value. Overcoming the problem of valuing uneconomic airport facilities is more difficult, but could possibly be approached through assessments of potential future revenues that could be obtained from operating the facilities (ie the capitalised value approach discussed in Chapter 4).

Although problems will be encountered in adopting the market/replacement price approach to valuing Department of Aviation assets, the results would be far more meaningful than those derived using the current method. For example, the use of the market value method would correct the current situation under which Departmental landholdings are massively under-valued, with book values being based on historical cash acquisition costs which often bear no relationship to actual current value. Such under-valuing of land cannot be justified on either economic or accounting criteria.

For calculating interest and depreciation charges, it is suggested that an annuity method be substituted for the current arrangement under which depreciation is calculated by the straight line method and interest charged on the net depreciated value. The annuity method will give a constant annual capital charge (ie interest plus depreciation), with the depreciation component increasing over time (which should generally follow the trend of expected future demand). It should be noted, however, that other methods of calculating interest and depreciation charges would be acceptable and that depreciation charges calculated by any formula method will only approximate actual depreciation.

Just as capital costs should be calculated from real asset values (ie asset values adjusted for inflation), interest charges should also be calculated using a real rate rather than a nominal rate. In addition, the current practice of calculating interest charges using the long term bond rate in the year of acquisition does not give the correct opportunity cost of capital in the current year. Accordingly, it is suggested that the appropriate rate to use for all interest payment calculations is the real long term bond rate in the year of analysis for all asset types. It is also suggested that interest charges on the value of works-in-progress be treated as a current cost, to reflect the opportunity cost when it occurs, rather than capitalising it until facilities become operational as is the current practice.

There are two areas where no change from current practice is suggested: the asset life periods used in calculating depreciation; and the method used in accounting for stores inventories. This is because insufficient information was available to determine whether more appropriate lives should be adopted for depreciation purposes for the various types of aviation assets, while changes in stores accounting

procedures would involve considerable effort and be unlikely to have any significant effect on the total value of attributable costs. (It may be that improved accounting procedures might increase the efficiency of stores operations, but these improvements would almost certainly be insignificant relative to the total level of costs attributed to the aviation industry.)

It is apparent that there are practical methods for measuring the economic cost to the community from the provision of aviation infrastructure. Although the methods in some instances will only give an approximation of the economic cost of attributable aviation items, the results produced will more properly reflect the cost to the nation of providing these facilities compared with the current historic cost based methodology.

APPENDIX I—DEPARTMENT OF AVIATION COSTING SYSTEM: INFORMATION RECORDED

This appendix contains a description of the items of information entered in the Department of Aviation's computer costing system.

DATA ENTRIES

Each data entry into the basic system comprises a fixed form record equivalent to 144 characters in digits or 104 characters in binary code. Cost information is entered into the system from a variety of standard forms used within the Department. The items of data entered in the system are described below and some of the codes are shown in Tables I.1 to I.3. Table I.4 contains a summary of the items of information entered in the system and Table I.5 shows one of the formats of computer print-outs produced by the system. Within each record there are some fields in which a value is always entered eg cost period, location, etc, while other fields are set at zero if they are not applicable eg vehicle number, vehicle class, etc.

Data fields in which a value is always recorded

The fields in which some value is always recorded for each entry are as follows:

Cost period

The Department of Aviation financial year is divided into 13 four week cost periods based on the public service pay periods, plus a notional fourteenth period at the end of the year for posting adjustments and balancing entries into the system and, if necessary for balancing, a further fifteenth period.

Week number

Data are entered in this field from all records but is only used in preparing cost reports for workshop, technical, and field staff. Weeks are numbered 1 to 4 within each cost period.

Region number

The Department's regions are numbered from 1 to 5 for costing purposes. Outlays for Central Office branches located in Canberra are included in the accounts for the New South Wales region while Central Office branches in Melbourne are included in the accounts for the Victoria/Tasmania region.

Account type

The type of account is represented by a two digit code as shown in Table I.1. All Departmental expenditure is ultimately classified to an account type code in the range 01 to 05. Where an entry is recorded under an account type code higher than 05 the system records the amount under the code shown, then automatically converts the account type to the appropriate code in the range 01 to 05 and records the entry a second time against the new code. For example, petrol purchases for departmental vehicles are intially debited to account type 07; the system then re-codes the data entry and makes a second debit entry against the appropriate account in the 01 to 05 range.

Cost account code

The cost account code is a three digit code grouped under broad type-of-facility headings eg airways facilities, buildings, etc. The cost account codes apply to all account types 01 to 05. A complete list of cost account codes combined with account type codes is given in Appendix 12.4.3 of the Financial and General Accounting

Instructions (Department of Aviation, unpublished a). The cost account codes are also hierarchical, eg code 2.11 covers maintenance of radio navigation equipment and within this category, 2.111 denotes visual aural range (VAR), 2.112 is for distance

TABLE I.1—DEPARTMENT OF AVIATION COMPUTER COSTING SYSTEM; TYPE OF ACCOUNT CODES

Type of account	*Code number*
Capital	01
Maintenance and operations	02
Administration	03
Miscellaneous	04
Revenue	05
Fuel (vehicles, plant, aircraft, and launches)	07
Maintenance (vehicles, plant, aircraft and launches)	08
Tyres and tubes (vehicles, plant, and aircraft)	09
Workshop jobs	16
Minor work orders	26
Works authority projects	36

Note: A description of how 'type of account' codes are used in the Department of Aviation's costing system is given in Chapter 2.

Source: Department of Aviation (unpublished a).

TABLE I.2—DEPARTMENT OF AVIATION COSTING SYSTEM; VEHICLE CLASS CODES

Class of vehicle	*Code number*
Heavy vehicles	1
Medium vehicles	2
Light vehicles	3
Airport plant, motorised	4
Aircraft	5
Fire fighting and crash vehicles	6
Airport plant, non-motorised	7
Marine craft, engines	8
Marine craft, hulls	9

Source: Department of Aviation (unpublished a).

TABLE I.3—DEPARTMENT OF AVIATION COMPUTER COSTING SYSTEM; TYPE OF MAINTENANCE CODES FOR AIRCRAFT

Type of maintenance	*Code number*
Miscellaneous (including fuel, tyres and tubes)	0
Line maintenance (pre flight checks)	1
Scheduled overhaul	2
Unscheduled overhaul	3
Scheduled maintenance	4
Unscheduled maintenance	5
Cleaning of aircraft	6
Flight duties	7
Aircraft radio equipment	8
Engineering changes	9

Source: Department of Aviation (unpublished a).

measuring equipment (DME), 2.113 is for instrument landing systems (ILS), etc. (The characteristic 2 is the account type code denoting maintenance and the three digit mantissa is the cost account code). There are about 230 cost account codes at the two digit level. For each Department of Aviation facility the cost account codes are the same for account type 1 (capital) and account type 2 (maintenance) entries, but otherwise a given cost account number does not always refer to the same cost

TABLE I.4—DEPARTMENT OF AVIATION COMPUTER COSTING SYSTEM; ITEMS OF DATA RECORDED

Position on computer record	*Item*	*Range*	*Comments*
1- 3	Week number	1 to 4	Week number within cost period
4- 6	Cost period	1 to 15	Year comprises 13x4 week cost periods based on AGS pay periods plus 2 notional balancing periods
22-24	Voucher type		Data pay voucher type number
25-27	Work group		Technical and field staff organised into work groups
28-30	Employee number		Number within work group (not AGS number)
31-33	Rate of pay		Normal hourly rate
46-48	Region	1 to 5	1 Qld, 2 NSW, 3 VIC/TAS, 4 SA/NT, 5 WA
49-51	Account type		See Table I.1
52-54	Cost account	000 to 999	Three digit code number for all account types from 01 to 05
55-57	Location number	000 to 999	Unique number assigned to each location within each region (each departmental location uniquely specified by region and location codes)
52-57	Vehicle number		Registration number
58-60	Vehicle class		Nine classes (see Table I.2.)
52-57	Job number		Number allocated to workshop jobs, minor works orders or works authority jobs
61-64	Labour hours		Hours worked at standard rate
69-72	Vehicle hours		Engine hours recorded instead of distance for some types of vehicles and plant
73-76	Vehicle kilometres		Distance travelled
77-80	Labour value		Product of records (61-64) x (31-33)
81-84	Extra duties value		Overtime payments
85-88	Materials value		Value of materials purchased for use by the Department of Aviation (not value of materials purchased and used by contractors or other departments)
89-92	Other expenses value		

Note: The table does not include information items entered for systems control. eg batch numbers, etc.

Source: Department of Aviation (unpublished a).

area, as evidenced by the following three examples of account type/cost codes:

- 1.191 capital expenditure for airways facilities, meteorological equipment, anemometers;
- 2.191 maintenance expenditure for airways facilities, meteorological equipment, anemometers; and
- 3.191 administrative expenditures for First Assistant Secretary and staff of Major Projects Division.

Location code
A three digit code number is assigned to each location in each region. The combination of a region code and a location code uniquely identifies the location of any Department of Aviation facility, although similar facilities in different regions may have the same location code, eg 009 refers to regional headquarters in more than one region. A list of location codes is given in Appendix 12.4.2 of the Financial and General Accounting Instructions (Department of Aviation, unpublished a).

Data fields only filled where appropriate
The above items of information must be recorded in every line of data. The following items of information are only entered where appropriate, otherwise the fields are set equal to zero.

Labour costs
Labour costs are not recorded separately for work carried out for the Department of Aviation by other departments or the private sector. However, the following items of information are recorded in the costing system in relation to wages and salaries incurred by the Department of Aviation:

- work group: technical and field staff are organised into work groups, each with an identifying number;
- employee number: each member of a work group is assigned an identifying number in addition to his Australian Government Service number;

TABLE I.5—DEPARTMENT OF AVIATION COSTING SYSTEM; OUTPUT FORMAT

Account type/ cost code/ location	*Labour*	*Extra duty*	*Materials*	*Expenses*	*Total*
01 Capital					
cost accounts					
locations					
02 Maintenance & operations					
cost accounts					
locations					
03 Administration					
cost accounts					
locations					
04 Miscellaneous					
cost accounts					
locations					
05 Revenue					
cost accounts					
locations					
Total					

Note: This table shows the format of one of the tabulations produced by the Department of Aviation computer costing system.

- labour hours worked;
- normal rate of pay per hour;
- labour value, which is calculated as the product of normal hours and normal rate plus on costs; and
- extra duties value.

Costs such as travel allowance, tea allowance, etc, which are paid through salaries or the collector of public moneys, are charged to other expenses, not labour.

Vehicle costs
The fleet of 'vehicles' operated by the Department of Aviation comprises the following general groups:

- registered motor vehicles or motorised plant, ie vehicles or items of machinery operating with a Commonwealth number plate;
- unregistered non-mobile plant, ie motorised plant which is not self mobile (eg generators, lawn mowers, etc);
- departmental aircraft; and
- rescue launches.

All outlays for fuel, maintenance and parts for departmental vehicles are coded to account types 7, 8 or 9. In addition, the following items of information are coded on each cost entry:

- vehicle class: departmental vehicles are divided into the nine classes shown in Table I.2;
- vehicle registration number: alpha-numeric or alpha registration numbers are converted to purely numeric numbers for computer entry;
- for aircraft only, the type of maintenance: maintenance type and registration codes are combined in the registration number fields (maintenance codes are shown in Table I.4); and
- vehicle hours or vehicle kilometres as appropriate for each vehicle type.

The only entries for vehicles in the costing system not coded to cost accounts 7, 8 or 9 (apart from adjusting entries) relate to capital entries, ie purchase of vehicles, increase in value of vehicles by addition of new equipment, etc.

EQUIPMENT INSTALLATION AND MAINTENANCE PROJECTS

To facilitate project control, details are entered in the costing system of expenditures on work authorities (WAs), minor work orders (MWOs) and workshop jobs (WJs). The difference between installation and maintenance work carried out under work authorities and minor work orders is basically defined by the outlays involved. Currently, a work authority is required for projects costing over $3000 while minor work orders involve lesser outlays. A work authority may involve one or more minor work orders. Workshop jobs involve projects carried out by the Department of Aviation's workshops. A workshop job may be part of a minor work order or a work authority. A unique number is assigned to each work authority, minor work order or workshop job. (The job number may be an alpha-numeric code which is converted to a pure numeric code for data entry).

Expenditures for WAs, MWOs, and WJs are not coded with an account type/cost account/location code in the same way as other items entered into the system. Rather, a two digit code is entered into the type of account field which indicates the type of job, namely 16 for workshop jobs, 26 for minor work orders and 36 for works authority projects. The unique code number for each project is also entered in the system. The computer system holds an information file which shows the account

type/cost account/location code for each project. When details of an installation or maintenance project are entered into the system, the program first records an analysis of the outlays against the appropriate job number, then under the required account type/cost account/location code.

The transformations and postings which are, or may be, carried out using the computer system for installation and maintenance projects are as follows:

- all amounts debited against authorised projects, minor works orders and workshop jobs are re-coded automatically by the system and also debited against the appropriate account type/cost account/location code;
- all amounts debited to workshop jobs are also automatically re-coded and may be debited against authorised projects, minor works orders accounts or against vehicle accounts;
- amounts debited to minor work orders are automatically re-coded and also may be debited against authorised project accounts or against vehicle accounts; and
- amounts debited to works authority projects are automatically re-coded and also may be debited against vehicle accounts.

OTHER ITEMS

The fixed format record used in entering data into the cost system also has fields for 'materials value' and 'other expenses value'. The material value field is used for entering value of materials purchased for use by the Department of Aviation. All other items, including work carried out by other Departments or private firms, are included in the expenses category.

SUSPENSE ACCOUNTS

The amounts of some Department of Aviation expenditure items are entered into the costing system before data are available concerning which accounts should be debited. Such expenditures are intially debited to suspense accounts. When complete information on the expenditure is available, a credit entry is posted to the suspense account and the appropriate accounts are debited. The major items of expenditure debited to suspense accounts comprise salaries for some technical and field staff, all vehicle operating expenses and the costs of stores inventories. The data needed to transfer entries out of suspense accounts comprise the account type code, the cost account code and the location code; this information is provided by returns submitted to Department of Aviation regional offices by work groups, stores and sections operating vehicles.

APPENDIX II—DEPARTMENT OF AVIATION ASSET ACCOUNTING METHODS

This appendix provides details of the Department of Aviation's accounting procedures for assets, ie for calculating the value of assets, depreciation and interest charges. The initial sections of the appendix describe the general methods used in asset accounting, while following sections give details of procedures for specific classes of assets.

The 12 categories into which assets are classified are shown in Table 2.2. Similar accounting procedures are used for all asset categories except land, which is not depreciated. Certain additional special accounting procedures are also adopted for works in progress on runways, buildings and airways facilities, because the costs of installing or constructing such assets can extend over several accounting periods.

VALUE OF ASSETS

As a generalisation, the Commonwealth Government's civil aviation assets are acquired in three ways:

- land is purchased for the Department of Aviation by the Department of Administrative Services;
- runways and buildings are constructed by the Department of Housing and Construction; and
- other assets are purchased by the Department of Aviation itself.

Some proportion of the Department's land, runways and buildings inventories were acquired from the RAAF at the end of World War II or were transferred from other crown authorities at no cost to the Department.

The financial details of the Department of Aviation's assets are recorded in two asset registers. The first register contains historical cash cost information on the various classes of airways equipment, land, buildings and runways at each Departmental location but does not include any data on capitalised interest charges. The second asset register records details of the value of all Departmental assets, including figures transferred from the first register showing the total value of land, runways, etc by location. The second asset register also shows the capitalised interest and gross value of each class of assets and is the source of data used in calculating interest and depreciation charges on Department of Aviation assets. The asset registers maintained by the Department show only financial totals and do not give details of the number of items of each asset type held. It is understood that other 'non financial' asset registers are also operated by the Department of Aviation and that these give more specific physical details of some of the Department's assets.

The value of assets shown in the Department of Aviation asset registers is based on the historical cash acquisition payment. In some cases the value is affected by particular Departmental procedures. For example:

- the value of works carried out by the Department of Housing and Construction for the Department of Aviation may include payments to day-labour employees, but may not include salary payments for planning and supervision of the project by officers from the Department of Housing and Construction;

- the cost of acquiring land is shown as the amount paid and does not include any component of salaries paid to personnel at the Department of Administrative Services; and
- where the value of a moveable asset is increased by addition of equipment installed by Department of Aviation staff, such as fitting a radio to a vehicle, then the increased value is shown only as the amount paid for the equipment fitted, while the labour cost of installation is treated as a current expense.

The gross value of an item actually recorded in the Department's asset register is taken as the sum of the cash price paid plus capitalised interest for the year of purchase. The capitalised interest is calculated as 50 per cent of the product of the cash price paid and the current long term bond rate, ie it is assumed that, on average, assets are acquired and paid for half way through the financial year. For example, an asset purchased for $1000 when the long term bond rate was 10 per cent would be recorded in the assets register as having a gross value of $1050, ie $1000 (0.5 x 0.1 x 1000). The figure of $1050 would be used in subsequent years for calculating interest and depreciation charges.

INTEREST AND DEPRECIATION

No interest or depreciation charges are calculated as current costs on Department of Aviation assets in the year in which an asset is acquired. Rather, as discussed above, interest charges for the first year are capitalised.

In subsequent years, depreciation charges are calculated by the straight line method, with asset lives ranging from 40 years (2.5 per cent depreciation per annum) for runways and buildings, down to four years (25 per cent depreciation per annum) for vehicles. Depreciation is charged as a proportion of gross book value of assets. The Departmental financial accounts do not allow track to be kept of each asset item, nor do the records include an account showing accumulated provision for depreciation. Rather, records are kept showing expenditure on each type of asset in each year and the value of assets is simply removed from the records after the appropriate lifetime.

Depreciation charges are calculated on the gross book value of assets on the first day of each financial year and interest rates are charged on the net depreciated value, ie gross historic value less provision for depreciation. (Although no record is kept of accumulated provision for depreciation, the use of the straight line depreciation method means that net written down value can easily be calculated as a proportion of gross value.) This simplifies the procedure as similar types of assets can be treated collectively. The rate of interest used in calculations is the long term bond rate in the year of purchase.

A hypothetical example of the way in which depreciation and interest charges are currently calculated is given in Tables II.1 to II.3.

Table II.1 shows the method by which gross book value of assets is calculated. The example shows a hypothetical series of purchases over a seven year period of a type of asset having a five year life span. The value of an asset entered in the Department of Aviation's books of account is calculated as the cash price paid plus capitalised interest on the asset in the year of purchase. Capitalised interest is calculated as 50 per cent of the interest charge at the long term bond rate in the year of purchase of the asset.

In the above example, the interest charge shown as a current cost in the Departmental accounts is calculated as the interest on the net depreciated value of assets purchased in the previous five years. For example, the interest charge shown in the accounts for year seven comprises the interest on the net depreciated value of assets purchased in years two to six inclusive. No interest is calculated for year one, since assets purchased in that year would be fully depreciated in year six accounts. Likewise,

the interest on assets purchased in year seven is capitalised and is not shown in the accounts of year seven as a current cost. The interest charge on assets is calculated using the long term bond rate in the year of purchase, irrespective of variations

TABLE II.1—HYPOTHETICAL EXAMPLE OF DEPARTMENT OF AVIATION METHOD FOR CALCULATING GROSS BOOK VALUE OF ASSETS WITH FIVE YEAR DEPRECIATION PERIOD

Year of purchase or sale	*Cash purchase price ($)*	*Disposal price ($)*	*Net increase ($)*	*Interest*		*Gross book value[c] ($)*	*Cumulative gross value[d] ($)*
				Rate[a] (per cent)	*Value[b] ($)*		
1	1 000	–	1 000	5	25	1 025	1 025
2	500	–	500	10	25	525	1 550
3	2 000	200	1 800	10	90	1 890	3 440
4	3 000	–	3 000	5	75	3 075	6 515
5	5 000	–	5 000	10	250	5 250	11 765
6	4 000	–	4 000	5	100	4 100	15 865
7	2 000	–	2 000	10	100	2 100	16 940

a. Long term bond rate in year of purchase.

b. Value of capitalised interest in year of purchase. equals 50 per cent of product of cash purchase price and current long term bond rate.

c. Gross value of asset entered in asset register.

d. Cumulative gross value at beginning of *next* year. eg cumulative gross value for purposes of calculating depreciation charges in year 8 will be $16 940 equal to $15 865 + $2100 – $1025: the last item being the writing off of assets purchased in year 1.

– nil or rounded to zero

TABLE II.2—HYPOTHETICAL EXAMPLE OF DEPARTMENT OF AVIATION METHOD OF CALCULATING INTEREST CHARGES IN YEAR SEVEN ON ASSETS WITH FIVE YEAR DEPRECIATION PERIOD

Year of purchase	*Gross value[a] ($)*	*Depreciated value[b]*		*Interest rate[c] (per cent)*	*Interest charge in year 7[d] ($)*
		per cent of gross	*value ($)*		
1	1 025	0	0	5	0
2	525	20	105	10	10.5
3	1 890	40	756	10	75.6
4	3 075	60	1 845	5	92.3
5	5 250	80	4 200	10	420.0
6	4 100	100	4 100	5	205.0
7	2 100	..	..	10	..
Total	..	..	..	..	803.4

a. Gross value equals cash paid for asset plus capitalised interest in year of purchase.

b. Assets assumed to be depreciated over five years by straight line method, ie 20 per cent per annum. Values shown are net depreciated values of assets purchased in years 1 to 7 at end of year 7.

c. Long term bond rate in year of purchase of assets.

d. Interest charged in year 7 on assets purchased in years 2 to 6 inclusive. Assets purchased in year 1 have been depreciated to zero value and do not generate any interest charge while an interest charge on assets purchased in year 7 will not be included in the accounts until year 8.

.. not applicable

Note: The Department of Aviation depreciates assets by the straight line method assuming zero residual value. Interest charges are calculated as the product of the depreciated value of assets and the long term bond rate in the year of purchase.

in the bond rate in later years, ie interest rate charges shown in Department of Aviation accounts for year seven equal the sum of the products of the net depreciated value of assets and the long term bond rate for years two to six inclusive. The last section of this appendix outlines a slightly different approach which is adopted for calculating interest rates in cases where the life of an asset exceeds the issue period of long term bonds in the year in which the asset was purchased.

A hypothetical example of the method by which interest charges are calculated in Department of Aviation accounts is given in Table II.2. Depreciation charges on Department of Aviation assets are calculated by the straight line method with residual value being taken as zero. Using the figures given in Table II.2, depreciation in year seven would be 20 per cent of the total gross values of assets purchased in years two to six inclusive. Assets purchased in year one would be fully depreciated by year six and hence would not generate any depreciation debit in year seven. Likewise, there is no depreciation charge for assets purchased in year seven in the accounts for year seven, because the practice followed by the Department is not to depreciate assets until the year after purchase.

Table II.3 gives a hypothetical example of the Department of Aviation assets register for airways facilities. The register shows asset values by year of completion and year of expenditure. The register also shows the long term bond rate in the year of expenditure. Interest is calculated on the depreciated value of assets at the long term bond rate in the year of expenditure. For example, in year seven, the interest charged on assets completed in year six (when they are still in the register at 100 per cent of value before depreciation) will comprise 10 per cent of $2300 on the capitalised cost of works carried out in year four which were subsequently completed

TABLE II.3—HYPOTHETICAL EXAMPLE OF DEPARTMENT OF AVIATION ASSET REGISTER AND CALCULATION OF INTEREST CHARGES FOR AIRWAYS FACILITIES

Year facility completed	*Year of expenditure*	*Gross capitalised value ($)*	*Depreciated value year 7* (per cent)	*Depreciated value year 7* ($)	*Interest rate*[a] (per cent)	*Depreciation charge year 7 ($)*
Year 1	Year 1	1 000	0	0	6	0
Year 2	Year 1	2 000	20	400	6	24
	Year 2	1 500	20	300	8	24
Year 3	Year 2	700	40	280	8	22
	Year 3	1 300	40	520	9	47
Year 4	Year 2	2 500	60	1 500	8	120
	Year 3	3 000	60	1 800	9	162
Year 5	Year 3	1 000	80	800	9	72
Year 6	Year 4	2 300	100	2 300	10	230
	Year 5	2 000	100	2 000	11	220
Total	..	..	..	..	..	921

a. Long term bond rate in year of expenditure.

.. not applicable

Note: The Department of Aviation's asset register for airways facilities shows value of assets by year of completion of construction and by year of expenditure. For example, the above figures show $5500 of completed works in year 4 comprising $2500 of work carried out in year 2 and $3000 in year 3. Interest charges are calculated on the net depreciated asset value using the long term bond rate in the year of expenditure.

in year six, plus 11 per cent of $2000 for costs in year five for works completed in year six, a total of $450. (The determination of interest rates on assets after the appropriate long term bond issue has matured is described in a following section.) As with other assets, depreciation on airways facilities is calculated by the straight line method with zero residual value.

The above discussion has referred to airways facilities. Similar accounting methods are used for assets like runways, buildings and other facilities for which expenditures on construction may extend over several years prior to the asset becoming operational. The simpler method shown in Table II.2 is used for calculating interest charges on other types of assets.

As a generalisation, the date of completion of installation or construction projects is taken as the date on which all outstanding payments are made and all legal matters finalised. In practice, however, the date of completion seems to be a matter of judgement for departmental staff. In some instances runways and related ground facilities have been defined as completed when they become operational, even though financial and legal matters were not finalised or some minor portion of the work was still unfinished. In such cases, the asset is declared completed in order to minimise the capitalised value of the asset on which the aviation industry will subsequently be charged interest.

DEPRECIATION PERIODS

The asset lives used by the Department of Aviation in calculating depreciation on its assets are approximately based, where possible, on the depreciation periods defined by the Taxation Office for private sector firms operating similar assets. (Although the depreciation periods used by the Department of Aviation are not exactly the same as those allowed by the Taxation Office.) It should be noted, however, that certain types of assets operated by the Department of Aviation are rarely, if ever, operated by private sector firms, eg fire tenders, airways facilities, etc. The asset lives currently used for calculating depreciation charges on assets are shown in Table 2.2.

WORKS IN PROGRESS

The accounting methods outlined in the previous section are applied in general to all Department of Aviation assets in calculating interest and depreciation costs. However, certain additional accounting records are maintained for works in progress on assets which are installed or constructed over more than one accounting period, comprising mainly airways facilities, buildings and runways and other airport improvements.

The general principle adopted in accounting for facilities under installation or construction is that interest on cash outlays is capitalised until the facility becomes operational, then interest and depreciation are charged as a current cost on capitalised value. Depreciation is not charged on a facility until it becomes operational.

The interest charged on facilities is calculated using the long term bond rate in the year of expenditure. Interest is capitalised at this rate while an asset is under installation or construction, then interest is charged as a current cost using the same rate on the capitalised value from the initial year of operation. The procedure for calculating interest on land purchases is different from that used for construction projects; details of the calculation of interest on land purchases and the determination of interest rates after the maturity of the long term bond issue in the year of purchase are described below.

As with other purchases of assets, it is assumed that cash payments for installation or construction projects are made, on average, half way through each financial year. Only 50 per cent of interest on outlays is therefore capitalised in the year of outlay,

but in subsequent years the full amount of interest is calculated and capitalised on the cash outlay and previously capitalised interest.

Department of Aviation records of work in progress are based on annual returns provided by the Department of Housing and Construction in respect of runway, building, and improvement projects, and returns from the Department's Airways Division in respect of airways facilities. (The Department of Administrative Services also provides returns on purchases of land and residences.) The returns show the value of work in progress at the beginning of each financial year. These are used to calculate the value of completed work each year by taking the amount of work in progress at the beginning of the period, plus expenditure charged during the year, less the amount of work in progress at the beginning of the next financial year.

Table II.4 gives a hypothetical example of Department of Aviation accounting methods for assets under installation or construction. In the example cash payments of $1000, $2000 and $4000 are made in years one, two and three respectively. Fifty per cent of the interest on these outlays is capitalised in the year of expenditure, while in following years the full amount of interest is charged on the amount of cash outlay plus previously capitalised interest. The rate of interest charged in each year is the long term bond rate in the year of expenditure. When work on a project is completed and the expenditure is written out of the works in progress register, then a proportionate amount of interest is also written out. In the Table II.4 example, $500

TABLE II.4—HYPOTHETICAL EXAMPLE OF THE DEPARTMENT OF AVIATION METHOD OF ACCOUNTING FOR WORKS IN PROGRESS OVER MORE THAN ONE ACCOUNTING PERIOD

			Interest rate					
			12 per cent Year 1		*14 per cent Year 2*		*15 per cent Year 3*	
Year	*Cost item*	*Annual totals*	*Cash cost*	*Interest*	*Cash cost*	*Interest*	*Cash cost*	*Interest*
Year 1	WIP[a]	1 000	1 000	..	..	..	..	..
	INT[b]	60	..	60	..	..	..	..
	E&I[c]	1 060	1 000	60	..	..	..	..
	CW[d]	0	0	0	..	..	..	..
Year 2	WIP[a]	3 060	1 000	60	2 000	..	..	..
	INT[b]	267	..	127	..	140	..	..
	E&I[c]	3 327	1 000	187	2 000	140	..	..
	CW[d]	0	0	0	0	0	..	..
Year 3	WIP[a]	7 327	1 000	187	2 000	140	4 000	..
	INT[b]	741	..	142	..	299	..	300
	E&I[c]	8 068	1 000	329	2 000	439	4 000	300
	CW[d]	908	500	164	200	44	0	0
Year 4	WIP[a]	7 160	500	165	1 800	395	4 000	300

a. Work in progress at beginning of year
b. Interest charges
c. Expenses and interest
d. Completed works
.. not applicable

Note: In this example the Department's capital expdnditure is $1000 in year 1, $2000 in year 2, and $4000 in year 3. The long term bond rate is 12 per cent, 14 per cent, and 15 per cent in years 1, 2 and 3 respectively. In year 3, $908 worth of completed works are written out of the works in progress register to the assets register; this figure comprises $664 for work carried out in year 1 ($500 cash payments and $164 of capitalised interest) and $244 for work carried out in year 2 ($200 cash payments and $44 capitalised interest).

of expenditure in year one is written out of the works in progress register in year three; this represents 50 per cent of year one expenditure carried forward to year three and hence 50 per cent of the capitalised interest is also written out. Table II.4 shows that $908 worth of completed works would be written out of the works in progress register and entered on the assets register in year three, comprising $664 for works carried out in year one ($500 cash and $164 capitalised interest) and $244 for year two ($200 cash outlays plus $44 interest).

In theory, individual assets are written out of the work in progress register on completion. In practice, however, the longest outstanding amounts of work in progress may be written out, with the value of works written out of the register being equal to the value of the completed project. The difference between theory and actual practice is demonstrated in Table II.5. The method of writing out the oldest expenditure first is adopted by Department of Aviation staff in order to minimise the capitalised value of assets on which the aviation industry is charged interest.

LAND

Land is purchased by the Department of Administrative Services on behalf of the Department of Aviation. Money is allocated to the Department of Administrative Services for purchases of land which is subsequently entered on the asset register of the Department of Aviation. The Department of Administrative Services also purchases residences for use by Aviation personnel. Accounting treatment of land is unique in two respects; land values are not depreciated, and interest on land purchases is treated as a current cost from the year after the year of purchase, even though its use for aviation purposes may be several years in the future. The value of land purchases entered in Department of Aviation asset registers is calculated in the same way as for other assets, ie as the sum of the cash price plus half the interest for one year calculated using the current long term bond rate and the purchase

TABLE II.5—HYPOTHETICAL EXAMPLE OF DEPARTMENT OF AVIATION METHOD OF TRANSFERRING WORKS IN PROGRESS TO THE ASSETS REGISTER

	Year of expenditure			
	Year 1	*Year 2*	*Year 3*	*Year 4*
Project 1	500	600	800	900
Project 2	400	300	300	300
Project 3	200	200	200	200
Project 4	100	100	100	100
Total WIP[a] at end Year 4	1 200	1 200	1 400	1 500
Write out Project 2				
actual	1 200	100	-	-
balance WIP[a]	0	1 100	1 400	1 500
theory	400	300	300	300
balance	800	900	1 100	1 200

a. Works in progress.
- nil or rounded to zero

Note: The works in progress register shows the value of works in progress at the end of year 4. If project 2 is completed in year 4 then $1300 is written out of the works in progress register and entered in the assets register. In theory, cash payments and interest for project 2 are written out against the actual year of expenditure. In practice the total value of project 2 may be written out against the longest outstanding amounts: in this case, the $1300 for project 2 has actually been written out against the $1200 for all projects for year 1 and $100 of the total for year 2. It should be noted that the works in progress register does not actually record individual projects but rather shows only total expenditures for each type of asset.

price. In subsequent years, interest on land holdings is treated as a current cost. In some cases, land has been acquired by the Department of Aviation as much as a decade or more before facilities are constructed on it. Long lead times are necessary where several parcels of land have to be acquired for major projects, eg Brisbane airport. The interest on such purchases is treated as a current cost in order to avoid accumulation of large capitalised values on land which would subsequently generate large interest costs for the aviation industry when facilities are constructed and become operational. This practice differs from the treatment of work in progress on runways and buildings where expenditure is capitalised until the facility becomes operational. Rental and other income received on land being held for future aviation use is recorded as a credit in Department of Aviation accounts, offsetting interest charges.

The various costs incurred by the Department of Administrative Services in purchasing land for the Department of Aviation are not taken into account for cost recovery purposes, either as current costs in the year of purchase or as capitalised cost items added to the cash purchase price. Further, some landholdings were transferred from the RAAF or from other crown authorities and, because no cash transaction was involved, such landholdings were entered in the Department of Aviation asset register at zero value.

RUNWAYS, BUILDINGS AND OTHER IMPROVEMENTS

Expenditure on runways comprises capital works and maintenance. Capital expenditure is defined as work which improves the quality or capacity of an airport, such as widening or strengthening of runways to accept a bigger type of plane, while maintenance work comprises expenditure to maintain an existing quality or capacity.

There is no conceptual problem in distinguishing capital works from maintenance expenditure; each airport is a uniquely identifiable unit with precisely known qualities and capacities and certified for landings of specified plane types. Nevertheless, in practice the distinction between capital and maintenance works may be blurred in some instances, if only because funds for works may sometimes be available for, say, maintenance but not capital works. Hence, over several years a series of maintenance works might eventually result in the upgrading of an airport's capacity, eg re-sealing might yield a stronger runway or repairs to taxi-ways might be extended so that a grass runway becomes sealed. For individual works projects, the Department of Aviation distinguishes capital from maintenance expenditure by the criterion of whether an airport's category is changed; expenditure which upgrades the status of an airport or runway being defined as a capital work.

AIRWAYS FACILITIES

Airways facilities include communications equipment, radar, etc although communications equipment is probably the largest component of the total. The depreciation period of 20 years used for airways facilities is based on the rate allowed by the Tax Office for similar equipment operated by the private sector.

Some airways facilities are on the Department of Aviation asset register at zero cost. For example, the airways facilities at Darwin are recorded in the asset registers at zero cost because they were re-constructed after cyclone Tracey with special Commonwealth Government assistance. No cash expenditure by the Department of Aviation was involved and therefore the assets are recorded at zero value.

In some major projects the cost of certain major airways facilities items of equipment are included in the cost of buildings. Where the Department of Housing and Construction has not been able to give an analysis of the various cost components, the project cost is entered into the Department of Aviation asset register simply as a building. There are, therefore, some major items of airways facilities which

are currently being depreciated over 40 years instead of the 20 years specified for airways facilities.

AIRCRAFT (GENERAL AND F28)

Different depreciation periods are used for F28 and other general aircraft to reflect the expected lives of different aircraft types. A certain proportion of the interest and depreciation charges for departmental aircraft is defined as being attributable to the regulatory functions of Government rather than being attributed to the aviation industry for cost recovery purposes. For example, departmental aircraft are used for flying training for officers required to hold pilot licences (examiners of airmen, etc) and, on rare occasions, are used as VIP aircraft (current costs of VIP operations using Department of Aviation aircraft are paid by the Department of Prime Minister and Cabinet).

COMPUTER EQUIPMENT

The value of computer equipment shown in Department of Aviation accounts comprises mainly those machines used by the Department's ADP Branch. Computer equipment used by other areas may be entered in asset registers under other classifications, such as test equipment. The financial implication is that certain items of equipment are currently being depreciated over 20 years rather than the nominal 10 years. The value of computer equipment in other accounting classifications is not known but could be in the order of $1 million.

REFINANCING OF COMMONWEALTH LOANS

Interest charges on Department of Aviation assets are calculated using the long term bond rate in the year of purchase of the assets. When a long term bond issue matures, bond holders are normally given the option of converting their bonds to a new bond issue receiving the current interest rate. The interest rate on the conversion loan is subsequently used for calculating interest for assets to which the original rate of interest applied. This practice mainly applies to the calculation of depreciation on runways, buildings and improvements which are depreciated over 40 years.

APPENDIX III—SUMMARY OF RESULTS: DEPARTMENT OF AVIATION COSTING SYSTEM, 1980-81

This appendix shows tables extracted from the Department of Aviation's report (unpublished b) on cost recovery for 1980–81. The report is produced for internal departmental use only and is not readily available to the public, although it is provided to the aviation industry. All of the figures shown in the Department of Aviation's annual reports on cost recovery are derived from the Department's costing system rather than its appropriations accounts.

TABLE III.1—ANALYSIS OF DEPARTMENT OF AVIATION COSTS AND REVENUES, 1980–81

($million)

Cost/revenue items	Total	Attributable	Non-attributable
Costs			
Direct costs			
Airport and route facility costs	129.7	129.7	–
Regional Offices branch costs	63.2	43.3	19.8
Central Office branch costs	59.1	21.9	37.2
Other direct costs	27.5	23.7	3.8
Total	279.5[a]	218.7	60.9
Indirect costs			
Depreciation	19.1	19.1	–
Interest			
depreciated asset values	29.6	29.6	–
stores stock	1.6	1.6	–
net cash outlay	6.1	4.6	1.4
Superannuation liability	28.6	24.4	4.2
Total	85.1	79.5	5.6
Total costs	364.7	298.2	66.5
Revenue			
Collected by Department of Aviation			
Air navigation charges	95.9	95.9	–
Dividends	2.2	–	2.2
Rentals	16.3	16.3	0.1
Trading concessions	16.1	16.1	–
Car parking	4.6	4.6	–
Miscellaneous	9.2	8.2	1.0
Total	144.4	141.1	3.3
Collected by other departments			
Aviation fuel tax-Department of Business and Consumer Affairs (Australian Customs)	45.1	45.1	–
Sale of equipment-Department of Administrative Services	0.4	0.4	–
Rentals-Department of Administrative Services	0.3	0.3	–
Total	45.8	45.8	
Total revenue	190.2	186.9	3.3

a. Difference due to rounding.
– nil or rounded to zero.

Source: Department of Aviation (unpublished b).

TABLE III.2—ANALYSIS OF DEPARTMENT OF AVIATION OUTLAYS ON AIRPORT AND ROUTE FACILITIES, 1980–81

Account type/ cost account code	*Item*	*$million*
	Maintenance	
	Airways facilities	
2.10	Airways communication equipment	5.18
2.180)	Test equipment (electronic and electrical)	
2.181)	miscellaneous (180), radio (181) and aircraft flight test	
2.184)	equipment (184)	0.25
2.11	Radio navigation equipment	4.36
2.182	Test equipment, navigation	0.08
2.12	Airport/airway lighting (excluding street)	2.00
2.183	Test equipment, lighting and power	0.06
2.13	Power generation equipment (including ancillary)	1.72
2.15	Power distribution cables	0.77
2.14	DC and audio frequency control lines	1.26
2.17	Teletype equipment and lines (salaries of operators but not maintenance staff)	1.98
2.19	Meteorological type equipment	0.12
	Total	17.77
	Airport facilities	
2.16)	Water airport equipment (wharves etc) minor	
2.28)	maintenance vehicles/plant by Aviation staff sites,	
2.41–49)[a]	pavements, etc	12.96
2.30-40	Departmental buildings, various	9.39
	Total	22.35
	Vehicles, plant, furniture and equipment	
2.51	Fire fighting vehicles and equipment	1.97
2.52-61)		
2.63-68)	Plant, tools, miscellaneous equipment	1.65
2.62	Marine craft	0.09
2.70-76	Furniture	0.48
	Total	4.19
	Total	44.32

TABLE III.2 (Cont)—ANALYSIS OF DEPARTMENT OF AVIATION OUTLAYS ON AIRPORT AND ROUTE FACILITIES, 1980–81

Account type/ cost account code	*Item*	*$million*
	Operations	
2.82	Air traffic control officers	25.32
2.80	Flight service officers	20.12
2.81	Fire fighting staff	11.52
2.69	Search and rescue equipment	0.26
	Total	57.22
	General expenses	
4.24	Electricity and gas	6.72
4.25	Telephones and postage, etc	2.39
4.23	Rates	3.03
4.27	Rent	
2.26	Cleaning of buildings	3.46
2.25	Garbage collection, etc	0.21
Sundry[b]	Administration	6.69
2.27	Car parking facilities, etc	5.69
	Total	28.19
	Total expenses	129.73

a. 2.41-49 includes sealed and unsealed runways, taxiways, and aircraft movement areas, fences, approach areas, lighting, roads, etc.

b. *Includes:* 3.90; 3.920, 923, 925; 3.97; 4.059; 3.91; 3.921, 922, 924; 3.94; 4.21; 4.22; 4.48; 4.83.

Note: The figures shown are referred to as costs at 'locations' and are calculated as total costs for each region less costs at regional offices. The term 'location' covers airports, navaids, etc, but does not include central or regional offices, workshops, stores etc.

Source: Department of Aviation (unpublished b).

TABLE III.3—DEPARTMENT OF AVIATION REGIONAL OFFICE BRANCH COSTS, 1980–81

Account type/ cost account code	*Item*	*$million*
	Operations branches	
3.821	Assistant Director (Operations) and staff	.60
3.822	Flying Operations Section	3.14
3.823	Airworthiness Section	3.13
3.824	Airways Operations Section	2.09
3.825	Environment and Security Section	.30
	Total	9.27
3.83	Airports Branch	6.82
3.84	Airways Engineering Branch	8.81
3.802	Inspectors of Air Safety	1.01
3.803	Air Transport Policy Section	0.29
a	Surface operations sections	4.44
	Total	21.37
	Management Services branches	
3.811	Assistant Director (Management Services) and staff	0.22
3.812	Finance Section	2.56
3.813	Personnel Section	6.09
3.814	Supply and Transport Section	3.01
3.815	Business and Property Section	0.60
3.816	Internal Audit Section	0.29
	Total	12.76
3.95-6	Staff training: instructors and trainees	9.16
	Directors and staff	0.42
	General expenses	
3.920-5	Stores administration	2.70
4.23&7	Rent and rates	1.94
4.25	Telephones and postage, etc	1.58
b	Maintenance of buildings	1.82
c	General administration	0.97
4.21	Transport charges Department of Admin. Services	0.36
2.26	Cleaning of buildings	0.49
4.24	Electricity and gas	0.36
	Total	10.24
	Total	63.21

a. All codes.
b. Maintenance of buildings comprises items 2.10 to 2.76.
c. General administration includes 3.90, 3.93. 4.22. 4.28, 4.32 and 2.25.

Source: Department of Aviation (unpublished b).

TABLE III.4—DEPARTMENT OF AVIATION CENTRAL OFFICE BRANCH COSTS, 1980–81

Cost code	*Item*	*$million*
	Ground Facilities Division	
3.23	Airways, Planning, Research, and Development Branch	2.78
3.26	Airways Work and Services Branch	2.26
3.21	Airport Planning and Development Branch	1.12
3.20	Airport Engineering Branch	2.18
	Brisbane Airport Branch	.12
	Total	8.46
	Airways Operations Division	
3.60	Operational Services Branch	2.81
3.61	Planning and Development Branch	0.11
3.62	Environment and Security Branch	0.27
	Total	3.19
	Flying Operations and Airworthiness Division	
3.30	Regular Public Transport Branch	0.66
3.31	General Aviation Branch	0.70
3.32	Flying Unit Branch	2.19
3.36	Airworthiness Branch	2.19
3.39	Aviation Medicine Branch	0.34
	Total	6.07
	Air Transport Policy Division	
3.40	Economic Policy and Investment Branch	0.70
3.41	Domestic Regulation Branch	0.46
	Total	1.16
	International Policy Division	
3.43	Bilateral Relations Branch	0.30
3.44	Economic Investigations Branch	0.37
3.45	International Relations and Air Freight Branch	0.30
	Total	0.97
	Management Services Division	
3.53	Establishments and Systems Branch	0.90
3.55	Industrial Branch	0.78
3.54	Personnel Development and Transport Education Branch	2.56
3.56	Administrative Services Branch	4.43
3.46	Assistant Crown Solicitor	0.02
	Total	8.68
	Finance and Commercial Division	
3.50	Finance Branch	0.95
3.51	Commercial Branch	
3.512	Business and Property Section	0.57
3.514	Supply and Transport Section	1.05
3.58	ADP Branch	1.59
	Total	4.16

TABLE III.4 (Cont)—DEPARTMENT OF AVIATION CENTRAL OFFICE BRANCH COSTS, 1980-81

Cost code	*Item*	*$million*
	Other	
3.180	Planning Sydney Airport Division (MANS)	0.07
3.16	Air Safety Investigation Branch	0.75
3.13	Overseas representatives	0.06
3.19	Surface transport divisions	15.07
3.70-79		
3.17	First Assistant Secretary and staff	0.51
3.102)	Minister and staff, executive	
3.103)	Public Relations, executive	0.49
3.101	Secretary, deputy secretaries and staff	0.40
	Total	17.35
	Total	50.05
	General expenses	
4.27)	Rent	2.83
4.23)	Rates	
4.25	Telephones, postage etc	3.30
a	Maintenance of buildings and equipment	1.48
4.50	Overseas travel	0.24
4.21	Transport charges. Department of Admin. Services	0.39
4.28	Advertising	0.16
2.17	Maintenance of teletype equipment and lines	0.11
2.26	Cleaning of buildings	0.26
4.24	Electricity and gas	0.26
	Total	9.02
	Total	59.07

a. Several codes.

Source: Department of Aviation (unpublished b).

TABLE III.5—DEPARTMENT OF AVIATION OTHER DIRECT COSTS, 1980-81

Account type/ cost account code	*Item*	*$million*
a	Central Training College	2.60
a	Fire Training School	0.18
2.83	Meteorological services	11.89
a	Aircraft and equipment-maintenance and operations	5.53
4.44	Experimental	0.83
4.45	Noise investigations	b
4.43	Development of civil aviation	0.06
4.53	Assistance for flying training	0.07
4.55	Payments to ICAO	0.32
4.52	Payments to airlines; subsidies	0.33
4.49	Airfare subsidy Tasmania-Melbourne	0.41
4.81	Aerodrome development grants	1.83
4.82	Aerodrome maintenance grants	2.40
4.46	Air safety investigations	0.05
4.26	Flying training, hire of private aircraft	0.76
4.47	Aerodrome and site surveys	0.24
3.97-700	Staff training, field staff	c
	Total	27.52

a. Calculated as the sum of various account type/cost type codes for specific location codes.
b. Expenditure under this category on noise investigation totalled $4283.
c. Expenditure under this item on training totalled $4256.

Source: Department of Aviation (unpublished b).

APPENDIX IV—METHOD OF CALCULATING CHARGES TO AVIATION INDUSTRY FOR METEOROLOGICAL SERVICES

Reproduced below are extracts from an agreement between the Department of Aviation and the Bureau of Meteorology (unpublished).

PRINCIPLES FOR COSTING METEOROLOGICAL SERVICES

The Department of Aviation shall bear the costs incurred by the Bureau of Meteorology in providing meteorological services for civil aviation and the charge shall be based on the following principles.

Principle 1
The costs of providing meteorological services for civil aviation shall include:

- the salaries and allowances paid of officers directly involved in providing the service;
- administrative overheads of staff directy attributable to provision of the service;
- other costs directly attributable to the service including communications, materials, observations, computing and interest and amortisation of capital equipment; and
- accommodation provided by the Bureau of Meteorology to officers directly involved in providing the service.

Principle 2
The costs of research and investigations undertaken by the Bureau in accordance with the provision of Section 6 and approved by the Department of Aviation shall be calculated on the basis of the charging policy and borne by the Department of Aviation[1]. A statement of the costs shall be provided to the Department of Aviation.

Principle 3
Costs of shared services or facilities shall be allocated on a proportional basis taking account of the relative usage of the services or facilities.

Principle 4
The cost of providing accommodation and associated services for meteorological offices established at aerodromes in accordance with these arrangements shall be borne by the Department of Aviation.

Principle 5
Except where agreement to the contrary is expressly stated, the Department of Aviation may charge the Bureau of Meteorology for the provision of such ancillary services and facilities that are not required to provide meteorological services for civil aviation. If more convenient administratively, the Bureau may make allowance for the cost of such service and facilities in determining the annual charge.

Principle 6
The cost of providing, installing and maintaining meteorological instruments and apparatus at aerodromes shall be borne by the owner (ie the Department of Aviation or the Bureau of Meteorology) except that costs shall be included in the charge

1. Section 6 of the working arrangements specifies that the Bureau of Meteorology will carry out research which is needed to improve meteorological services to aviation or research requested by the Department of Aviation.

levied for Bureau services in cases where Bureau meteorological instruments and apparatus are required to provide services for civil aviation.

Principle 7
Operational and meteorological information shall be handled without charge on the aeronautical telecommunications service.

CALCULATION OF CHARGE

The cost of providing meteorological services to civil aviation will be calculated using the charging formula:

Charge = 2.05 (A + B) + 0.27A + C – 0.12D

Where

A = the salaries of shift workers involved in providing the service to civil aviation.

B = the salaries of non-shift workers involved in providing the service to civil aviation.

C = the other direct costs.

D = the salaries of staff for whom the Secretary (of the Department of Aviation) provides accommodation.

Note 1: The component 2.05 (A + B) is attributable salaries plus an overhead loading of 105 per cent which covers relevant administrative expenses and includes accommodation. The 0.12D component provides an appropriate allowance to cover those cases where accommodation is provided by the Secretary (of the Department of Aviation).

Note 2: The component 0.27A is a loading on shiftworker's salaries to cover penalty payments.

Note 3: The costs of salaries shall be determined by applying the top increment of salary for staff allocated to the provision of meteorological services for civil aviation.

APPENDIX V—ACCOUNTING APPROACH FOLLOWED BY THE BRITISH AIRPORTS AUTHORITY

The British Airports Authority (BAA) provides a useful example of an approach to resource valuation on a current cost accounting basis. The following details are based on information contained in the BAA annual report (BAA 1983).

The BAA is a British government owned public enterprise, established as a commercial profit seeking, tax-paying organisation in 1965. It operates seven UK airports: Heathrow, Gatwick and Stansted serving the London area; and the Scottish airports of Glasgow, Aberdeen, Edinburgh and Prestwick. The BAA is not involved in the provision of air traffic control, air navigation or flight service systems; these are the responsibility of the British Civil Aviation Authority's National Air Traffic Service. Instead, its task is to operate the airports and provide fire services, security services and terminal management at the airports under its control. Most other British airports are run by local government authorities.

To place the BAA in perspective, it handled 44 million passengers, 755 000 aircraft movements and 685 000 tonnes of cargo and mail in 1982–83. By comparison, the eight Australian capital city airports handled 20 million passengers in 1981–82. A staff of 7000 is employed by the BAA, together with assets with a depreciated current cost value of £952 million ($A1517 million)[1]. Revenues, which amounted to £284 million in 1982–83 ($A453 million) are derived from; aircraft landing fees and parking and apron charges (54 per cent of the total), and from rents and concessions for retail shops, catering facilities, advertising, car parks and office space. The BAA has been consistently profitable since its establishment, with a current cost accounting profit of £30 million in 1982–83 ($A48 million) and has financed its capital works almost entirely from internally generated funds.

As a commercial undertaking, the Authority prepares accounts on a financial accounting basis and, in common with other British nationalised industries, these accounts are prepared in accordance with SSAP16, the current cost accounting standard set by the Institute of Chartered Accountants in England and Wales. Fixed assets are valued on the basis of replacement costs and depreciation is charged on a straight line basis using these costs, including an allowance for backlog depreciation. Land was valued at the cost of its notional replacement or at its open market value by professional surveyors at 1 April 1981 and is updated by the BAA's own staff each year. Buildings, runways, main services, fixed plant and equipment were also valued at the same date by expert valuers, with values updated by indices for each asset category provided by the valuers. Motor vehicles and office machinery are revalued each year by reference to publicly available price indices. Assets under construction are recorded at historical cost until they are completed, at which time they are revalued to replacement costs. The undepreciated replacement value of all assets was estimated at £1800 million ($2.9 billion) in 1982–83.

The asset lives chosen for depreciation purposes, which are based on the BAA's own studies, are shown in Table V.I.

Interest costs are recorded as they are incurred and as almost all assets have been

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1. Based on midrate for the pound sterling of £1=$A1.5934 as at 15 December 1983, quoted in the *Australian Financial Review* 16 December, 1983.

TABLE V.1—ASSET LIVES USED BY BRITISH AIRPORTS AUTHORITY
(years)

Asset	*Minimum life*	*Maximum life*
Terminals, operational buildings and plant	15	40
Other buildings	40	58
Runways, taxiways, aprons	23	59
Aerodrome lighting	15	32
Car parks and fencing	10	45
Roads, bridges, tunnels, drainage	30	55
Electrical control equipment	7	7
Lifts, lifting equipment, etc	15	16
Electrical distribution plant	25	54
Loading bridges	15	17
Motor vehicles, mobile equipment	4	22
Office machinery	7	8

Source: British Airports Authority (1981-82).

financed internally they are relatively low. The policy on interest incurred on assets under construction is not stated. However, the BAA agreed with the British Government to a target profit level of a 6 per cent return on net assets revalued at current cost and prices were set in an attempt to achieve this return over the three year period to 1982-83 (although in fact profit fell short of this target).

Non-capital costs are recorded in the same way as in historic cost accounting. The BAA is responsible for the cost of sound proofing grants made to residents in areas affected by noise disamenity around Heathrow and Gatwick airports; the cost of these grants, estimated to total about £18 million ($A29 million), is being capitalised as a deferred expense and written-off over 10 years.

The BAA sets its own charges independently of outside control and its policy is to base charges on long-run marginal costs. It appears that these costs for capital assets involve valuation on a replacement cost basis, straight line depreciation and the required return of six per cent on depreciated replacement value of assets. The resultant charging structure includes differential charges for different airports, peak charges and, where capacity is fully utilised, rationing prices. According to Carlson (1982), the pursuit of these policies led to a 40 per cent increase in charges at Heathrow airport to a level reportedly higher than any other airport in the world. However, there has been no increase in charges from May 1981 (in response to the effects of the economic recession).

The BAA example shows that current cost accounting can and has been applied to an airport operating organisation. It would appear that the practical problems of replacement cost valuation can be solved and the principles applied in a workable manner.

APPENDIX VI—UNITED STATES DEPARTMENT OF TRANSPORTATION: STUDY OF AVIATION COST ALLOCATION

A particularly comprehensive review of aviation cost allocation was carried out for the 1966–75 period by the US Department of Transportation. While most of the 18 volume report is concerned with allocation issues and the attribution of revenue, some attention was given to questions relating to the attribution of costs. The approach to the calculation of attributable costs is described in Working Paper No 4 of the study, entitled 'An Airport and Airway System Cost Base'. This working paper covers the airport/airway system costs incurred by the Federal Aviation Administration, the US Department of Defence, the US Department of State (in respect of costs of international en-route services), the National Aeronautics and Space Administration and the US Department of Transportation. Various other federal aviation programs are excluded from this analysis, although they are covered by other working papers. Aviation costs incurred by state governments. local authorities and private organisations are also excluded.

The cost base used in the working paper applied to the 10 year period from 1966 to 1975, including seven years of actual figures and three years of projected figures. All costs, both capital and operating, are expressed in 1971 price levels using various indices for equipment, labour and construction. There are five functional categories included in the cost base:

- Airport systems (basically land and runways)
- Terminal control systems (facilities and equipment required for landings and take-offs)
- En-route control systems
- Flight service systems
- Support systems.

The cost in each of these functional categories are aggregated into four cost categories:

- Research and development
- Facilities and equipment (basically capital expenditure)
- Relocation and modification
- Operation and maintenance.

Costs are presented in accordance with these functional and cost categories. Current cost estimates are based partially on budgeted figures and, where budgeted figures were not in a suitable format for the subsequent allocation exercises, on the basis of standardised cost per unit parameters which are multiplied by the appropriate number of units in each case.

Three alternative formats of capital costs were used. The first involved charging capital expenditure on a cash flow basis, so the capital charge in any one year was represented by actual capital expenditure in that year, ie capital costs were treated like current costs. The second approach involved the calculation of an equivalent annual capital charge for the year based on an annuity equation using

lives of varying length (shown in Table VI.1) and a discount rate of 10 per cent in real terms (as all costs were set at 1971 price levels). The third approach was similar to the second, but included an allowance for the unexpired portion of capital expenditures incurred prior to 1966, again updated to 1971 price levels.

Over 95 per cent of the average US$1.4 billion cost for each of the 10 years was accounted for by the Federal Aviation Administration. Nearly 70 per cent of total costs fall into the operation and maintenance cost category, with a further 25 per cent being facilities and equipment (or capital expenditure).

TABLE VI.1—ASSET LIVES USED IN UNITED STATES DEPARTMENT OF TRANSPORTATION STUDY

Asset	*Life (years)*
Radar and communications equipment	13
Lighting systems, control tower	15
Aircraft	20
En-route control and flight service facilities	25
Support facilities	30
Airport runways	40

Note: For all assets, a zero salvage value was assumed.

Source: US Department of Transportation (1972).

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ABBREVIATIONS

AAS	Australian Accounting Standard
ADP	Automatic Data Processing
AGS	Australian Government Service
ALOP	Aerodrome Local Ownership Plan
BAA	British Airports Authority
BTE	Bureau of Transport Economics
DofA	Department of Aviation
LODG	Local Ownership Development Grant
LOMG	Local Ownership Management Grants
MWO	Minor works order
RAAF	Royal Australian Air Force
VIP	Very important persons
WA	Work authority
WIP	Works in progress
WJ	Workshop job