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FINANCING THE AIRPORT AND AIRWAY SYSTEM: COST ALLOCATION AND RE--ETC(U)
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**FINANCING THE AIRPORT AND AIRWAY SYSTEM:
COST ALLOCATION AND RECOVERY**

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U.S. DEPARTMENT OF TRANSPORTATION

✓ **FEDERAL AVIATION ADMINISTRATION**

✓ **Office of Aviation Policy**

Washington, D.C. 20590

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Office of Aviation Policy
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

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16. Abstract Development and maintenance of the Federal airport and airway system are authorized by the Airport and Airway Development Act of 1970 (as amended through 1976). Elements of existing legislation will expire in 1980. The purpose of this report is to analyze airport and airway system finances as a guide for developing post-1980 development and financial programs. Estimates are provided of 1978 and 1987 airport and airway system costs. System costs are allocated to users under two alternative procedures providing a range of cost responsibility. Aviation tax revenues are projected for 1978 and 1987 and are compared with allocated user costs. Several changes in aviation user taxes are evaluated as methods of aligning future airport and airway tax contributions with cost responsibility.		14. Sponsoring Agency Code	
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EXECUTIVE SUMMARY

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The issue of future airport and airway user cost responsibility and implications for tax revision are examined in this report.

Background

The Federal Aviation Administration (FAA)--(1) makes grants for airport development, (2) provides airport and airway facilities and services, and (3) performs regulatory functions necessary for aviation safety. The cost of these functions is partially defrayed through taxes and fees paid by system users. Remaining expenses are funded from general tax revenues.

In September 1973, the Department of Transportation submitted a study to Congress which allocated total airport and airway system costs for the period 1965 through 1975 to users and compared allocated costs with user charge revenues. ^{1/} That study concluded that while taxes collected from air passengers, freight, and carriers paid 95 percent of the allotted air carrier cost, taxes on general aviation paid less than 20 percent of its allocated costs. The study recommended full recovery of all costs allocated to users.

1/ The Airport and Airway Cost Allocation Study: Determination, Allocation, and Recovery of System Costs [35], hereafter referred to as the 1973 Cost Allocation Study.

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Subsequent to the 1973 Cost Allocation Study [35], several attempts were made by the Executive Branch to obtain legislation revising user taxes. No congressional action was taken on the requested revisions.

The Issue

Aviation is a well established transportation mode. The Office of the Secretary of Transportation and the Federal Aviation Administration believe that users should pay a proportionate share of the costs of the Federal airport and airway system. Since the 1973 Cost Allocation Study is now outdated and a matter of continuing dispute by members of the general aviation community, a reexamination of user cost responsibility and user charge revenues is in order. At issue is the extent to which various user groups should be responsible for airport and airway system costs incurred over the next decade, the adequacy of anticipated user charge revenues in reimbursing the Government for the cost of facilities and services provided, the potential revision of user charges, and/or a reduction of services to users reluctant to pay for such services.

Approach

Costs of FAA's current level of service from 1978 through 1987 are projected and analyzed with respect to user cost responsibility. Two alternative allocation procedures were employed to bound a range of user cost responsibility. One

technique allocates all airport and airway costs to users. The alternative procedure identifies a portion of airport and airway service costs as cost incurred to implement the public policy of a common airport and airway system meeting the requirements of all users. Under this procedure, users are only held responsible for the cost of the minimum service they require.

Revenues from user charges are also projected for the period 1978 through 1987 assuming an extension of existing charges and rates. (The projections do not give special consideration to the impact of regulatory reform or aircraft noise reduction proposals due to the uncertainties associated with these events.) Revenues from users are compared with the range of costs allocated to users.

Finally, potential changes in aviation user charges are identified and evaluated with respect to safety impact, equity, administrative qualities, precedent, and economic efficiency.

Findings

Total FAA costs are projected to grow from \$2.8 billion in FY-1978 to between \$5.7 and \$6.2 billion in FY-1987, depending on the degree of productivity increase achieved by the FAA. Only 84 percent of total costs are attributable to airport and airway system users including Government aviation. The remaining 16 percent of FAA costs are allocated to the general public or recipients of other FAA services.

Such costs consist of regulatory and general Government expenses, the cost of National and Dulles Airports, certification costs, nonaviation weather expenses, airway system costs attributable to national defense requirements, and air traffic control expenses associated with subsidized air transportation service to small communities.

Costs attributable to airport and airway system users were allocated under two alternative procedures:

1. Allocation of all airport and airway costs to users (based on a combination of economic analyses of operating and support costs, and engineering-economic analyses of new facility and equipment costs); and
2. Allocation of the minimum cost of required service to users with residual costs considered public costs incurred in the interest of aviation safety and reliability.

Combining nonattributable costs with allocations of attributable airport and airway costs produces the range of cost responsibility given in Table 1.

If existing airport and airway user taxes were extended through 1987, revenues would grow from \$1.3 billion in FY-1978 to \$3.0 billion in 1987. Most existing taxes are due to expire in 1980 or change to lower rates. Costs attributable to air carriers and general aviation will exceed revenues by between \$449 to \$751 million in 1978 (depending on which allocation procedure is used). At present, air carrier passengers and shippers reimburse the Federal Government for approximately

TABLE 1
ALLOCATION OF FAA COSTS
(Percent of Total)

Attributable Cost Assumption	1978		1987	
	Minimum Cost of Service	Allocate Total Cost To Users	Minimum Cost of Service	Allocate Total Cost To Users
User				
Government Use, Public Interest Costs, Other Nonattributable Costs	37	26	37	24
Air Carrier ^{1/}	50	50	48	48
General Aviation	13	24	15	28

^{1/} Air carrier's cost share is the same under both allocation methods because the cost of serving air carriers in the existing system is considered the cost of minimum required service.

88 percent of the cost of services provided to them. General aviation taxes return between 14 and 25 percent of allocated costs.

The following alternative general aviation user charges are analyzed in this report:

- o A revised fuel tax;
- o An excise tax on the sale of new aircraft and/or avionics equipment; and
- o Revised annual weight taxes.

These charges were evaluated in terms of safety impact, equity, administrative feasibility, precedent, and economic efficiency. While other forms of charges can be identified, such charges generally are characterized by one or more major deficiencies excluding it from active consideration.

Recommendations

Based on the analysis described in this report, the following actions are recommended to equitably provide required resources for adequate airport and airway system service through 1987:

- o Retain existing types of taxes on air carriers, air freight, and air passengers--ticket tax, way-bill tax, international enplanement tax, and aircraft registration and weight taxes.
- o Revise the general aviation fuel tax from a fixed cents-per-gallon rate to a constant percentage of value rate, introduce a percent of value excise tax on sales of new general aviation aircraft and avionics equipment, and retain existing aircraft registration and weight taxes.

- o Gradually establish parity over five to ten years between the relative proportion of allocated cost recovered by user taxes from air carriers and from general aviation.

Potential revenues from existing commuter passenger taxes and general aviation aircraft weight and registration taxes, a 6 percent excise tax on new general aviation aircraft and avionics sales, and alternative percent-of-value general aviation fuel tax rates are given in Table 2. For 1978, the potential range of recovery is between 50 and 66 percent assuming the minimum requirements cost allocation, and between 27 and 36 percent assuming the full system allocation. By 1987, cost recovery from these options would grow to between 58 and 83 percent assuming the lower bound cost allocation, and between 32 and 45 percent assuming the upper bound allocation. Specific recommendations on tax rates will be developed in conjunction with legislative proposals on future use of the Trust Fund.

TABLE 2

POTENTIAL GENERAL AVIATION

TAX REVENUES AND ALLOCATED COSTS

	1978		1987	
	Millions of Dollars	Percent Recovery	Millions of Dollars	Percent Recovery
10 Percent Fuel Tax	\$ 68.6		\$239.4	
6 Percent New Aircraft and Avionics Sales Tax	88.0		210.0	
Existing Commuter, Weight, and Other Taxes	27.0		63.8	
<u>TOTAL</u>	\$183.6	27-50	\$513.2	32-58
20 Percent Fuel Tax	\$129.3		\$451.1	
6 Percent New Aircraft and Avionics Sales Tax	88.0		210.0	
Existing Commuter, Weight, and Other Taxes	27.0		63.8	
<u>TOTAL</u>	\$244.3	36-66	\$724.9	45-83
Minimum Requirement Cost Allocation	\$368.8		\$878.1	
New Investment/Marginal Cost Allocation	\$671.6		\$1,609.0	

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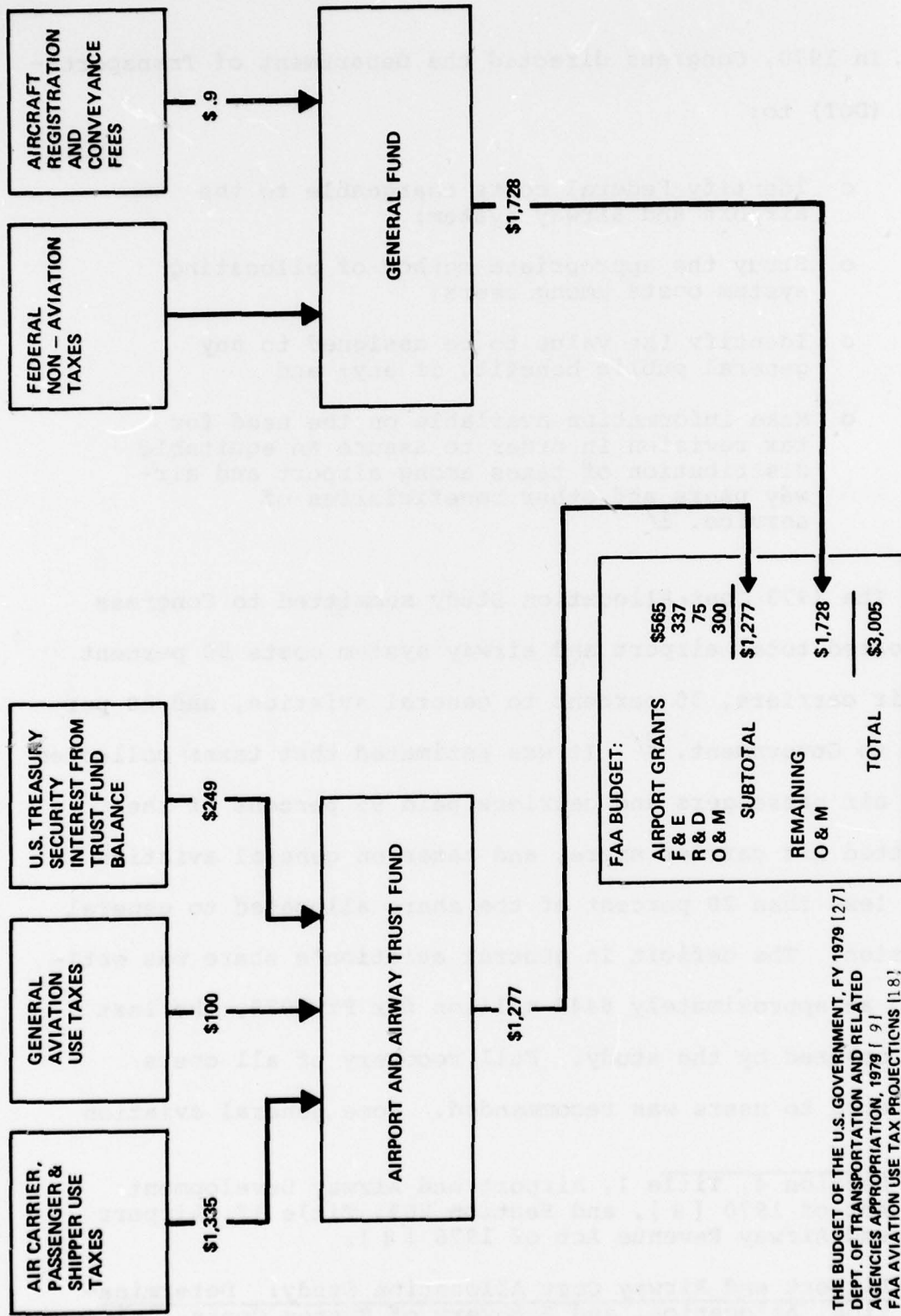
I. Introduction

The Federal Aviation Administration (FAA)--(1) makes grants for airport development, (2) provides airport and airway facilities and services, and (3) regulates aircraft production facilities, aircraft operation, airmen, carriers, schools, and repair facilities. The costs of performing these functions are partially defrayed through taxes and fees paid by system users. Remaining expenses are funded from general tax revenues. This report presents an analysis of potential recovery of airport and airway system costs from users during the period 1978 through 1987.

A. Background

Taxes on air passenger tickets, air freight waybills, noncommercial use of aviation fuel, and other aircraft related items were authorized by Congress. ^{1/} Revenues from these sources are placed in the Airport and Airway Trust Fund for use in financing congressionally authorized expenses--research and development, airport planning and development, airway facilities investment, and some maintenance costs. Other airport and airway expenses are taken from general tax funds. Figure 1.1 illustrates the projected source and use of funds by the FAA in FY-1979.

^{1/} Title II, Airport and Airway Revenue Act of 1970 [8].



SOURCE: THE BUDGET OF THE U.S. GOVERNMENT, FY 1979 [27]
 DEPT. OF TRANSPORTATION AND RELATED
 AGENCIES APPROPRIATION, 1979 [9]
 FAA AVIATION USE TAX PROJECTIONS [18]

Figure 1.1
 PROJECTED FEDERAL AVIATION ADMINISTRATION FINANCES -- FY 1979
 (Millions)

In 1970, Congress directed the Department of Transportation (DOT) to:

- o Identify Federal costs chargeable to the airport and airway system;
- o Study the appropriate method of allocating system costs among users;
- o Identify the value to be assigned to any general public benefit, if any; and
- o Make information available on the need for tax revision in order to assure an equitable distribution of taxes among airport and airway users and other beneficiaries of service. ^{1/}

The 1973 Cost Allocation Study submitted to Congress allocated total airport and airway system costs 50 percent to air carriers, 30 percent to general aviation, and 20 percent to Government. ^{2/} It was estimated that taxes collected from air passengers and carriers paid 95 percent of the allotted air carrier share, and taxes on general aviation paid less than 20 percent of the share allocated to general aviation. The deficit in general aviation's share was estimated at approximately \$442 million for FY-1975, the last year covered by the study. Full recovery of all costs allocated to users was recommended. Some general aviation

^{1/} Section 4, Title I, Airport and Airway Development Act of 1970 [8], and Section 209, Title II, Airport and Airway Revenue Act of 1970 [8].

^{2/} Airport and Airway Cost Allocation Study: Determination, Allocation, and Recovery of System Costs [35].

users dispute the 1973 Cost Allocation Study findings and argue against full cost recovery. (See, for example, "Review of the Aviation User Charge Situation," Aircraft Owners and Pilots Association [4].)

Based on recommendations of the 1973 Cost Allocation Study, the President proposed to Congress during the fall of 1974 that departure fees of \$5 to \$10 be instituted on general aviation flights from airports receiving FAA air traffic control tower service [20]. No Congressional action was taken on this proposal. In 1975, the Executive Branch submitted to Congress an alternative legislative proposal to:

- o Increase allowable expenses from the Trust Fund;
- o Increase the noncommercial aviation fuel tax from 7 to 15 cents-per-gallon;
- o Increase the international passenger enplanement tax from \$3 to \$5; and
- o Decrease the domestic ticket tax from 8 to 7 percent.

A portion of the requested increase in allowable Trust Fund expenses was enacted by Congress. No Congressional action was taken on the requested revision in user taxes.

B. Statement of the Issue

The issue analyzed in this report is what revision, if any, should be made in the future recovery of system costs

from users. The broad issue can be divided into four subordinate questions:

- o What will be the costs of airport and airway service from 1978 through 1987 and how is this cost to be shared between the general public and system users and among users themselves? (Chapter II)
- o What airport and airway tax contributions are projected for users assuming an extension of existing user taxes? (Chapter III)
- o How do user tax contributions compare with allocated user costs? (Chapter IV)
- o What revisions should be made in the present method of financing the airport and airway system to equitably provide for future needs? (Chapter V)

Cost and revenue projections contained in this report are based on aviation forecasts prepared in September 1978 and presented in FAA Aviation Forecasts, Fiscal Years 1979-1990 [16]. Projection procedures are described in detail in separate documents written in 1977:

Airport and Airway Cost Projections - 1977-1986
[1 and 13].

Airport and Airway Costs Incurred in the Public Interest [21].

Airport and Airway Costs Incurred in Servicing Small Communities [2].

Minimum General Aviation Airport and Airway System Requirements [32].

Airport and Airway System Cost Allocation [14].

The reader is cautioned to note that cost and revenue projections contained in the above cited methodological documents are based on earlier aviation forecasts and are superseded by projections contained in this paper.

II. Cost of Services

The FAA performs several functions:

1. Administration of airport planning and development grants;
2. Air traffic control, navigation, and flight services;
3. Regulation of airmen and aircraft production, operation, and servicing;
4. Operation of National and Dulles Airports; and
5. Research and development.

Projected costs are categorized as either attributable or not attributable to airport and airway system users. Costs attributable to airport and airway users are further divided by type of user--air carrier, general aviation, and Government aviation.

A. Projection of Total FAA Costs

FAA appropriations for FY-1978 and forecasts of FY-1987 are provided in Table II.1. In addition, reference information on allowable Trust Fund expenses, as authorized by the Airport and Airway Development Act Amendments of 1976, are also contained in the table. Separate statistics are provided for airport and airway expenses, aviation regulatory expenses, and National and Dulles Airport expenses. For airport and airway development expenses, subordinate detail is given on research and development expenses, facility and equipment

TABLE II.1

FAA APPROPRIATIONS
(Millions Current \$)

Time Period	1978		1987	
	Allowable Trust Fund Expenses ^{2/}	Total Cost	Total Projected Increased Productivity	Total Projected Cost Current Productivity
Airport and Airway Expenses				
Research, Development, and Demonstration	50.0 ^{3/}	106.3 ^{4/}	176.1 ^{4/}	176.1 ^{4/}
Facilities and Equipment	250.0 ^{3/}	208.6	684.4	442.6
Operations and Maintenance				
ATC Operations		856.0	1,452.3	1,964.7
Installation & Maint. Service		207.9	284.8	409.2
Maintenance	275.0	427.4	1,073.8	1,097.2
Other ^{1/}		255.2	608.2	702.7
Airport Grants	555.0	531.2	1,037.3	1,037.3
Subtotal	1,130.0	2,592.6	5,316.9	5,829.8
Flight Standards		159.3	364.8	364.9
National Capital Airports		33.6	57.0	56.7
TOTAL	1,130.0	2,785.5	5,738.7	6,251.4

^{1/} Administration of medical program, development, direction, administration of airports program, centralized training, and direction staff and support.

^{2/} P.L. 91-258 (84 Stat. 219) as amended through July 12, 1976.

^{3/} Law specifies not less than.

^{4/} Includes facilities R&D.

expenditure, ^{1/} operation and maintenance costs, and airport grants.

FAA appropriations were projected for two alternative cost scenarios:

1. Continuation of the present relationship between system costs and airport and airway activity levels; and
2. Planned productivity increases in providing airport and airway services.

Projected FAA appropriations, assuming a continuation of the present relationship between system costs and airport and airway activity, are based on: (1) empirically derived relationships between capital, labor, and output, ^{2/} and (2) long-run budget trends and other factors (such as program plans and grant authorizations) influencing costs. Alternative projections of appropriations, assuming planned increases in FAA productivity, were constructed by selectively adjusting estimates based on present relationships to reflect planned

^{1/} Cost projections contained in Table II.1 treat capital costs as current expenses. This treatment is consistent with the task of projecting annual FAA appropriations, but differs somewhat from the treatment of capital costs in the 1973 Cost Allocation Study [35]. In that study, capital costs were amortized over a period of time. Amortization converts capital expenses into a series of annual charges.

^{2/} A formal economic analysis of these relationships for air traffic control is given in An Econometric Analysis of En Route and Terminal Air Traffic Control [3] and cost projections procedures are documented in Airport and Airway Cost Projections: 1976-1986 [1 and 13].

new program facility and equipment expenses, associated controller productivity gains, and net impacts on maintenance requirements. The FAA is attempting to increase the level of service produced by labor and capital (total factor productivity) through new technologies--the automation of air traffic control functions, automated flight services, and low maintenance navigation equipment.

Total FAA costs are projected to grow from \$2.8 billion in FY-1978 to between \$5.7 and \$6.2 billion in FY-1987 depending on whether or not productivity increases. Average annual growth of current dollar costs is expected to range between 8 and 9 percent over the next ten years. The relative contributions of major cost categories to total cost are 93 percent for airport and airway costs, 6 percent for flight standards, and 1 percent for National and Dulles Airports. Little variation is expected in these proportions within the projection period even if planned productivity increases are achieved. ^{1/}

B. Nonattributable Cost

Approximately 14-16 percent of total FAA costs are not attributed to users of the national airport and airway system. The excluded costs are associated with costs either incurred

^{1/} Under the productivity increase scenario, airport and airway operations and maintenance costs in 1987 will be significantly less than under a scenario of no productivity change. These lower labor costs are partially offset during the study period, however, by higher levels of capital expenditure needed to complete various long-run investment programs.

TABLE II.2

FAA COST ELEMENTS NOT ATTRIBUTABLE TO
NATIONAL AIRPORT AND AIRWAY SYSTEM USERS
(Millions Current \$)

Item	Year	1978	1987
<u>Public Interest Costs</u>			
Regulation and Other Government Expenses ^{1/}		236.2	511.7
Nonaviation Weather Expenses		28.1	65.7
Clearly Allocable Defense Costs ^{2/}		90.1	190.7
Expenses Associated With Subsidized Air Transportation Service to Small Communities		44.4	79.6
<u>Service Benefits Limited to Local Users</u>			
National and Dulles Airport Expenses		33.5	57.1
<u>TOTAL</u>		432.3	904.8

^{1/} Flight standards (includes costs of issuing registrations and certificates), environmental regulation, aviation medicine, and portions of central training, direction, staff, and support.

^{2/} Excludes FAA services now paid for by DOD on a direct reimbursement basis. These costs are also excluded from FAA cost projections given in Table II.1.

in the public interest (social or merit wants) or incurred in providing services to a very limited group of individuals. ^{1/} Table II.2 itemizes these elements of total FAA costs. The rationale for each exclusion is discussed briefly below.

Research on safety, aviation medicine, and the environment whether conducted or sponsored by the FAA is considered a part of general Government activity. Similarly, safety regulation per se is a general Government function, but the issuance of registrations and certificates to individuals is considered to primarily benefit certificate recipients. Consequently, the cost of developing and enforcing aviation regulations is assigned to the general public while the costs of issuing registrations and certificates are assigned to individual applicants. ^{2/}

^{1/} Social wants are those consumed in equal amounts by all where people who may not choose to voluntarily pay for the services cannot be excluded from service benefits (The Theory of Public Finance [25]). Because individuals cannot be excluded from benefits, the costs of satisfying social wants must be borne by the public at large. Merit wants are those goods or services which the public considers so important that their satisfaction is provided for, at least in part, through the public budget. Certain FAA activities are associated with fulfilling social wants--national defense; research and regulation. Other activities support the provision of merit wants--transportation service to small communities.

^{2/} The Independent Offices Appropriations Act of 1952 authorizes Federal agencies to prescribe fees to cover the costs of licensing and certification activities.

FAA staff and facilities are used to collect and analyze weather data for both the aviation community and the Nation's weather service, the National Oceanic and Atmospheric Administration (NOAA). Data provided to NOAA is utilized for public information and associated costs are assigned to the general public.

In conjunction with the provision of terminal and en route air traffic control, the FAA utilizes both VHF and UHF ground-to-air communications. UHF communications are strictly attributable to the requirements of military aircraft and the FAA is not reimbursed by the military for this communication capability. UHF communication costs are, therefore, excluded from the common costs of the airport and airway system and considered a defense cost to be borne by the general public. Similarly, the additional cost of providing TACAN navigation equipment to meet exclusively military needs instead of less expensive DME/VOR equipment suitable for civilian use is assigned to the general public.

Terminal air traffic control service has been instituted at a number of terminals served by Federally subsidized air carriers. In the absence of these air carrier flights, the locations would not qualify for air traffic control service under FAA establishment criteria. ^{1/} Thus, the public interest

1/ Airway Planning Standard Number One--Terminal Air Navigation Facilities and Traffic Control Services [15].

in providing common carrier air service to small communities has resulted in airport and airway service costs that would not otherwise be incurred. The general public (or possibly the community benefited) should bear the costs of this service.

Finally, the costs of National and Dulles Airports are considered the exclusive responsibility of the local users of these facilities. At present, various fees charged to users of these facilities and paid into the general fund reimburse the Government for the costs of these airports.

Table II.3 divides FAA costs between:

1. Users of National and Dulles Airports, FAA certification and registration applicants, and public interest costs; and
2. Airport and airway system costs.

Estimates are given for FY-1978 and FY-1987 under alternative assumptions regarding FAA productivity. As will be discussed in Section C, it is possible to argue that an additional part of the cost of serving users should be borne by the general public as the cost of public interest in a common airport and airway system.

C. Cost Allocation Among Users

Cost responsibility can be viewed from several perspectives with different implications for the allocation of costs among

TABLE II.3
AIRPORT AND AIRWAY SYSTEM USER COST--
INITIAL ALLOCATION
(Millions Current \$)

Cost Projection Assumptions	Increased Productivity	Current Productivity
<u>1978</u>		
Total FAA Appropriations ^{1/}	2,785.5	2,785.5
Nonattributable Costs ^{2/}	432.3	432.3
Airport and Airway System User Cost	2,353.2	2,353.2
<u>1987</u>		
Total FAA Appropriations ^{1/}	5,738.7	6,251.4
Nonattributable Costs ^{2/}	904.8	904.8
Airport and Airway System User Cost	4,833.9	5,346.6

^{1/} See Table II.1.

^{2/} See Table II.2.

users. It is, therefore, difficult to arrive at a single prescription regarding the issue of airport and airway cost recovery.

It can be argued that airport and airway costs should be borne by the beneficiaries of airport and airway service. ^{1/} Air passengers, shippers, and the general public benefit from added commercial air transportation reliability and safety provided by Federal airport and airway service. Contributions from these beneficiaries can be obtained by adding the cost of Government services to the price of common carrier air transportation as is present practice. The case of general aviation, however, is less clearcut. To achieve existing high levels of safety and service, while permitting joint use of the airport and airway system by air carriers, general aviation, and Government aviation, the quality of FAA service may exceed the requirements of general aviation alone. ^{2/} Present airport and airway services are frequently oriented toward performance requirements of air carrier and military aircraft. If this is true, then at issue is the extent to which general aviation should be held responsible for the additional cost of airport and airway performance capability in excess of its requirements.

^{1/} For a review of taxation theories espousing the benefit approach, see The Theory of Public Finance, pp. 61-89 [25].

^{2/} See Minimum General Aviation Airport and Airway System Requirements [32].

On the other hand, consideration of the efficient use of resources suggests that users should be charged the additional system cost associated with their use of service (plus some share of fixed costs). ^{1/} Application of this principle, however, does not provide a complete answer to the question of cost recovery. There are substantial fixed costs associated with the airport and airway system. One airway service--navigation aids--has no variable costs of use associated with it. Services frequently differ by type of user served, even though the same basic facility is used. This introduces the problem of joint cost pricing. There is no general agreement on how joint fixed costs should be shared between users and the general public, or among users themselves [24, pp. 188-190]. Finally, one major Federal service--terminal air traffic control--is produced only in association with the use of an airport per se. Direct charges for Federal air traffic control service do not confront the user with a choice limited to the purchase of terminal control service per se, but rather make the user choose between using or not using a given airport. Thus, an equitable solution to efficient use of terminal control service may require giving users the option of discontinuing the service at a given airport.

^{1/} The Theory of Public Finance, p. 48 [25].

1. Findings of the 1973 Cost Allocation Study

The 1973 Cost Allocation Study ^{1/} examined ten methods of allocating airport and airway system costs. A "long-run marginal cost method" was adopted by the study as the most satisfactory means of allocating costs. Under this procedure, user cost responsibility was based on (but not limited to) the additional cost of providing an extra unit of service to a user. System variable costs attributable to users were calculated as the product of the additional cost of serving a given type of user and the number of such users. Fixed costs were allocated to users in the same proportions as the variable cost proportions. ^{2/} For 1975, the marginal cost method allocated system costs 51 percent to air carriers, 29 percent to general aviation, and 20 percent to the public. ^{3/}

1/ The Airport and Airway Development and Revenue Act of 1970 directed the Secretary of Transportation: (1) to determine the costs of the Federal airport and airway system, (2) to determine how these costs should be allocated among the various users, and (3) to recommend an equitable way of recovering these costs. In accordance with congressional instructions, the Office of the Secretary of Transportation conducted a study and submitted its results to Congress--September 1973--in Cost Allocation Study: Determination, Allocation, and Recovery of System Costs [35].

2/ Fixed costs include those portions of direct airport and airway service cost which were statistically estimated as invariant with aviation activity.

3/ The Cost Allocation Study allocated only expenses incurred by the FAA for airport and airway service. Users were not held responsible for the cost of FAA regulation activities, weather information, National Capital Airports, or general Government.

Methods employed by the 1973 Cost Allocation Study are generally consistent with traditional theory of public finance. The study's findings, however, did not stress the uncertainties and discretionary elements associated with attribution of cost responsibility and methods for cost recovery. ^{1/}

2. Proposed Range of Cost Responsibility

Two alternative allocations of airport and airway system cost are presented in this section. These alternatives bound a range of user cost responsibilities for the airport and airway system. The alternatives are: (1) the new investment/marginal cost method, and (2) the requirements for minimum service method. In the "new investment/marginal cost" method, all airport and airway system costs are allocated to users. The "requirements for minimum service method" suggests that a portion of airway service costs be borne by the general public as the cost of public policy to provide a common airport and airway system. Section 306, Federal Aviation Act of 1958 [8] directs the Secretary of Transportation to give full consideration to the requirements of commercial and general aviation and to the public right of freedom to transit through navigable airspace.

^{1/} See Review of the 1973 Airport and Airway Cost Allocation Study [22].

i. Allocation Based on New Investment/Marginal Cost

Under the new investment/marginal cost procedure, each user is held responsible for the costs which the FAA actually incurs in providing service. All airport and airway costs are allocated to users by a combination of methods:

1. Research and development (R&D) and facilities and equipment (F&E) costs--Allocated to users based on an analysis of estimated user cost responsibility of individual R&D and F&E program elements.
2. Operations and maintenance (O&M) costs--The variable cost incurred in serving each user was estimated as the product of marginal service costs and user activity levels. Fixed costs were allocated to users in inverse proportion to the price sensitivity of user demand for air transportation service. ^{1/}
3. Support costs--Support costs were allocated to users in the same proportions as the cost category they supported (R&D, F&E, or O&M).
4. Grants-in-aid--Allocated to users as specified in the Airport and Airway Development Act.

A detailed description of allocation procedures is given in Airport and Airway System Cost Allocation [4].

Tables II.4 and II.5 contain allocated cost for FY-1978 and FY-1987 under two assumptions regarding FAA productivity-- (1) continuation of existing production relationships, and

^{1/} This treatment of fixed costs is based on a suggested departure from marginal cost pricing by Baumol and Bradford [6].

TABLE II.4

ALLOCATION OF AIRPORT AND AIRWAY SYSTEM COSTS
NEW INVESTMENT/MARGINAL COST METHOD
CONSTANT FAA PRODUCTIVITY ASSUMPTION
(Millions Current \$)

Cost Component	FY-1978				FY-1987					
	Total	Public and Other	A/C	G/A	Mil. and Gov.	Total	Public and Other	A/C	G/A	Mil. and Gov.
R&D	87.0	1.1	55.0	21.5	9.4	140.4	2.0	88.6	34.6	15.2
F&E										
Centers	67.3	0.0	48.4	6.7	12.1	149.7	0.0	107.8	15.0	26.9
Towers	54.2	1.6	28.4	17.3	6.8	124.7	2.5	66.0	40.3	15.9
FSS	19.8	0.0	1.0	18.8	0.0	47.4	0.0	2.4	45.0	0.0
Nav aids	44.5	0.0	24.1	14.7	5.8	81.6	0.0	44.1	26.9	10.6
Others	22.8	0.0	15.3	7.5	0.0	39.3	0.0	26.3	13.0	0.0
Subtotal	208.6	1.6	117.1	65.1	24.7	442.6	2.5	246.5	140.2	53.4
O&M										
Centers	573.1	59.5	271.9	129.9	111.9	1,479.3	119.0	644.1	497.6	218.6
Towers	513.8	43.3	256.0	177.0	37.4	1,211.2	84.5	510.0	488.5	68.1
FSS	123.4	4.1	6.6	100.4	12.2	220.4	7.4	11.6	178.6	22.8
Other	73.1	7.0	32.0	24.4	9.7	151.1	12.7	62.8	59.7	15.9
Subtotal	1,283.4	113.9	566.6	431.7	171.3	3,061.9	223.7	1,288.5	1,224.4	325.3
Support										
I&M	207.9	42.2	80.3	61.2	24.3	409.3	101.4	139.7	132.8	35.3
Adm Flt Std	159.4	159.4	0.0	0.0	0.0	364.8	364.8	0.0	0.0	0.0
Adm Med	9.4	9.4	0.0	0.0	0.0	24.4	24.4	0.0	0.0	0.0
Dev Dir	9.3	0.0	5.9	2.3	1.0	12.5	0.0	8.0	3.1	1.4
Ap Admin	23.0	2.6	17.9	2.5	0.0	64.5	4.7	52.8	7.0	0.0
Gen Trng	87.8	20.1	33.3	24.7	9.7	221.8	36.2	85.2	79.4	21.0
Dir, S&S	125.7	29.1	53.1	31.4	12.1	379.4	52.5	161.2	130.4	35.3
Subtotal	622.5	262.8	190.4	122.2	47.1	1,476.5	584.0	446.8	352.8	92.9
F, E&D	19.3	19.3	0.0	0.0	0.0	35.7	35.7	0.0	0.0	0.0
Nat Cap Apts	33.6	33.6	0.0	0.0	0.0	57.0	57.0	0.0	0.0	0.0
Grants-in-Aid	531.2	0.0	457.5	73.7	0.0	1,037.3	0.0	892.7	144.6	0.0
TOTAL	2,785.5	432.3	1,386.6	714.2	252.5	6,251.3	904.8	2,963.1	1,896.6	486.8
Adjustments ^{1/}	0.0	0.0	13.9	-42.6	28.7	0.0	0.0	29.6	-105.5	75.9
Adj. Total Allocated	2,785.5	432.3	1,400.5	671.6	281.2	6,251.3	904.8	2,992.7	1,791.1	562.7
Share (%)	100	16	50	24	10	100	15	48	28	9

^{1/} Adjustment to exclude costs of air carrier training and Government flights.

TABLE II.5

ALLOCATION OF AIRPORT AND AIRWAY SYSTEM COSTS
NEW INVESTMENT/MARGINAL COST METHOD
INCREASING FAA PRODUCTIVITY ASSUMPTION
(Millions Current \$)

Cost Component	FY-1978				FY-1987				Mil. and Gov.	
	Total	Public and Other	A/C	G/A	Mil. and Gov.	Total	Public and Other	A/C		G/A
R&D	87.0	1.1	55.0	21.5	9.4	140.4	2.0	88.6	34.6	15.2
F&E										
Centers	67.3	0.0	48.4	6.7	12.1	358.1	0.0	257.8	35.8	64.5
Towers	54.2	1.6	28.4	17.3	6.8	138.5	2.5	73.4	44.9	17.7
FSS	19.8	0.0	1.0	18.8	0.0	47.4	0.0	2.4	45.0	0.0
Nav aids	44.5	0.0	24.1	14.7	5.8	81.6	0.0	44.1	26.9	10.6
Others	22.8	0.0	15.3	7.5	0.0	58.9	0.0	39.5	19.4	0.0
Subtotal	208.6	1.6	117.1	65.1	24.7	684.4	2.5	417.1	172.0	92.7
O&M										
Centers	573.1	59.5	271.9	129.9	111.9	1,120.1	119.0	443.1	407.7	150.4
Towers	513.8	43.3	256.0	177.0	37.4	1,057.9	84.5	480.8	435.2	57.4
FSS	123.4	4.1	6.6	100.4	12.2	220.4	7.4	11.6	178.6	22.8
Other	73.1	7.0	32.0	24.4	9.7	127.7	12.7	49.2	53.7	12.1
Subtotal	1,283.4	113.9	566.6	431.7	171.3	2,526.1	223.7	984.6	1,075.2	242.7
Support										
I&M	207.9	42.2	80.3	61.2	24.3	284.8	101.4	78.5	85.7	19.3
Adm Flt Std	159.4	159.4	0.0	0.0	0.0	364.8	364.8	0.0	0.0	0.0
Adm Med	9.4	9.4	0.0	0.0	0.0	24.4	24.4	0.0	0.0	0.0
Dev Dir	9.3	0.0	5.9	2.3	1.0	12.5	0.0	8.0	3.1	1.4
Ap Admin	23.0	2.6	17.9	2.5	0.0	64.5	4.7	52.8	7.0	0.0
Gen Trng	87.8	20.1	33.3	24.7	9.7	184.1	36.2	64.2	68.3	15.3
Dir, S&S	125.7	29.1	53.1	31.4	12.1	322.7	52.5	129.6	113.9	26.7
Subtotal	622.5	262.8	190.4	122.2	47.1	1,257.8	584.0	333.0	278.0	62.8
F, E&D	19.3	19.3	0.0	0.0	0.0	35.7	35.7	0.0	0.0	0.0
Nat Cap Arpct:	33.6	33.6	0.0	0.0	0.0	57.0	57.0	0.0	0.0	0.0
Grants-in-Aid:	531.2	0.0	457.5	73.7	0.0	1,037.3	0.0	892.7	144.6	0.0
TOTAL	2,785.5	432.3	1,386.6	714.2	252.5	5,738.8	904.8	2,716.0	1,704.4	413.4
Adjustments 1/	0.0	0.0	13.9	-42.6	28.7	0.0	0.0	27.2	-95.4	68.2
Adjusted Total	2,785.5	432.3	1,400.5	671.6	281.2	5,738.8	904.8	2,743.2	1,609.0	481.6
Allocated Share (%)	100	16	50	24	10	100	16	46	28	8

1/ Adjustment to exclude costs of air carrier training and Government flights.

(2) planned productivity increases. ^{1/} Under both assumptions, user shares of FY-1978 cost are allocated 50 percent to air carrier, 24 percent to general aviation, 10 percent to Government and military, and 16 percent to the general public and users of the National Capital Airports. ^{2/} By 1987, cost proportions shift to 48 percent to air carrier, 28 percent to general aviation, 8 to 9 percent to Government and military, and 15 to 16 percent to the general public and users of the National Capital Airports. Increases in the proportion of system cost attributed to general aviation and decreases in the relative share of air carriers and Government aviation result from significant differences in the rates of growth projected for users during the period 1978 through 1987. General aviation's use of FAA terminal and en route traffic control services will grow 4 and 7 percent per year, respectively, while air carrier growth will be only 2 percent and 3 percent per year for these services. Military aviation, the largest component of Government flying, is not expected to grow at all over the period.

Alternative FAA productivity assumptions change the absolute amounts of costs allocated to users and slightly

^{1/} As stated previously in the report, the FAA is adopting new technologies in the form of automation of air traffic control functions, automated flight services, and low maintenance navigation equipment.

^{2/} National and Dulles Airports represent only one percent of total FAA costs.

change the relative shares of total airport and airway system costs allocated to various users and the general public. Changes in relative shares of user cost responsibility are more pronounced for individual cost categories than for total costs. For example, air carriers will be responsible for about 56 percent of 1987 facility and equipment expenditures assuming continuation of existing production relationships. In order to attain productivity increases, more capital expenditure will be required in 1987 and air carriers would be responsible for 61 percent of facility and equipment costs under this alternative scenario.

ii. Allocation Based on the Requirements for Minimum Service

The existing airport and airway system is designed for joint use by air carriers, general aviation, and Government aviation including military. To accommodate joint use, FAA service must meet the needs of the most sophisticated, as well as less sophisticated, aircraft. Frequently, the "lowest common denominator" of service in the joint use system is the service requirement of sophisticated aircraft. In these circumstances, service can be provided to less sophisticated aircraft, but the unit cost of such service in the joint system is greater than the cost of providing the minimum service required. An alternative allocation is, therefore, to hold users responsible only for the cost of the minimum service which they require. This procedure will not

necessarily fully allocate total airport and airway system costs to users and the unallocated residual in such cases may be considered the cost attributable to public policy regarding aviation safety, reliability, and a joint use airport and airway system. Such costs are allocated to the general public.

As stated above, the technical characteristics of airport and airway services provided in the present system are dominated by requirements imposed by more sophisticated, larger aircraft--the type of aircraft which constitute the bulk of the air carrier and military fleets. Thus, estimates of the cost of minimum service required by air carriers and Government (primarily military) aviation can be constructed using unit cost data for the present airport and airway system. Annual estimates consist of the variable cost of providing projected service to air carriers and military (product of unit costs and air carrier and Government aviation usage over the period 1978 through 1987), plus an appropriate share of fixed costs of the present system (to exclude capacity costs associated with general aviation). Costs allocated to air carriers and Government aviation under the new investment/marginal cost method given in Tables II.4 and II.5 (see preceding section) conform to this procedure and are, therefore, accepted as estimates of the minimum cost of service to these users.

To obtain estimates of the cost of minimum service required by general aviation, it is first necessary to

construct a hypothetical airport and airway system capable of meeting requirements imposed solely by these users. The annual costs of operating, maintaining, and expanding this hypothetical system over the period 1978 through 1987 comprise the cost of minimum service to general aviation. Such a minimum requirements system, its costs, and estimating procedures are described in Minimum General Aviation Airport and Airway Requirements [32]. ^{1/} In estimating minimum requirements costs, it was assumed that existing facilities and equipment would be available to the postulated system if required (sunk costs not considered) and the estimates, therefore, focus on future operating costs and selected future program capital costs. The postulated system is designed to handle all types of general aviation flights, including IFR itinerant operations. It consists of 20 mini en route centers, 120 towers, the current network of flight service stations (with presently planned modifications), and substantially reduced navigation, communications, and radar surveillance. Table II.6 itemizes the elements of general aviation cost responsibility based on minimum service requirements of general aviation.

Table II.7 summarizes the allocation of costs to all users based on their minimum service requirements. From a

^{1/} Estimates of the cost of general aviation minimum service requirements given in the Minimum General Aviation Airport and Airway Requirements [32] have been revised in the present document for consistency with current forecasts of future aviation activity.

TABLE II.6

GENERAL AVIATION COSTS ASSUMING
A SEPARATE MINIMUM REQUIREMENTS
GENERAL AVIATION SYSTEM
(Millions Current \$)

Cost Component	FY-1978	FY-1987
R&D	8.0	14.4
F&E (FSS Only)	19.8	47.4
O&M		
Centers	90.7	309.4
Towers	56.4	148.0
FSS	100.4	178.6
Other	5.0	9.0
Support (I&M Only)	14.8	26.7
Grants-In-Aid	73.7	144.6
<u>TOTAL</u>	<u>368.8</u>	<u>878.1</u>

TABLE II.7

ALLOCATION OF AIRPORT AND AIRWAY SYSTEM COSTS
MINIMUM SERVICE REQUIREMENTS METHOD
(Millions Current \$)

Productivity Assumptions	Increasing FAA Productivity		Constant FAA Productivity	
	Dollars	Percent	Dollars	Percent
Allocations				
<u>FY-1978</u>				
General Aviation	368.8	13	368.8	13
Air Carriers	1,400.5	50	1,400.5	50
Military and Government Aviation	281.2	10	281.2	10
Public and Other				
Cost of Common System	302.7	11	302.7	11
Other Public Interest Costs and National Capital Airports	432.3	16	432.3	16
TOTAL FAA APPROPRIATION	2,785.5	100	2,785.5	100
<u>FY-1987</u>				
General Aviation	878.1	15	878.1	14
Air Carriers	2,743.2	48	2,992.7	48
Military and Government Aviation	481.6	8	562.7	9
Public and Other				
Cost of Common System	731.1	13	913.0	15
Other Public Interest Costs and National Capital Airports	904.8	16	904.8	14
TOTAL FAA APPROPRIATION	5,738.8	100	6,251.3	100

requirements for minimum service perspective, FAA cost responsibility is allocated 48-50 percent to air carriers, 13-15 percent to general aviation, 8-10 percent to Government aviation, and 27-29 percent to the general public (including the cost of the policy to maintain a common airport and airway system) and users of other FAA services. These proportions are not very sensitive to assumptions concerning constant or increasing FAA productivity. The public policy cost attributed to maintenance of a common use airport and airway system tends to increase over the period 1978 through 1987 from 11 percent to 15 percent of the system cost.

III. Revenue Collections

Projections of future airport and airway user tax revenues are presented in this section. The revenue projections are compared with user cost responsibilities in Section IV to evaluate the need for user tax revision.

Existing Federal taxes on airport and airway system users are summarized in Table III.1. All of these taxes are indirect in nature; payment is not directly linked with specific use of service. Most existing taxes are due to expire in 1980 or change to lower rates. ^{1/}

Projections of annual tax revenues for 1978 and 1986, assuming an extension of existing taxes and rates through 1986, are given in Table III.2. Separate detail is provided by type of tax for revenues associated with air carriers and general aviation.

Total revenues are expected to increase at an average annual rate of 10 percent from approximately \$1.3 billion per year in 1978 to \$3.0 billion in 1987. In 1978, air carrier associated revenues will constitute 93 percent of the total and general aviation contributions 7 percent. Because revenues from general aviation are expected to grow at a slower rate than air carrier revenues, general aviation's contribution is expected to decrease to 6 percent of total revenues by 1986. Freight waybill tax revenues will grow at the fastest

^{1/} Title II, Airport and Airway Revenue Act of 1970 [8].

TABLE III.1

SUMMARY DESCRIPTION OF PRESENT
AVIATION USER TAX STRUCTURE

Type of Tax	Tax Base	Present Rate	Rate in 1980
Domestic Passenger Ticket Tax	Passenger Transportation Charges	8 Percent	5 Percent
International Air Passenger Enplanement Tax	Passenger Enplanements	\$3 Per Person	-0-
Domestic Air Cargo Waybill Tax	Cargo Transportation Charges	5 Percent	-0-
Aviation Gasoline	Fuel Purchases	7 Cents-Per-Gallon	1 1/2 Cents-Per-Gallon
Jet Fuel	Fuel Purchases	7 Cents-Per-Gallon	-0-
Aircraft Registration	Aircraft	\$25 Per Aircraft	-0-
Aircraft Weight Tax	Aircraft Weight	2¢ Per # Over 2,500	-0-
Nonturbine-Powered Turbine-Powered	Aircraft Weight	3 1/2 Cents-Per-Pound	-0-
Aircraft Tire and Tube Sales Tax	Tire Weight	5 Cents-Per-Pound	5 Cents-Per-Pound
Tires	Tube Weight	10 Cents-Per-Pound	9 Cents-Per-Pound
Tubes			

TABLE III.2

AIRPORT AND AIRWAY TRUST FUND USER CHARGE
REVENUE FORECAST I/
(Millions Current \$)

Payee	1978	1987
Air Carrier		
Ticket Tax	1,086.6	2,531.1
International Head Tax	68.7	90.6
Waybill Tax	57.3	167.2
Aircraft Registration Fee	.1	.1
Aircraft Weight Fee	15.6	24.6
Tire and Tube Tax	.9	.9
<u>Subtotal</u>	1,229.2	2,814.5
General Aviation		
Air Taxi	15.1	41.8
Aircraft Registration Fee	4.7	7.1
Aircraft Weight Fee	7.1	14.8
Fuel Tax	64.5	116.6
Tire and Tube Tax	.1	.1
<u>Subtotal</u>	91.5	180.4
<u>TOTAL</u>	1,320.7	2,994.9

I/ Assumes a continuation of existing user charge rates during the period 1980 through 1987.

annual rate--13 percent--with air taxi passenger ticket tax revenues experiencing the second highest average growth rate--12 percent. Thus, while small changes are expected in the relative importance of individual aviation user taxes (assuming existing taxes and rates are continued), the relative contributions of air carrier and general aviation tax revenues that prevail now will continue through 1987.

Revenue projections given in Table III.2 were prepared from existing relationships between tax yields and aviation activity and forecasts of the future level of activity--domestic passenger traffic, domestic air freight traffic, international air traffic, commuter traffic, and general aviation. Most of the forecasts, and their derivation, are described in FAA Aviation Forecasts, Fiscal Years 1979-1990 [16].

IV. Cost Versus Revenue

Total airport and airway user charge revenues are compared with FAA appropriations in Figure IV.1. In 1978, total user charge revenues are expected to equal 46 percent of total FAA appropriations. This fraction of recovery of system costs will grow to 53 percent in 1987 if the FAA achieves its planned productivity increases. ^{1/} If, however, the current relationship between airport and airway system usage and system costs continues, user charges will recover only 48 percent of airport and airway system costs by 1987.

Costs attributable to air carriers and general aviation using the requirement for minimum service allocation in FY-1978 will exceed revenues from these sources by \$448.6 million. Under the marginal cost/new investment method, the FY-1978 deficit would be \$751 million. The deficit must be balanced by payments from the general fund.

In Table IV.1, user charge revenues are compared with allocations of system cost computed using both the new investment/marginal cost and requirements for minimum service methods. At present, air carriers, passengers, and shippers reimburse the Federal Government for approximately 88 percent of the cost of airport and airway services provided to them. General aviation returns between 14 and 25 percent of

^{1/} Assuming an extension of existing user taxes.

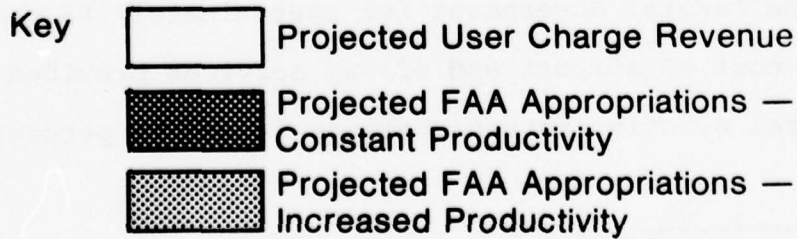
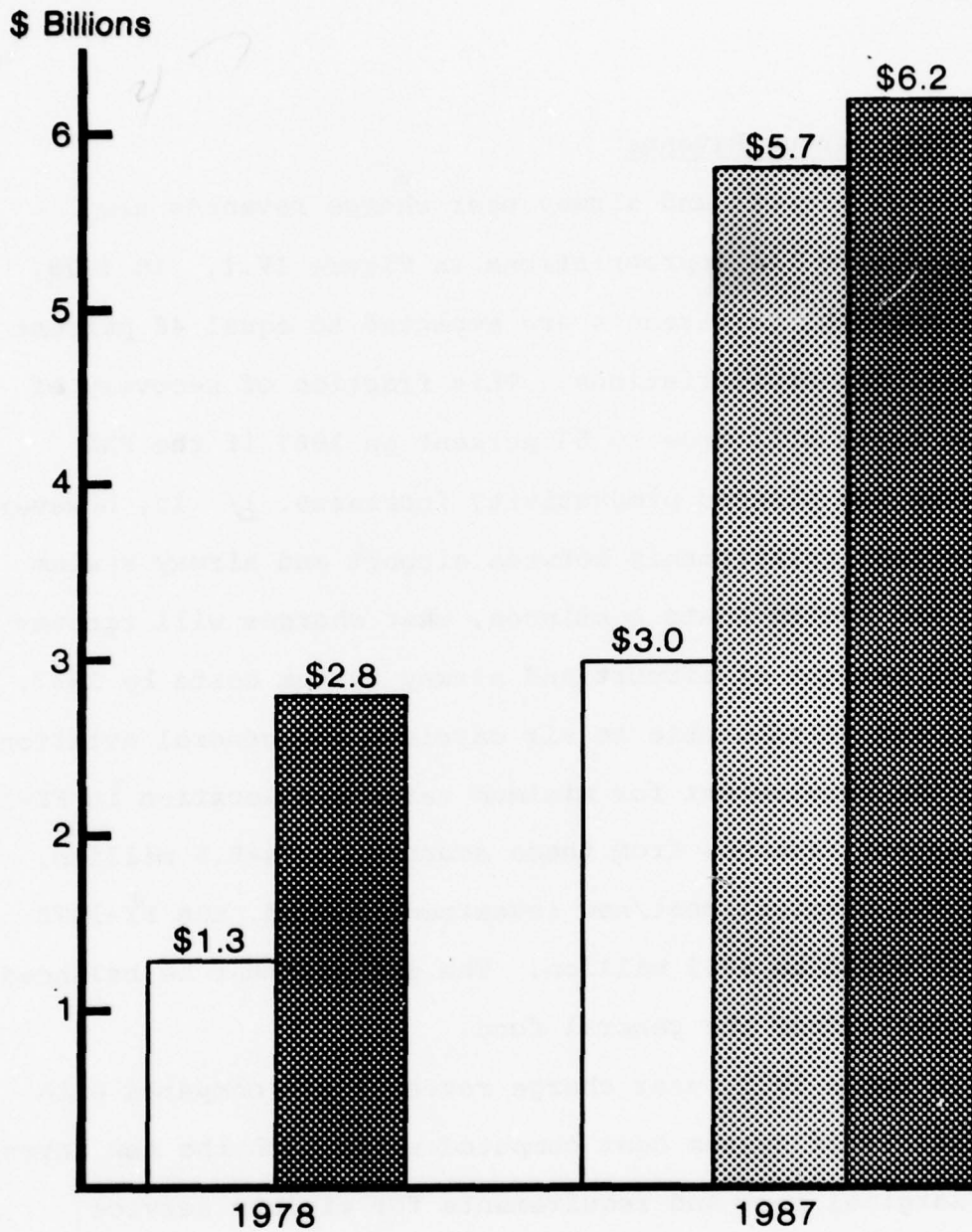


Figure 4.1 FAA Appropriations and User Charge Revenues

TABLE IV.1

USER CHARGE REVENUES COMPARED WITH
ALLOCATED COSTS ^{1/}
(Millions Current \$)

Year	Air Carrier	General Aviation	Government ^{2/}
1978			
Revenue	1,229.2	91.5	N/A
Cost Allocation			
New Investment/Marginal Cost:	1,400.5	671.6	713.5
Minimum Requirement:	1,400.5	368.8	1,016.2
Deficit/Surplus Range	(171.3)	(277.3 to 580.1)	
Percent Cost Recovered	88	14 to 25	N/A
1987			
Revenue	2,814.5	180.4	N/A
Cost Allocation			
New Investment/Marginal Cost:	2,743.2	1,609.0	1,386.4
Minimum Requirement:	2,743.2	878.1	2,117.5
Deficit/Surplus Range	71.3	(697.7 to 1,428.6)	
Percent Cost Recovered	103	11 to 21	N/A

^{1/} Cost projected assuming increasing FAA productivity during the period 1978 through 1987.

^{2/} Government includes both Government and military aviation, FAA costs incurred in the public interest, and FAA costs not attributable to airport and airway users.

N/A--Not Applicable.

allocated costs to the Government (depending on which allocation procedure is employed). Over the period 1978 through 1987, the percentage of recovery tends to increase for air carriers to 103 percent and decrease for general aviation to between 11 and 21 percent (dependent on allocation method). Projected reduction in cost recovery from general aviation results from heavy reliance on the 7 cents-per-gallon fuel tax. Revenues from this fixed rate tax source will not keep pace with inflation. The cost recovery proportion is sensitive to assumptions concerning FAA productivity. If an assumption of constant FAA productivity is used, cost recovery for air carriers remains at 94 percent in 1987 instead of rising to 103 percent. Recovery from general aviation could fall to only 10 percent assuming constant productivity and using the new investment/marginal cost allocation method.

Currently, neither air carriers nor general aviation fully reimburse the Government for the cost of airport and airway services provided to them. The gap between revenues and costs is greatest for general aviation over the entire period 1978 through 1987. Estimates of the shortfall of general aviation revenues are dependent on the cost allocation procedure used and range between \$277 and \$580 million for FY-1978. This deficit will rise to between \$698 million and \$1.4 billion by 1987. While no changes are recommended at the present time for air carrier user charges, the gap

between costs and revenues attributed to general aviation should be reduced by an increase in general aviation user charge revenues and/or a reduction in the level and, therefore, the cost of services presently projected as attributable to general aviation.

V. Cost Recovery Alternatives

Costs of the airport and airway system for 1978 assigned to air carriers and general aviation exceed user charge revenues from these sources for the period by \$448 to \$751 million (depending on the allocation method employed). A large portion of the deficit is associated with the provision of service to general aviation. Only a fraction (14 to 25 percent) of general aviation costs are presently reimbursed by means of user charges. This chapter establishes criteria for evaluating potential new or revised user charges, identifies alternative general aviation charges, and analyzes the alternatives.

A. Evaluation Criteria

The following factors are considered appropriate for evaluating alternative user charges:

1. Safety - Charges should not discourage the use of safety service or otherwise create unsafe conditions.
2. Equity - Charges should be justifiable on the grounds of benefits received by the aircraft operator or passengers and the cost of services provided to the pilot. Further, charges should be related to user's ability to pay.
3. Administrative Qualities - Charges should be enforceable, predictable, and minimize collection and compliance costs.
4. Precedent - There should be precedent for the type of charge proposed.

5. Economic Efficiency - Charges should encourage efficient allocation of resources.

The safety criteria are adopted because the FAA has a congressional mandate to promote aviation safety. Equity, the requirement for "fairness," is frequently associated with discussions of taxation. Opinions vary as to what is fair. ^{1/} For purposes of this analysis, charges are considered "fair" when they are related to direct benefits received by the aircraft operator and passengers and the cost of service provided. As a secondary concern, charges may be considered more equitable when related to a user's ability to pay for service, thereby reducing economic hardship. Proposed charges should be easy and inexpensive to administer, and are more likely to be accepted by the public if there is successful precedent for the type of charge suggested. Generally, in order to promote efficient resource allocation, charges should at least equal the marginal cost of providing a unit of service. ^{2/}

Potential airport and airway service charges which perform well in terms of one standard may be inadequate by others. Charge alternatives must be judged by the extent to which they satisfy stated criteria.

^{1/} See Public Finance, pp. 54, 55 [11].

^{2/} See The Theory of Public Finance [25].

B. Identification of Alternatives

There are many types of potential charges directly or indirectly related to the use of airport and airway services. The following alternative general aviation user charges are discussed in Section C of this chapter:

1. A revised fuel tax--either a unit tax (a specified cost per gallon) or an ad valorem tax (constant percentage of the sales price);
2. An excise tax on the sale of new aircraft and/or avionics equipment; and
3. Revised annual registration and/or weight taxes.

Other types of charges can be identified, but they are generally characterized by major deficiencies in terms of the evaluation criteria previously described. Charges initially considered and eliminated on these grounds are: terminal charges at airports with FAA towers, en route service fees, flight service charges, geographically differentiated Federal fuel or registration/weight charges, variations in the fuel tax by type of user, and peak-capacity charges. ^{1/} The rationale for their rejection as a means of increasing cost recovery from general aviation is given below.

Imposition of terminal charges at airports with FAA towers may be disadvantageous in terms of safety, equity, and administrative characteristics. If terminal charges

^{1/} See "An Evaluation of Potential Airport and Airway User Charges" [29].

cause widespread diversion to nontowered airports, there would be a significant increase in general aviation accidents--up to a maximum of over 500 additional accidents per year. ^{1/} Also, Federal terminal air traffic control service is always provided in conjunction with use of an airport (runways, terminal buildings, and other facilities). Terminal charges for Federal air traffic control service do not confront the user with a choice limited to the purchase of terminal control service per se, but rather make flyers choose between using or not using a given airport. In some cases, however, airports have already been paid for by users through local funding mechanisms such as taxes or bond issues. Thus, an equitable solution to cost recovery involving terminal service charges may require giving pilots the option of discontinuing the service at a given site. Finally, cost of administering charges at all terminals with air traffic control service using the private sector on a reimbursed basis or Government workers may be excessive. ^{2/}

Imposition of direct charges for flight service stations services is not considered administratively feasible. The

^{1/} Accident estimate based on total diversion of all general aviation operations from towered airports and calculated based on accident rates given in Safety Effects of Diversion of General Aviation Operations from Tower to Nontower Airports [30].

^{2/} See A Preliminary Analysis of Methods of Collecting Landing Fees at Towered Airports [28].

unit costs and, therefore, the potential fees involved for briefings or VFR flight plan filing are relatively low. Many times these services are rendered by telephone. The cost of collecting for flight station services is, therefore, considered likely to be excessive and impose significant avoidance problems.

If imposed, en route service charges might effect aviation safety through diversion of IFR flights to VFR service. Present VFR accident rates should not be used to judge the impact of the diversion because it is hypothesized that many of the diverted flights may occur during poor weather conditions which are not characteristic of present VFR flying.

Geographic differentiation of charges such as fuel taxes, aircraft sales taxes, registration/weight taxes, and other excises is not considered feasible due to difficulty in enforcement and lack of adequate Federal precedent. First, geographic discrimination may be illegal. Second, significant regional differences in Federal sales or registration taxes (from several hundred to several thousand dollars) may induce users to purchase aircraft at locations where the Federal excise tax is minimum, or register the aircraft in areas where the registration fee is minimum. A third disadvantage to geographic charges is their acceptability to the public and Congress. Historically, the rate of Federal taxes collected in the various states has been the same.

Higher fuel taxes on "heavy users" of system services are not considered feasible due to administrative problems. Because differences in taxes result in differences in the retail price of fuel, dealers would be required to determine the applicable rate for a given customer and then calculate total sales values using this rate. In recognition of these difficulties, present exemptions from existing fuel taxes are handled by means of annual tax rebates.

The use of peak-hour or peak-day charges to increase cost recovery specifically from general aviation is not given further consideration because available evidence [14] suggests that the hourly and daily patterns of general aviation activity at terminals are similar to air carrier utilization. In order to maintain equity between air carrier and general aviation users, peak charges would have to be levied on all users. ^{1/}

C. Analysis of Alternatives

Alternative general aviation user charges are analyzed below with respect to the evaluation criteria described in Section A. In addition, quantitative estimates are provided for the impact of charges on aviation activity, use of the airway system, aviation accidents, and anticipated revenue yield.

^{1/} Peak-hour charges should not, however, be excluded from any subsequent consideration of revisions to airport and airway financing or airport capacity allocation involving all users--air carriers, general aviation, and Government aviation.

1. Fuel Tax

Fuel taxes could be revised in at least three ways to increase cost recovery:

1. Increase the present unit (cents-per-gallon) fuel tax;
2. Replace the unit (cents-per-gallon) tax with an ad valorem (constant percentage of value) tax; and
3. Replace the existing unit tax with a variable unit tax tied to the wholesale price of fuel.

Fuel charges are not directly associated with the use of specific services and an increase in the tax is, therefore, not expected to effect the use of safety related services. Because the amount of flying is somewhat sensitive to the cost of flying, fuel taxes may indirectly reduce the total number of aviation accidents through reductions in flying due to increased flying costs.

Fuel consumed by an aircraft and hence fuel tax payments are directly related to its weight, type of engine, and to distance flown. As illustrated in Table V.1, aircraft characteristics such as weight and number of engines are further correlated with the income of aircraft owners (ability to pay taxes), the avionics equipment on board the airplane, and the number of IFR hours flown. The latter two items indicate that the airplane uses services provided

TABLE V.1
AIRCRAFT CHARACTERISTICS AND USE

Type of Aircraft	Median : Number : Flying Hours : Per Year	Median : Number : IFR Hours : Per Year	Percent : Avionics Equipped :	1975 : Sales Price of Aircraft : (000's)	Median 1974 : Family Income of Individual Owners : (000's)	Typical : Aircraft Weights (Empty) : (Lbs)	Estimated : Annual Fuel Use : (gallons)	Estimated : Annual Fuel Tax : @ 7¢/Gal.
Single-Engine Piston 1-3 Seats	92	-0-	8	\$25.1	\$19.6	900 to 1,500	1,000	\$70
Single-Engine Piston 4 or More Seats	106	-0-	46	\$39.6	\$26.1	1,300 to 2,300	1,500	\$105
Twin-Engine Piston 12,500 Lbs	200	31	90	\$183.6	\$45.5	2,800 to 6,000	7,200	\$504
Multi-Engine Piston 12,500 Lbs	156	8	60	N/A	\$39.4	N/A	N/A	N/A
Turboprop	365	200	97	\$800.0 to \$2,100.0	\$80.0	4,000 to 8,500	24,500	\$1,715
Turbojet	425	367	98	\$1,300.0 to 3,000.0	\$150.0	7,000 to 15,000	131,000 271,000	\$9,170 to \$19,012
Rotocraft	188	-0-	7	\$50 to \$150	\$18.8	1,000 to 8,000	2,800 5,000	\$196 to \$350

Sources: General Aviation Aircraft Fleet [23].
Selected Statistics: United States General Aviation [19].
General Aviation: Aircraft, Owner, and Utilization [67].

by the FAA. Thus, the fuel tax is, therefore, considered relatively equitable. ^{1/}

A 7 cent-per-gallon fuel tax is now being collected on all noncommercial use of aviation fuels. Raising the amount of this tax or replacing it with a variable unit tax would entail minimal administrative burden. If the tax were applied according to the value of price per gallon (ad valorem tax), there may be some additional administrative burden in auditing compliance by fuel sellers because Federal fuel tax records are not presently kept on the value of sales. This burden is not considered severe as evidenced by the prevalence of ad valorem state sales taxes.

While fuel taxes are indirectly linked to the use and unit cost of service, this relationship does not, however, necessarily promote efficient resource allocation. Fuel taxes do not provide an automatic procedure by which FAA resources are channeled into providing aviation services which are considered a fair value by general aviation.

^{1/} One quantitative measure of the strength of the relationship between fuel taxes and use of the airport and airway system by type of aircraft can be obtained from Kendall's Coefficient of Concordance (W). W expresses the degree of association between variables transformed into ranks and has a potential range from zero (0) to one (1) [31, pp. 229-238]. The closer the computed value of W is to 1, the stronger the relationship between variables. Using data from Table V.1, the computed W for fuel taxes, hours flown, IFR hours flown, presence of VOR navigation equipment, and income of aircraft owners (ability to pay taxes), is .96. This value is significant at the 99 percent confidence level and indicates a very strong, direct relationship between these variables.

Tables V.2 and V.3 contain estimates of the impact of \$.15 and \$.20 cents-per-gallon fuel taxes, and 10 percent and 20 percent ad valorem fuel taxes. Increased fuel taxes raise aircraft operating costs and, other things being equal, this reduces aviation activity from the level that would otherwise exist. Increasing the cents-per-gallon rate to \$.15 or \$.20 per gallon is expected to cause 6 percent and 10 percent reductions in forecasted flying hours and tower operations. The reader should note that even with these tax increases, flying activity projected for 1987 will be far greater than today's levels. The cents-per-gallon rate remains constant over time, and if there is inflation in the economy, the real cost of the tax (and its impact on flying) decreases over time. Thus, the relative reductions in activity shown for 1987 are less than in 1978--3 percent and 5 percent, respectively, for the \$.15 and \$.20 rates.

The immediate effects of ad valorem fuel taxes and unit taxes yielding comparable revenue are similar. ^{1/} Because fuel prices are expected to inflate at a faster rate than the general price level, the impacts of ad valorem taxes are expected to become greater with the passage of time. For

^{1/} Economic theory contends that ad valorem taxes which produce the same yield as unit taxes result in slightly lower overall retail prices and greater output. For purposes of the present analysis, however, such differences are small enough to consider the impacts similar.

TABLE V.2

IMPACT OF HIGHER PER-GALLON FUEL TAXES

Year and Tax Level	1978		1987	
	Present Rate (7¢)	15¢	Present Rate (7¢)	15¢
General Aviation Activity ^{1/}		20¢		20¢
Flying Hours (10) ⁶	38.6	36.5	60.8	58.8
Operations at FAA Towers (10) ⁶	54.1	51.1	80.4	77.7
Accidents ^{2/}	4,478	4,234	7,053	6,820
User Charge Revenue (\$10 ⁶)	91.5	161.1	180.4	312.4
Fuel Tax (\$10 ⁶)	64.5	134.1	116.6	248.6
All Other (\$10 ⁶)	27.0	27.0	63.8	63.8

^{1/} Including air taxi.

^{2/} Based on 1976 rate of 11.6 accidents per 100,000 flying hours.

TABLE V.3

IMPACT OF AD VALOREM FUEL TAXES

Year and Tax Level	1978		1987	
	Present Rates	20%	Present Rates	20%
General Aviation Activity ^{1/}				
Flying Hours (10) ⁶	38.6	38.5	60.8	59.1
Operations at FAA Towers (10) ⁶	54.1	54.0	80.4	78.1
Accidents ^{2/}	4,478	4,469	7,053	6,855
User Charge Revenue (\$10 ⁶)	91.5	95.6	180.4	303.2
Fuel Tax (\$10 ⁶)	64.5	68.6	116.6	239.4
All Other (\$10 ⁶)	27.0	27.0	63.8	63.8

^{1/} Including air taxi.

^{2/} Based on 1976 rate of 11.6 accidents per 100,000 flying hours.

example, impacts of a 10 percent ad valorem tax in FY-1978 would be almost the same as a 7 cent-per-gallon rate, but the 10 percent rate will cause a decline in activity of 3 percent from the level that would exist in 1987 if the 7 cent tax were continued. The impacts of a variable unit tax, designed to duplicate the gradual effective increase in the tax rate of an ad valorem tax, are the same as those summarized for the ad valorem tax in Table V.3.

2. Excise Taxes on New Aircraft and Avionics Sales

Ad valorem (percentage) taxes on the sale of new aircraft and/or avionics represent entrance charges to users of the airport and airway system. Two such charges are analyzed here:

1. A 6 percent tax on new domestic aircraft sales.
2. A 6 percent tax on new domestic avionics equipment sales.

The 6 percent tax rate was selected for evaluation because of its potential to significantly reduce the gap between the costs of FAA service to general aviation and revenues presently collected from this group.

Taxes on the value of new aircraft sales are not expected to have a significant effect on aviation safety. Available evidence on the price sensitivity of aircraft sales [34] suggests that buyers of larger, better equipped

aircraft are not likely to be influenced by small increases in aircraft prices. Consequently, an excise tax on new aircraft sales is not expected to cause a downgrading of the performance characteristics of aircraft being purchased.

An excise tax on avionics may have minor effects on aviation safety by discouraging purchases of new equipment. Unfortunately, direct evidence is not available on the price sensitivity of avionics sales. It is assumed, however, that because avionics are accessories to aircraft, avionics sales could be more sensitive to price changes than aircraft sales. ^{1/} Consequently, some small aircraft presently being equipped with various avionics devices may refrain from this practice in the future or may equip with older, used equipment. Limited downgrading of avionics purchases by owners of more sophisticated aircraft may also occur.

As illustrated in Table V.1, aircraft value and, consequently, aircraft and avionics excise taxes are correlated with aircraft use of the airport and airway system and the income of aircraft owners. These excise taxes are, therefore, considered relatively equitable. ^{2/}

^{1/} Alternatively, it could be argued that avionics are complementary goods to aircraft, and hence the impact on avionics price increases on sales would be no greater and perhaps less than the impact of price increases on aircraft sales.

^{2/} The Kendall Coefficient of Concordance between the sales price of aircraft, hours flown, IFR hours flown, presence of VOR navigation equipment, and income of aircraft owners is .96.

At present, mechanisms for collecting excise taxes on new aircraft and avionics equipment sales do not exist. For new aircraft sales, there is a good point of control for tax collection--the Federal aircraft titling procedure. Excise taxes on new avionics are probably best administered through retailers and this may impose a somewhat greater administrative burden than the aircraft sales tax. Both new aircraft and new avionics equipments sales taxes are considered administratively feasible.

Some precedent exists for taxes on new aircraft and avionics equipment sales. An excise tax already exists on the sale of aircraft tires and tubes. In the past, new automobile and truck sales were subject to a 10 percent tax.

Both the tax on new aircraft sales and the tax on new equipment sales present the buyer of an aircraft with a partial bill for Federal airport and airway services at the time of investment decision. While the tax is not necessarily expected to alter aircraft purchase decisions, some of the Government costs of service will be explicitly considered in the buyer's choice of aircraft and equipment. The type of aircraft and equipment does influence the cost of airway services--for example, aircraft operating at over 18,000 feet must fly under FAA en route control. Similarly, general aviation aircraft equipped with transponders can

utilize the extensive control services provided by the FAA in selected terminal control areas. Thus, aircraft and equipment sales taxes may somewhat improve the allocation of resources.

A 6 percent tax on new aircraft imposed at the beginning of 1978 would yield about \$75 million by the end of the year. By 1987, tax yields from this source could amount to \$179 million if present trends in aircraft sales and prices persist. With tax imposition, new domestic aircraft sales would be temporarily constrained, but not reduced from current levels. Between 1974 and 1978, domestic unit and dollar sales of new aircraft grew at average annual rates of 10 and 20 percent, respectively. It is estimated that a 6 percent tax on new aircraft might cause up to a 12 percent short-term decline in the number of new aircraft that otherwise might be sold domestically in the absence of a tax and a somewhat smaller decline in the value of sales. ^{1/} Thus, the impact of the

^{1/} Evidence on the likely impact of a tax on aircraft sales is mixed. Research conducted by the Office of Aviation Policy [34] suggests that sales of light, single-engine aircraft are sensitive to price increases (an increase in price decreases sales by a proportionate or more than proportionate amount), at least in the short run, and multi-engine aircraft sales are not sensitive to price changes (less than a proportionate impact) within the range of observed price variation. No conclusions could be drawn on the impact of price changes on aircraft sales for high performance, single-engine aircraft. Other things held constant, the estimated average short run impact on all aircraft sales is a 2 percent decrease in sales per one percent increase in price.

tax and existing annual growth rates will roughly offset each other producing at maximum, a brief leveling off period in domestic sales. Further, export sales of aircraft would not be subject to the tax. Because export sales constitute 20 percent of total general aviation unit sales by United States manufacturers, it is possible for total aircraft sales to experience some growth, albeit small, in the period immediately following tax imposition. In the longer term, domestic aircraft sales will likely resume their upward trend.

Decreases in flying hours and the use of FAA services are, therefore, not expected to exceed one (1) percent of presently projected levels and may be less because the more price sensitive aircraft are, on average, flown fewer hours each year.

Using the sensitivity of aircraft sales to price changes as a surrogate of the impact of price changes on new avionics sales, a 6 percent tax on avionics might cause a 12 percent decline in avionics sales. Tax revenues from such an avionics tax would have yielded approximately \$13 million in FY-1978 and the yields will rise annually to \$31 million in 1987. No significant decrease in flying hours is anticipated to result from the reduction in avionics sales. There may be some small decrease in the utilization of FAA services dependent on onboard aircraft avionics.

3. Weight Taxes

Increased cost recovery from general aviation could be obtained by increasing the rates of existing annual aircraft weight taxes on general aviation and eliminating exemptions (piston aircraft weighing less than 2,500 pounds).

Increasing the weight tax is not expected to alter the pattern of airport and airway system usage. All safety impacts of the tax will, therefore, be associated with changes in flying hours caused by long-run changes in the size of the aircraft fleet.

Table V.1 illustrates the direct relationship between aircraft weight and hence aircraft weight tax, use of the airport and airway system, and aircraft owner income. Weight taxes are, therefore, considered to be relatively equitable. ^{1/} Because weight taxes would be collected annually, they may impose more inconvenience than 'pay-as-you-go' taxes.

Weight taxes are already being imposed and no additional administrative costs are anticipated as a result of increasing the rate of tax.

Table V.4 provides estimates of the impact of two different rates of weight tax:

1. \$.07 per pound on all general aviation aircraft.
2. \$.14 per pound on all general aviation aircraft.

^{1/} The Kendall Coefficient of Concordance between aircraft weight, hours flown, IFR hours flown, presence of VOR navigation equipment, and income of aircraft owners is .96.

The rates were selected for evaluation because they would substantially increase user tax revenues from general aviation-- \$43.7 and \$94.7 million in 1978 for the 7¢ and 14¢ taxes, respectively. The two rates would result in average annual charges of \$238 and \$476 for piston aircraft and \$1,540 and \$3,080 for turbine aircraft (an average increase in total annual aircraft costs of 1 and 2 percent).

The cost increases associated with potential revisions in the weight tax are fixed in nature and are not expected to result in net decreased aircraft utilization in the short run, although some aircraft owners may be motivated to sell their aircraft to others. No method is available for estimating the number of such sales, but they are not expected to be significant. Further, in the short-term, revised weight taxes could reduce projected increases in the fleet by 2 to 4 percent from levels that otherwise would occur. Assuming fixed tax rates, this constraint would diminish over time because per pound weight taxes would remain constant, thereby decreasing in importance as other costs of flying increase. By 1987, the net effect of these taxes, if imposed, might be to reduce the projected size of the total fleet by one percent. Thus, projected fleet growth over the period 1978 through 1987 would be 50 percent instead of 51 percent. Similar changes are anticipated by 1987 for flying hours and operations at FAA towers; see Table V.4.

Table V.5 summarizes the major tax alternatives with respect to the evaluation criteria.

TABLE V.4
IMPACT OF INCREASED AIRCRAFT WEIGHT TAXES

Activity <u>1/</u>	Year			1978			1987		
	Present Tax Rates	7¢ Per #	14¢ Per #	Present Tax Rates	7¢ Per #	14¢ Per #	Present Tax Rates	7¢ Per #	14¢ Per #
Number of Aircraft (10) ³	186.6	186.6	186.6	282.5	279.7	279.7	282.5	279.7	279.7
Flying Hours (10) ⁶	38.6	38.6	38.6	60.8	60.2	60.2	60.8	60.2	60.2
Operations at FAA Towers (10) ⁶	54.1	54.1	54.1	80.4	79.6	79.6	80.4	79.6	79.6
Accidents <u>2/</u>	4,478	4,478	4,478	7,053	6,982	6,982	7,053	6,982	6,982
User Charge Revenues (10) ⁶	91.5	135.2	186.2	180.4	245.7	327.1	180.4	245.7	327.1
Weight Tax (\$10 ⁶)	7.1	50.8	101.8	14.8	81.4	162.8	14.8	81.4	162.8
Registration Fee (\$10 ⁶)	4.7	4.7	4.7	7.1	7.0	7.0	7.1	7.0	7.0
Fuel Tax (\$10 ⁶)	64.5	64.5	64.5	116.6	115.4	115.4	116.6	115.4	115.4
ALL Other (\$10 ⁶)	15.2	15.2	15.2	41.9	41.9	41.9	41.9	41.9	41.9

1/ Including air taxi.

2/ Based on 1976 rate of 11.6 accidents per 100,000 flying hours.

TABLE V.5
SUMMARY OF FEASIBLE TAX ALTERNATIVES

Type of Charge	Fuel Tax		Excise Tax on New Aircraft and Equipment	Added Weight Tax
	Cent-Per-Gallon	Ad Valorem		
Characteristics				
1. Rate	\$.15 or \$.20 per gallon of fuel	10% or 20% fuel sales value	6% sales value of new aircraft and/or avionics equipment	\$.07 or \$.14 per #
2. Equity				
a. Direct association with service rendered	No	No	No	No
b. Voluntary payment for service	No	No	No	No
c. Relation to actual cost of service used	Good	Good	Fair	Fair
d. Nondiscriminatory	Yes	Yes	Discriminates against new investors	Yes
e. Other	Does not keep pace with inflation	Keeps pace with inflation	Does not penalize existing owners for previous investment decisions	Large lump-sum payment

TABLE V.5
SUMMARY OF FEASIBLE TAX ALTERNATIVES
(Continued)

Type of Charge	Cent-Per-Gallon	Fuel Tax	Excise Tax on New Aircraft and Equipment	Added Weight Tax
Characteristics		Ad Valorem		
3. Aviation Activity Impact If Imposed in 1978	\$.15-- \$.20--	10%-- 20%--	Short-run aircraft sales plateau, 1% activity	No short-run impact, 1% long-run activity
4. Allocation Efficiency	No change	No change	No change	No change
5. Safety				
a. Absolute level of accidents	Reduction due to lower activity	Reduction due to lower activity	Reduction due to lower activity	Reduction due to lower activity
b. Accident rate	No change	No change	No change	No change
6. Increased Cost Recovery First Year (10%)	\$.15-- \$.20--	10%-- 20%--	New aircraft-- Avionics--	\$.07-- \$.14--
	\$70 Million \$105 Million	\$4 Million \$65 Million	\$75 Million \$13 Million	\$44 Million \$95 Million

TABLE V.5
 SUMMARY OF FEASIBLE TAX ALTERNATIVES
 (Continued)

Type of Charge	Fuel Tax		Excise Tax on New Aircraft and Equipment	Added Weight Tax
	Cent-Per-Gallon	Ad Valorem		
Characteristics				
7. Administrative Feasibility				
a. Collection system available	Existing system	Existing system with modification	New system	Existing system
b. Cost of collection	No additional cost	Probably little additional cost	Probably low cost	No additional cost
c. Ease of calculation	Easy	Easy	Easy	Easy
d. Avoidance	Difficult	Difficult	Difficult	Difficult
8. Precedent	Modification of existing tax	Modification of existing tax	a. Already use some excise taxes b. Prior use of excise tax on transportation equipment	Modification of existing tax
9. Other Factors	Widespread impact - No action on 1975 proposal	Widespread impact	Impact limited to buyers of new aircraft and equipment	a. Widespread impact b. Maximum adverse psychological impact

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