National Business Aviation Association

Costs Incurred and User Fees Recovered by the Federal Government for Services to Business General Aviation

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HLB DECISION ECONOMICS INC.

RISK ANALYSIS · INVESTMENT AND FINANCE · ECONOMICS AND POLICY

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HLB Decision Economics Inc.

And

PricewaterhouseCoopers LLP

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Executive Summary

Business users of private jets and turboprops pay more in federal aviation user fees than the total costs borne by the federal government to provide them with aviation services. As shown in Table 1, the overcharge is about $4 million a year (ranging up to $19 million when estimation risk is taken into account). The figures given in Summary Table 1 reflect Federal Aviation Administration (FAA) cost data for the period 1999 to 2003. While more recent data are not yet available, the analysis indicates that costs are stable over time. Comprehensive documentation of the data and analysis underpinning this report is available in a separate volume.

Aviation services provided by the federal government (either directly or through grants-in-aid) include air traffic control, airport improvements and regulation. Although full cost recovery promotes the efficient use of aviation facilities and services, overcharging leads business aviation users to reduce their use of the system. In so doing, the overcharge diminishes the contribution of business aviation to national economic growth (presently estimated at $102 billion a year and 1.3 million jobs).

Summary Table 1: General Aviation Jet and Turbo-Prop (Turbine) Aircraft User Tax Payments and Allocated FAA Costs (Fiscal Year 2001)

General Aviation Aircraft Type	Jets and Turbo-Props Tax Revenues from Jet Fuel (in millions)	FAA Costs Allocated to Jets and Turbo-Props (in millions)	Cost Recovery (in percent)	
			Air Traffic Services	Total FAA Air Traffic & Non Air Traffic Costs
Jets, Turbo-Props (Turbine)	$188	$184	121%	102%

Source: HLB Decision Economics Inc. and PricewaterhouseCoopers LLP

THREE DECADES OF UNCERTAINTY

Although studies prepared by the FAA indicate that general aviation users underpay for aviation services, the FAA's calculation methods and resulting estimates of cost responsibility have varied widely over the years. Moreover, the most recent FAA estimates reflect a methodology that has been rejected by Congress for other federal transportation agencies. Whereas the FAA incurs certain aviation costs specifically on behalf of identifiable user groups, other costs, called "common costs," are incurred on behalf of all user groups (namely commercial airlines, military aircraft and general aviation). The FAA approach assigns a sizeable amount of these common costs to general aviation alone. The rationale for this approach is the notion that general aviation's willingness to pay for aviation services reflects the high value these aircraft users place on such services, and that value rather than cost is the right basis for setting user fees. Congress, on the other hand, has directed the Federal Highway Administration to gear federal user charges to cost alone, for two reasons. One is fairness. Since the federal government is the only provider of air traffic control, aviation users have no choice in the marketplace. Users' "willingness to pay" is thus seen to represent an unjust measure of value. The second Congressional rationale for insisting on cost as the basis for setting user fees is measurement. Aviation users are not homogeneous and the value of aviation services varies greatly from sub-group to sub-group, from one time of day to another, and from one region to another. Congress has deemed the measurement of value among diverse categories of transportation users to be too uncertain for practical purposes and instructs the Federal Highway Administration, for example, to base gasoline and truck taxes on costs alone.

NEED FOR CONGRESSIONAL GUIDANCE TO THE FEDERAL AVIATION ADMINISTRATION

The debate about general aviation's cost responsibility has been ongoing for more than three decades. Finding a long-term, stable policy solution must begin with Congressional direction to the Federal Aviation Administration regarding cost allocation principles. In formulating the basis for such direction to other agencies, Congress has taken counsel from independent scientific bodies. In the case of highway cost allocation and recovery, for example, Congress asked the U.S. Congressional Budget Office to help formulate the basic philosophical principles upon which Congress could (and subsequently did) base its guidelines to the Federal Highway Administration as to the allocation of costs between cars and trucks. For independent, consensus-based guidance, Congress also turns routinely to the Transportation Research Board of the National Academy of Sciences.

NEED FOR A COST RECOVERY MANAGEMENT PROCESS

User charges can promote economic efficiency by giving aviation system users an incentive to signal the undesirability of investing in facilities or levels-of-service that they either do not want or cannot pay for. For these incentives to work, however, mechanisms are needed to assess the users' ability and willingness to pay the full costs of proposed investments or increases in service quality before they occur. If investments are made without this signalling mechanism and increased user taxes are implemented after-the-fact, there is a high risk users reduce their use of facilities and services, leaving new investments under-utilized and unproductive. Leaving assets underutilized in this way offers nothing in the way of economic efficiency; indeed

The solution is for the FAA to gauge users' ability and willingness to pay *before* making new investments or increasing service levels. This can be done through a combination of consultations with industry groups and special studies of user demand and financial capacity. Under the FAA's current approach to managing the cost recovery process there is no consultation with general aviation users regarding their willingness or ability to pay for new airport facilities or air traffic services. Between 2000 and 2001, for example, FAA grants awarded to general aviation airports almost doubled, from $439 million to $813 million[1], without any mechanism to determine whether general aviation users have the ability or willingness to

[1] Includes grants for reliever airports, other general aviation airports and general aviation's share of state block grants (estimated to be 85%).

pay for these investments. Such "signalling" mechanisms should be brought into place before new spending and taxation decisions are made.

In addition to signalling, the management process needs to address the treatment of "non-user" costs. These are costs of services provided in support of social, economic development or employment-support policies. Passing on the cost of pursuing social objectives to aviation users, however, dilutes the economically desirable level of aviation activity. Certain flight service stations and general aviation airports are examples of social costs imposed on the general aviation community.

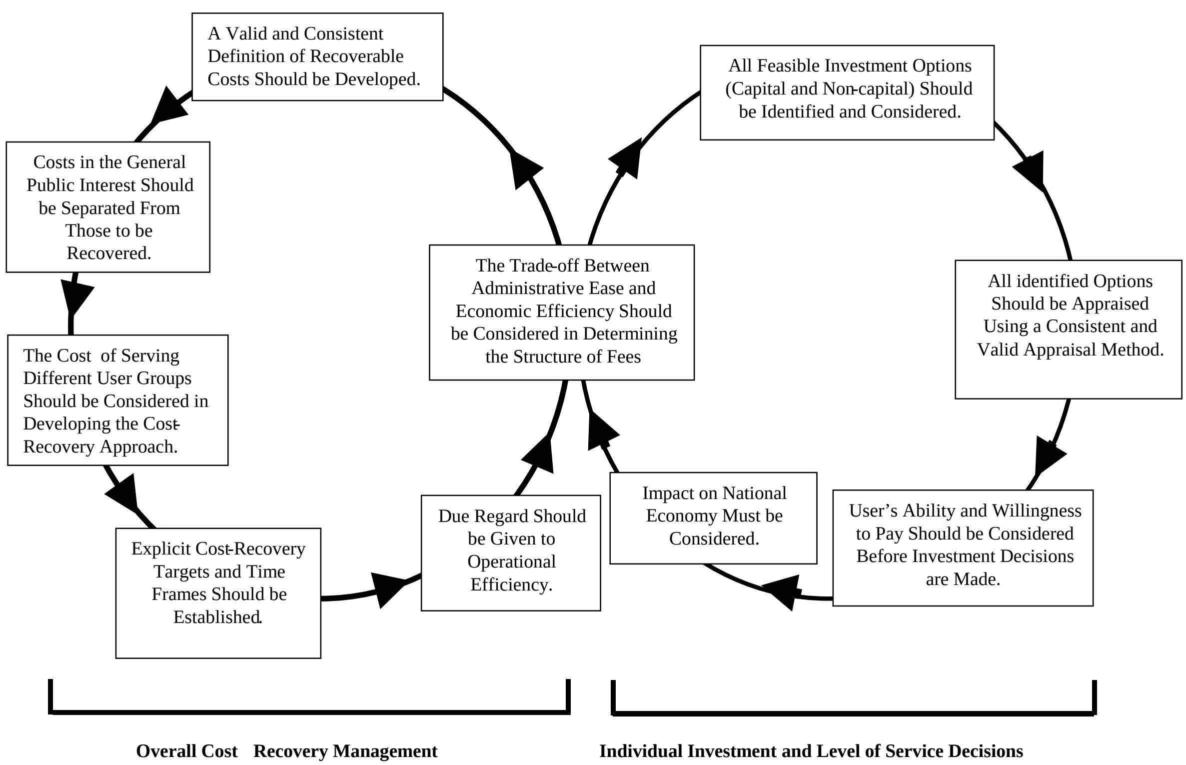
Summary Figure 1 presents a framework with which to address the cost recovery management process. The framework would serve to ensure that the cost recovery process:

(1) Takes into account user signals of operational efficiency and explicit cost recovery targets while separating public sector from private sector benefits;

(2) Accounts for economic impacts on individual industry sectors as well as the impact on the national economy; and

(3) Ensures a consistent evaluation framework across all market sectors.

Summary Figure 1: Criteria for Cost Recovery Management

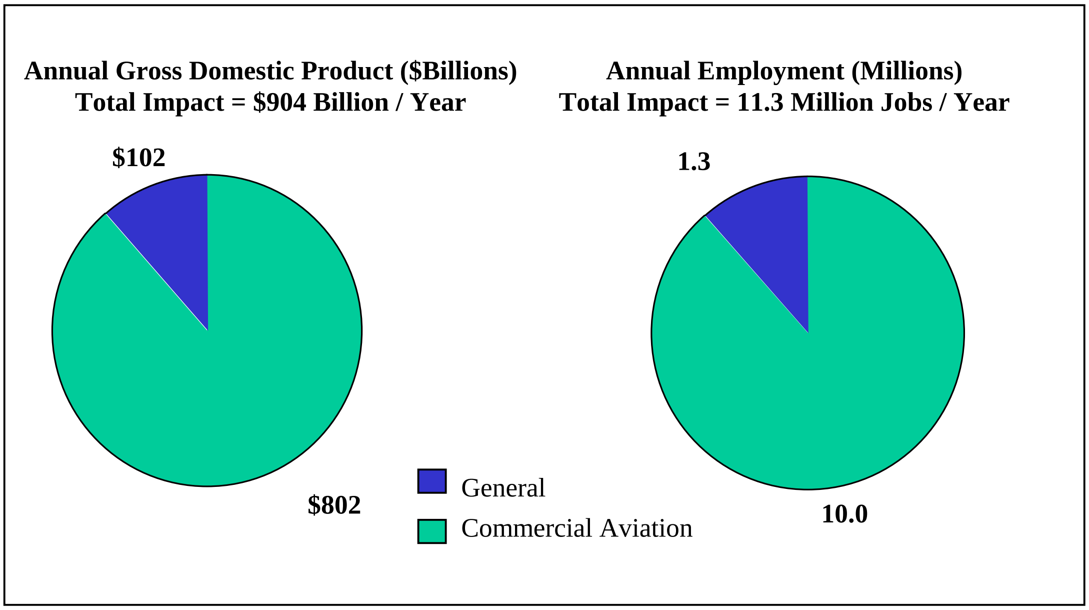


1. Introduction: The History of Cost Allocation in the FAA

This report represents an independent study of the allocation of the Federal Aviation Administration (FAA) costs to the general aviation user community. The study was undertaken by HLB Decision Economics (HLB) at the request of the National Business Aviation Association (NBAA) to: (1) provide the business aviation market with a better understanding of its impact on FAA resources and costs; (2) develop a cost allocation approach and framework; and (3) evaluate the extent to which general aviation recovers its share of allocated FAA costs and the corresponding tax policy implications. The study has been conducted in coordination with a federal fuel excise tax and revenue sensitivity analysis prepared by PricewaterhouseCoopers LLP.

The general aviation industry is an integral part of the nation's transportation system and a significant contributor to the U.S. economy. A recent study of the U.S. civil aviation industry found that general aviation contributed more than $100 billion in Gross Domestic Product and one million jobs in 2000[2]. Figure 1 shows the contribution from general aviation to the national economy.

Figure 1: U.S. Civil Aviation Economic Impacts, 2000



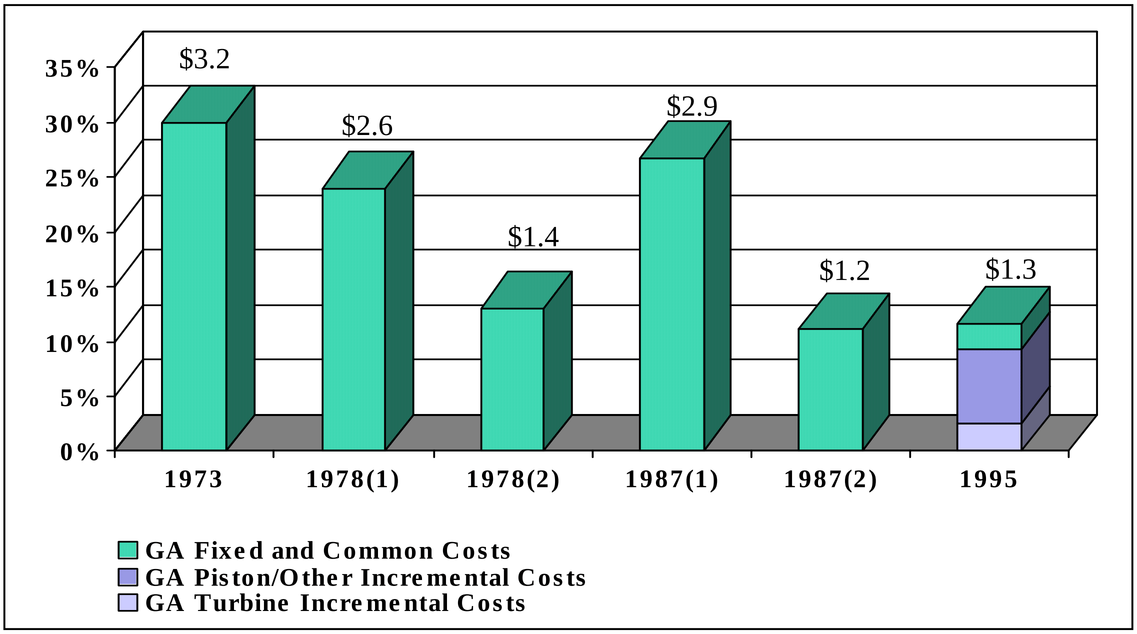
Source: The National Economic Impact of Civil Aviation, DRI-WEFA, Inc., July 2002

Numerous studies have been conducted over the past thirty-or-more years with the objective of allocating all of the FAA's operating costs to the users of the National Airspace System. These studies have employed various cost allocation methodologies and have produced a wide range of cost allocations, particularly for general aviation.

[2] The National Economic Impact of Civil Aviation, DRI-WEFA, Inc., July 2002

Figure 2 shows the range of costs allocated to general aviation from previous FAA cost allocation studies from $3.2 billion in the 1973 study to $1.2 - $1.3 billion in the more recent studies.

Figure 2: Share of General Aviation Costs from FAA Cost Allocation Studies: An Allocation of FY 2001 FAA Costs
Billions of 2001 Dollars



Source: HLB Decision Economics Inc. based on FAA cost allocation studies.

To be sure, the recovery of costs from system users promotes the efficient allocation of the nation's scarce economic resources. However, the range in cost responsibility identified by previous FAA studies introduces a significant risk to the economic health of the industry. These studies result in a general aviation cost burden ranging from $1.2 to $3.2 billion, depending on the cost allocation methodology applied. The range of error associated with these FAA cost allocation studies places a significant risk to this industry's economic contribution. For example, if 12 percent, as represented by the FAA 1995 Cost Allocation Study, is held to be an accurate estimate of general aviation's allocated cost responsibility, then a tax structure based on the 30 percent finding in the 1973 DOT study, would have severely compromised general aviation's contribution to national economic growth (estimated at $102 billion and 1.3 million jobs a year in 2001), resulting in a sizeable loss in GDP.

Table 1illustrates the costs to general aviation had the 1973 study cost allocation been implemented.

Table 1: General Aviation Share of FY 2001 FAA Costs from Alternative FAA Cost Allocation Studies
Billions of 2001 Dollars

	1973[3]	1978[4](1)	1978(2)	1987(1)[5]	1987(2)	1995[6]
Cost Allocation	$3.2	$2.6	$1.4	$2.9	$1.2	$1.3
$ Change from 1973	-	($0.6)	($1.8)	($0.4)	($2.0)	($2.0)
% Change from 1973	-	-20%	-57%	-11%	-63%	-61%

The potential range of error casts doubt on the validity of past allocation methodologies and underscores the imperative for building a consensus on a cost allocation approach for the general aviation user community. Any approach requires the FAA to separate accurately fixed and common costs from incremental costs that result from increased use of the system. With the exception of a limited number of general aviation airports, multiple user groups to varying degrees share all of the FAA's facilities. In addition to accurate cost accounting, there is the issue of "non-user" costs inherent in documented inefficiencies in the FAA's operations. The costs of these inefficiencies are passed on to user markets, increasing the risk of economic waste.

Several key factors affect the evaluation framework of an FAA cost allocation strategy:

1. FAA's Air Traffic Services (ATS) is a joint-use system designed to service the scheduled airline market. This market requires a more advanced technology and operational system than other commercial and non-commercial users. The cost to develop and maintain this system is above that required to meet the operational needs of the non-commercial market segment.

2. FAA provides services to a wide range of user markets, ranging from commercial airlines to the personal use of aircraft for recreational purposes. The general aviation user market represents an extremely diverse range of aircraft use that includes corporate jets, single-engine piston aircraft, helicopters, gliders and balloons. Skydiving is also included in this category. General aviation includes all non-commercial use of airspace, including training and instruction for all pilots, as well as some commercial activity (air taxi, sightseeing and tours, aerial observation and applications). The FAA, in conducting its cost allocation studies, does not differentiate among these markets. Instead, it allocates costs by the type of aircraft flown, or more precisely, by the type of fuel consumed, i.e., aviation gas and/or jet fuel.

3. More than half of the FAA's annual operating costs are common to all users. Of the remaining costs, very little is unique to any single user group. This makes any cost allocation highly subjective. Moreover, the FAA does not have the supporting cost

[3] "Determination, Allocation and Recovery of System Costs", Office of the Secretary of Transportation, DOT, 1973
[4] "Financing the Airport and Airway System: Cost Allocation and Recovery", Office of Aviation Policy, FAA, 1978
[5] "Airport and Airway Costs: Allocation and Recovery in the 1980s", FAA, 1987
[6] "A Cost Allocation Study of FAA's FY 1995 Costs", Prepared for FAA Office of Aviation Policy and Plans, Federal Aviation Administration by GRA, Incorporated, 1997

accounting and activity systems in place to enable accurate cost allocations by activity type and user.

4. Recent FAA cost allocation studies do not acknowledge an allocation of costs to the public sector, despite the broad public mandate of the FAA of safety and security. This leaves un-addressed the question of how much of the cost "to provide a safe, secure, and efficient global aerospace system that contributes to national security and the promotion of U.S. aerospace safety" should be borne by the public sector, as beneficiaries of these activities.

5. To date, Congress has not established guidelines for evaluating cost allocation within the FAA similar to the allocation guidelines provided on highway cost allocation. Typically, a Congressional review would evaluate alternative cost allocation methodologies with respect to (a) issues of joint-use of infrastructure by different user groups, and (b) economic efficiency in relation to fairness and equity in matters of cost allocation, taxation and risks to economic growth. Congress has not yet defined the cost allocation and a cost recovery framework that is appropriate for the FAA's costs.

These factors make cost allocation highly subjective and introduce a significant risk of overcharging specific user groups. This risk, in turn, threatens the continued contribution to economic growth provided by the general aviation sector and underscores the imperative for Congressional guidance in developing a consistent, equitable and viable approach to cost allocation. These issues, taken together, make it difficult to adopt the results of past FAA cost allocation studies. In fact, the huge range of costs attributable to general aviation underscore the risk inherent in implementing any specific study result.

The general aviation community seeks closure to the long-standing cost allocation debate. This paper reviews the issues related to the FAA's cost allocations and recommends an approach to allocating general aviation's share of FAA costs based on principles of fair and equitable treatment and the industry's ability and willingness to pay for services provided. Based on that approach, HLB provides an estimate of the FAA's fiscal year 2001 costs allocated to general aviation.

The study report presents a brief review of previous FAA cost allocation studies and the alternative methodologies used to derive general aviation's share of FAA costs. Chapter 2 describes FAA services and costs of operations. In Chapter 3, HLB presents its own assessment of costs attributable to general aviation and poses the issues inherent in developing a cost allocation strategy. Chapter 4 addresses general aviation tax revenues and cost-recovery. Chapter 5 presents the next steps in moving toward an effective cost recovery management framework for FAA cost recovery.

2. FAA Services and Costs

The FAA provides a single air traffic control system to a mix of market users. The use of FAA services varies considerably by major market user. FAA tracks air traffic control and flight support services for four major markets: large commercial carriers, regional and commuter/air taxi, the military and general aviation. FAA's services to these user markets is provided through the use of air traffic control, pre-flight and in-flight support services at three types of facilities:

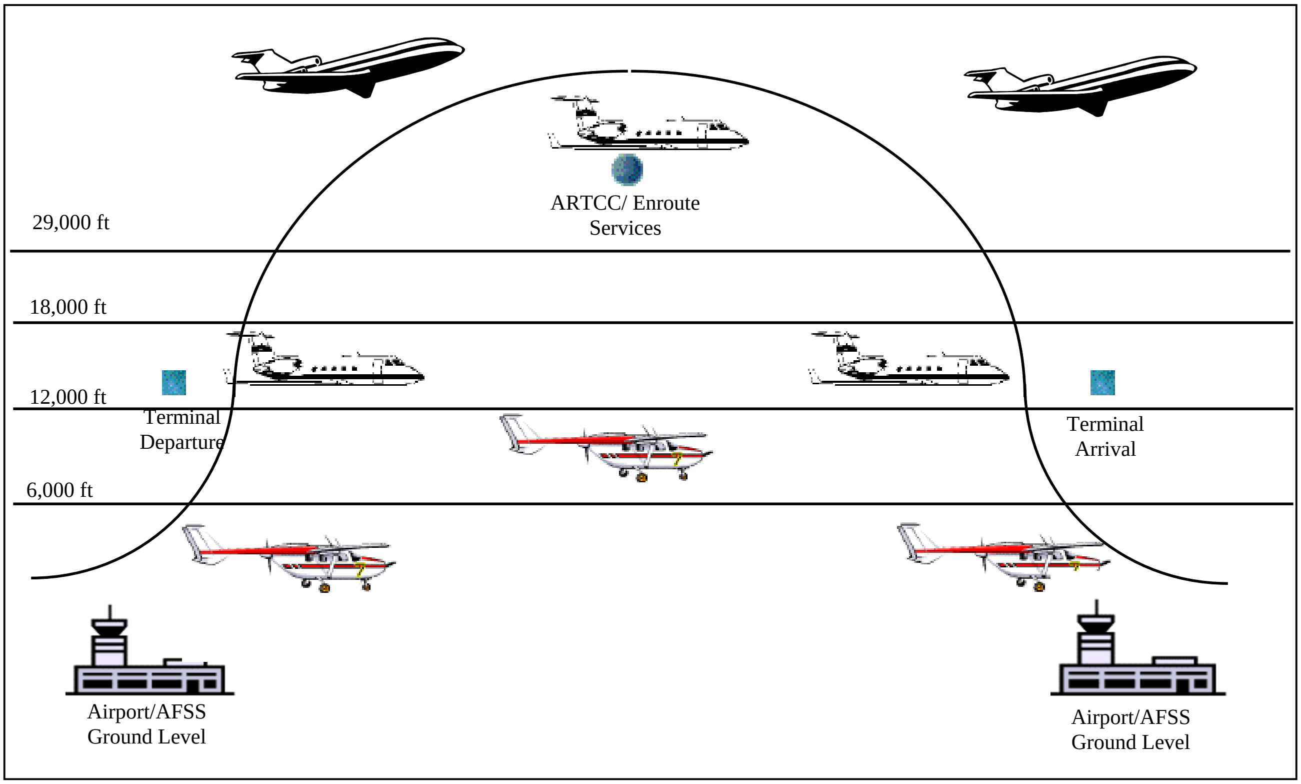
(1) **Airport Terminals and Approach Towers (ATCT)** provide services for aircraft departures and overflights within the air traffic control area of an airport facility or approach tower;

(2) **Enroute Centers (ARTCC)** provide services for aircraft departures and overflights for airspace outside the control area of the airport facility or approach tower. Enroute centers principally provide separation services for aircraft flying on IFR flight plans; and,

(3) **Automated Flight Service Stations (AFSS)** provide pre-flight and in-flight support services. Activities include flight plan filings and amendments, current information on weather and flight conditions and in-flight contacts. *AFSS do not provide air traffic control services.*

Figure 3 illustrates the diverse use of FAA services by type of aircraft and altitude – critical cost drivers. All aircraft above 18,000 feet are required to fly on IFR flight plans; below 18,000 feet is a mix of IFR and VFR aircraft.

Figure 3: FAA Air Traffic Services

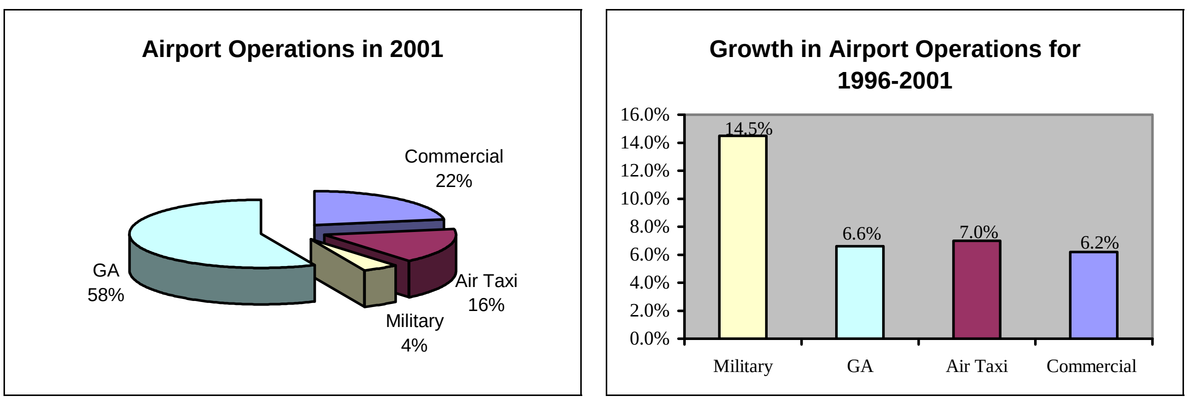


A significant amount of general aviation traffic occurs below 18,000 feet. These flights are primarily VFR flights and do not utilize FAA resources at enroute centers. Corporate and business aircraft, however, are more likely to fly above 29,000 feet along with commercial airlines.

<u>Airport Terminals and Towers</u>

Airport terminal and approach tower operations represent the largest component of the FAA's air traffic control services (ATC). Airport operations reflect ATC activities related to the separation and sequencing of air traffic in to and out of airports and in the surrounding airspace. Two types of activities are measured: (1) aircraft landings and departures, and (2) aircraft overflights. FAA's operational data include only those aircraft that receive services from FAA-controlled terminals and towers and does not report activity at non-towered general aviation airports. These general aviation airports receive traffic from general aviation, commuters, air taxi and military aircraft. Figure 4 shows total airport operations by major user market. In 2001, general aviation accounted for 58 percent of total FAA airport departures/landings and overflights at FAA-controlled airports.

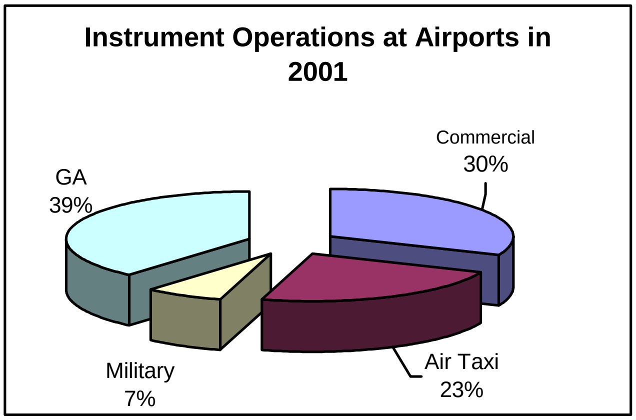
Figure 4: Airport Operations at Combined FAA/Contract Towers

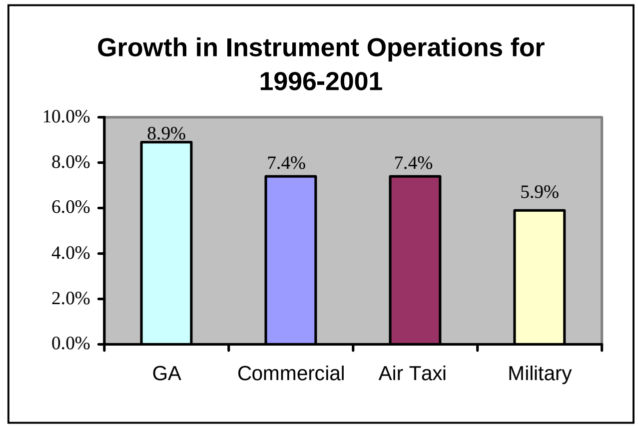


Source: FAA Aerospace Forecasts 2002-2013, Table 32

The type of flight plan an aircraft uses is an important cost driver. Aircraft operating under Instrument Flight Rules (IFR) consume considerably more ATC resources than those under Visual Flight Rules (VFR). Between 75 and 85 percent of all airport operations are IFR flights. Total instrument operations have grown by 7.9 percent since 1996, somewhat faster than total airport operations reflecting increased safety concerns. General aviation instrument operations represent about 40 percent of all FAA-controlled airport instrument operations and have grown at a somewhat faster rate (8.9 percent) than the total growth over the same five-year period. Airport instrument operations are presented in Figure 5.

Figure 5: Instrument Operations at Airports at Combined FAA/Contract ATC Service



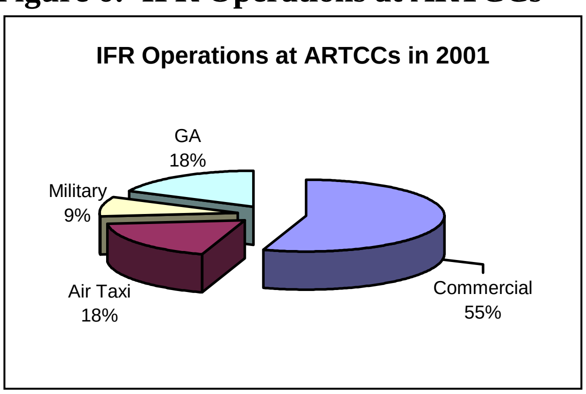


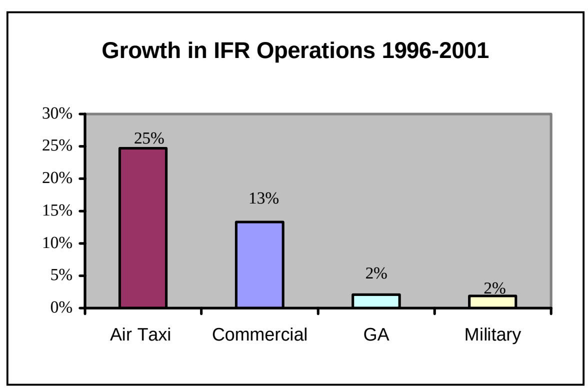
Source: FAA Aerospace Forecasts 2002-2013, Table 41

Enroute Centers

FAA's enroute centers (ARTCC) provide separation services for aircraft on IFR flight plans outside the airport terminal approach control area. General aviation's use of ARTCC services is significantly less than that of airport terminals and towers, representing less than 20 percent of total ARTCC operations. General aviation IFR departures, which measure general aviation aircraft entering the enroute center airspace, are generally twice the volume of general aviation IFR overflights. This suggests that roughly 80 percent of general aviation use of ARTCC services is within a single center. This reflects two general aviation characteristics: (1) significantly shorter trip lengths than other market users, and (2) the impact of IFR instructional training that extends just beyond the airport area. General aviation IFR operations at ARTCCs have grown by only 2.1 percent since 1996 compared to an overall growth of 11.9 percent. Figure 6 shows the relative use of FAA enroute centers with respect to all market segments.

Figure 6: IFR Operations at ARTCCs





Source: FAA Aerospace Forecasts 2002-2013, Table 45

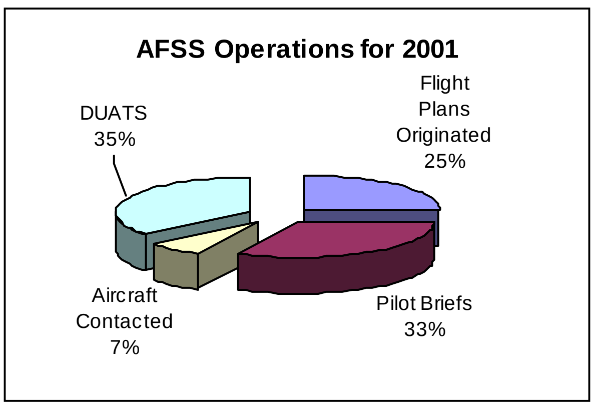
Automated Flight Service Stations (AFSS)

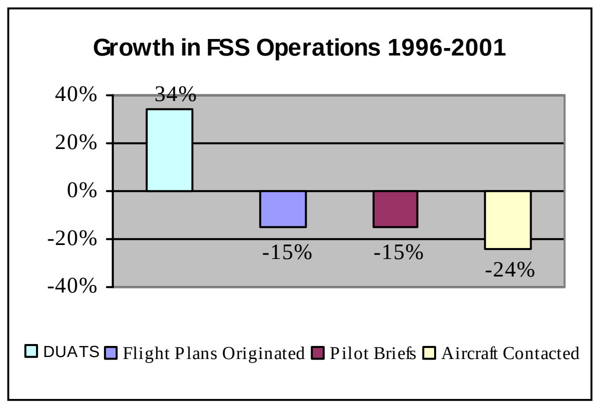
FAA's Automated Flight Service Stations (AFSS) provide pre-flight and in-flight support services to all aircraft. The primary users of AFSS services are pilots flying under Visual Flight Rules (VFR). These services include pre-flight planning assistance, aeronautical notices, weather briefings, updates on current flying conditions and emergency assistance.

Demand for AFSS services has been declining steadily since the 1980s, increasingly replaced by electronic flight services that can be accessed directly by pilots. The availability of automated weather briefing and flight plan processing services, such as DUATS, allows pilots to obtain weather data and to file flight plans directly from personal computers, diminishing the need to contact flight service specialists at an AFSS. Total flight services reported by the AFSS have declined by 16.1 percent over the past five years. Over the same period, the use of DUATS has increased by 34 percent.

Figure 7 presents a summary of AFSS operations from 1996 to 2002. General aviation accounts for 75 percent or more of all in-flight contacts. The FAA does not report pilot briefs and flight plans by market segment.

Figure 7: FSS Operations





Source: FAA Aerospace Forecasts 2002-2013, Tables 45-49

FAA Costs

FAA's cost of operation represents those of a joint-use system and, as such, very little is uniquely occasioned by any single user group. In fact, previous studies estimate that more than half of the FAA's annual operating costs are fixed and common to all users.

The FAA's costs of services totalled $10.8 billion in FY 2001. The single largest cost area is Air Traffic Services (ATS) at just over $7 billion, accounting for 65.3 percent of total FAA costs. Table 2 shows the distribution of the FAA's FY 2001 costs by line of business.

Table 2: FAA Costs by Line of Business, FY 2001

Line of Business	$ Millions	% of Total
Air Traffic Service	**7,075**	**65.3%**
En Route	3,210	29.6%
Towers	3,212	29.7%
Flight Service Stations	566	5.2%
Oceanic	86	0.8%
Airports	**2,179**	**20.1%**
Regulations and Certification	**690**	**6.4%**
Research and Acquisitions	**582**	**5.4%**
Other	**305**	**2.8%**
Total	**10,830**	**100%**

Source: FAA 2001 Financial Statements.

Notes: (1) Total cost estimates based on the FAA's 2001 Financial Statements. Lines of Business costs for en route, oceanic and flight service stations are sourced from the FAA website of the Assistant Administrator for Financial Services. Tower costs are taken as the difference of total ATS and En route, Oceanic and Towers. (2) 'Other' includes Civil Aviation Security, Commercial Space, Other programs and costs not

Enroute and Towers (terminal services) account for 90.8 percent of ATS costs with flight service stations and Oceanic services accounting for only 8.0 and 1.2 percent, respectively. Airport grants and administrative costs are the second largest FAA cost area at $2.2 billion or 20.1 percent of total costs.

Regulations and Certifications (AVR) are non-ATS activities that focus on aviation safety and represent 6.4 percent of the FAA's 2001 costs. AVR is responsible for establishing and maintaining aircraft design and manufacture standards, pilot training, certification requirements and pilot medical qualifications. AVR manages the FAA's rulemaking program.

Research and Acquisitions (ARA) represents 5.4 percent of the FAA's costs and is responsible for the FAA acquisition policy, research, system prototyping, and agency information resource management. The William J. Hughes Technical Center is housed within this line of business. The other FAA lines of business, which include Civil Aviation Security, Commercial Space, other programs and costs not attributed to programs account for 2.8 percent of FAA's costs.

The lack of a fully implemented Cost Accounting System makes it difficult to directly link actual use with facility-level costs and allocate costs to user groups. This inhibits the ability to conduct a comprehensive and reliable cost-based analysis of general aviation's incremental user costs.

Cost inefficiencies in the FAA's operation are well documented. HLB used two studies conducted by the Office of Inspector General at the U.S. Department of Transportation (DOT) in its analysis of cost allocation. These studies identified cost inefficiencies in the AFSS operations and in VFR Level 1 tower operations (those towers used primarily by general aviation). In the case of the AFSS, the DOT study found that the planned implementation of the OASIS modernization program should enable the consolidation of AFSS facilities from the current 61 stations to 23, saving the FAA $500 million over the seven year implementation period.[7] With respect to Level 1 VFR towers, the DOT study recommended that the FAA convert its 71 FAA-operated Level 1 VFR towers to contract towers for an estimated cost savings of $62.6 million. The study reported that average operating costs at contract towers for FY 1999 were $355,333 compared to $1,236,199 at FAA's VFR towers[8]. Total annual operating costs for the 206 contract towers were $73.2 million (in fiscal year 2000) compared to $87.8 million for the 71 FAA towers. If the 71 FAA towers were converted to contract towers, operating costs would fall to $25.2 million.

[7] "Report on Automated Flight Service Stations: Significant Benefits Could be Realized by Consolidating Sites in Conjunction With Deployment of OASIS", AV-2002-064, U.S. DOT, Office of Inspector General, December 7, 2001

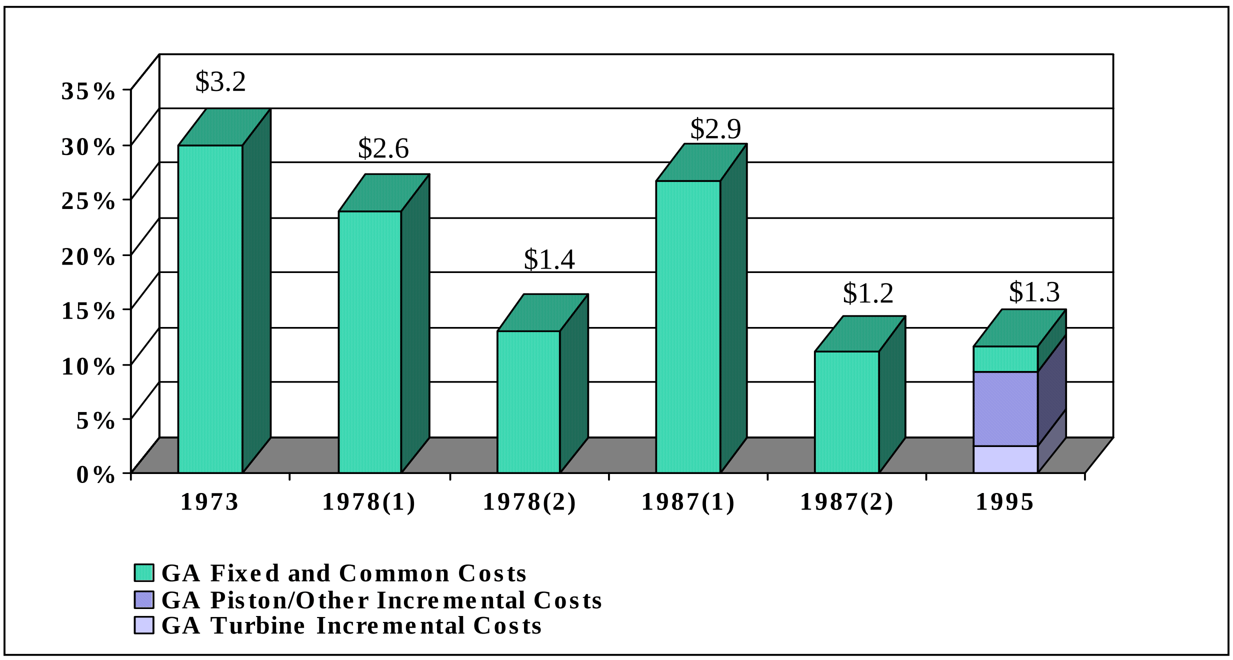
[8] "Report on Contract Towers: Observations on FAA's Study of Expanding the Program", AV-2000-079, U.S. DOT, Office of Inspector General, April 12, 2000

3. The Allocation of FAA Costs to Business General Aviation

Uncertainty and risk represent the central most issue in establishing general aviation's allocated share of annual FAA operating and capital costs. FAA's cost allocation studies conducted between 1973 and 1995 estimated general aviation's cost responsibility to range from as high as 30 percent of FAA's total annual costs to as low as 11 percent, based on different allocation methodologies and different assignments of cost recovery categories attributable to general aviation. Figure 8 presents the costs allocated to general aviation from the different FAA-conducted analyses.

Figure 8: Share of General Aviation Costs from FAA Cost Allocation Studies: An Allocation of Fiscal Year 2001 FAA Costs

Billions of 2001 Dollars



Source: HLB Decision Economics Inc. based on FAA cost allocation studies

The variations in cost allocation results are driven primarily by differences in the definition of recoverable costs and in the methodology of allocating the incremental, fixed and common costs of a joint-use system. These approaches can be summarized as follows:

1. The FAA studies conducted in 1973, 1978(1) and 1987 were based on an allocation framework based on marginal costs incurred from the incremental use of FAA services plus a share of common costs allocated in proportion to marginal costs.

2. The FAA study conducted in 1978(2) was based on an allocation framework based on the costs of a hypothetical minimum requirements system for general aviation. The only costs

attributed were those costs incurred in the use of a general aviation dedicated system. This approach does not charge general aviation for a joint-use system that was developed to serve a commercial aviation industry.

3. The FAA study conducted in 1987(2) was based on an allocation framework based on allocating only those costs of services uniquely occasioned by general aviation (i.e., 100 percent attributable). No allocation of costs was made for the joint-use of facilities. Fixed and shared costs are funded by the public sector.

4. The FAA study conducted in 1995 was based on an allocation framework based on the marginal cost approach with common costs allocated based on ability and willingness to pay (Ramsey pricing). This addresses the issue of economic efficiency by minimizing economic distortions.

A principal cause of the wide variation in the FAA's approach to general aviation's cost responsibility is due to the apparent pursuit of objectives that are very difficult to quantify and, yet, out of harmony with Congressional objectives. Under the assumption that the only Congressional objective for cost recovery is "economic efficiency," the FAA methodologies endeavour to allocate to general aviation not only the costs of those systems provided strictly on its behalf, but also a share of the cost of facilities and services provided primarily for non-general aviation users (commercial airlines and the military).

Unanswered Questions

Because general aviation aircraft share facilities designed for commercial users, there is no factual basis upon which to establish general aviation's share of such costs. Estimates of individual user costs are based on an array of assumptions and empirical techniques laden with uncertainty. It is this uncertain nature of the statistical methods, cost and usage data and assumptions used to estimate the allocation share analytically that yields the huge variances in historical estimates and results in a significant risk of over-attributing costs to the users of the FAA system.

Congressional guidance on cost recovery has historically been based on ability to pay, fairness and equity. Earlier Congressional debates on highway cost recovery during the 1970s and 1980s resulted in a cost recovery approach that imposed costs to each user sector that were uniquely occasioned on its behalf. The principles of fairness and equity require the avoidance on the reliance on technical uncertainty or subjective analysis as a basis for establishing the tax burden of different user groups. Congress has not yet mandated the establishment of similar guidelines for the FAA's cost recovery initiatives.

Furthermore, FAA studies for the most part have not included a consideration of public benefits received in providing national security and aerospace safety, community development benefits from airport development, and certifications and regulations in developing cost allocation policy. Yet, such an allocation is consistent with the economic theory of resource efficiency, which states that economic efficiency is maximized when users pay their marginal costs and common and fixed costs are allocated to the public – where a public benefit exists. Instead, the FAA's most recent cost allocation requires that all costs be borne by aircraft users. In this way, the

FAA has compromised the pursuit of economic efficiency in developing its cost allocation paradigm.

Thus, after decades of studying there remain a number of unanswered questions as to the appropriate cost allocation approach for the FAA's costs**.** Subsequent cost allocation studies must focus on the six key questions stated below:

1. Is the existing decision-making framework for aviation cost recovery appropriate to the achievement of fair, reasonable and efficient charges?

2. Does general aviation affect the FAA capital costs for the air traffic system and commercial airports?

3. Does general aviation affect the labor costs of FAA joint-use ATS facilities?

4. What is the size and scope of an efficient Flight Service Station system?

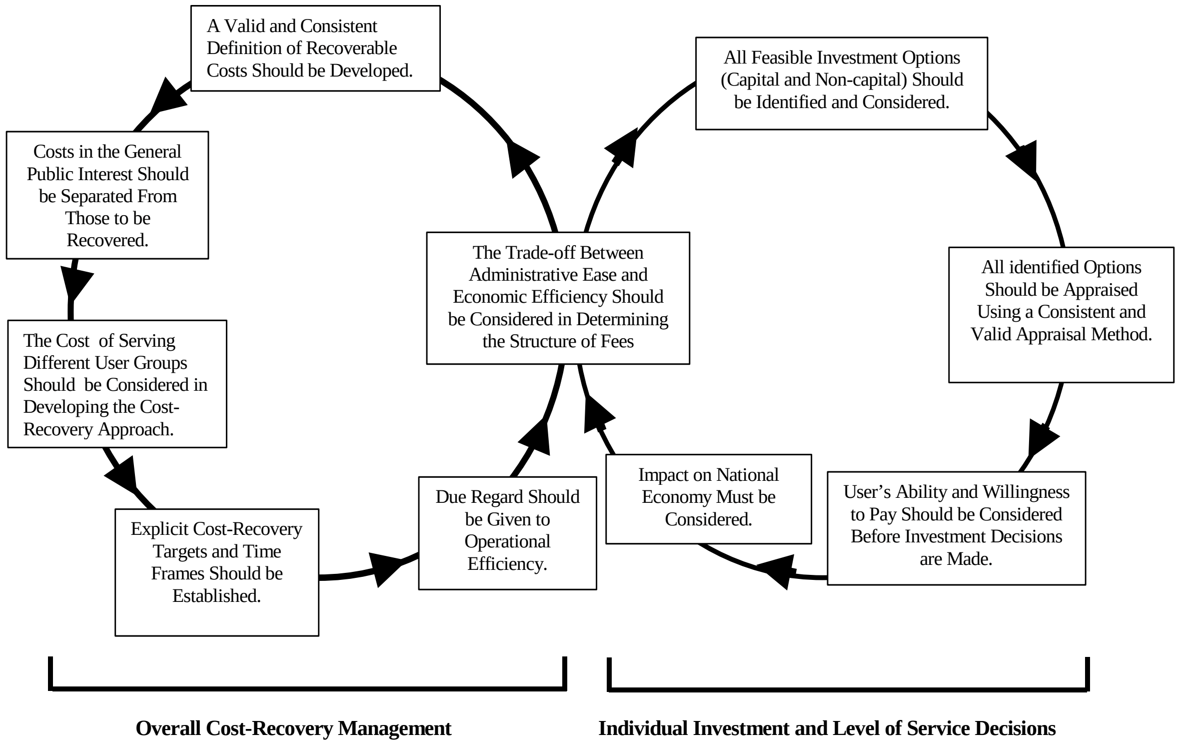
5. Does general aviation affect the level of FAA non-commercial airport development expenditures?

6. How should FAA and Congress deal with "common costs", those costs that cannot be attributed to any single user group?

These questions provide a roadmap for developing a cost allocation framework that reflects a balance between cost recovery and economic risk. Figure presents a framework in which to address the unanswered questions. This GAO-endorsed paradigm ensures that several objectives are met simultaneously: (1) the cost recovery system takes into account operational efficiency and explicit cost recovery targets while separating public sector from private sector benefits and accounting for differential market sector requirements; (2) the economic impacts on individual industry sectors as well as the total impact on the national economy are explicitly evaluated; and (3) ensures a consistent evaluation framework across all market sectors.

Each of the questions posed above can be answered in the context of the existing FAA cost allocation studies relative to the criteria presented in Figure 9.

Figure 9: Criteria for Cost Recovery Management



Source: International Journal of Government Auditing, January 1988

Question 1: Is the existing decision-making framework for aviation cost recovery appropriate to the achievement of fair, reasonable and efficient charges?

Several factors make it evident that previous FAA cost allocation studies lack an appropriate decision-making framework for a viable system of cost recovery charges. For example:

- Over the three to four decades of FAA cost allocation studies, there has been no consistent definition of recoverable costs. Some studies consider only those costs uniquely occasioned by general aviation to be recoverable while other studies include various allocations of joint-use costs.

- In the most recent FAA studies there is no delineation and separation of costs incurred in the public interest (particularly in relation to general aviation airports). For example, there are economic development benefits that accrue to geographic areas where general aviation airports exist.

- FAA's cost allocation fails to distinguish among distinct general aviation markets. There is no distinction for commercial and non-commercial use of aircraft or for the socio-economic differences underlying trip purpose, frequency of travel, and ability and willingness to pay.

- FAA's costs are allocated with no due-regard for operational inefficiency, as noted in the cases of Automated Flight Service Stations and VFR Towers; and,

- There is no institutionalized user consultation process with aviation groups regarding the ability and willingness to pay for FAA system improvements.

Question 2: Does General Aviation affect the FAA capital costs for the Air Traffic System and commercial airports?

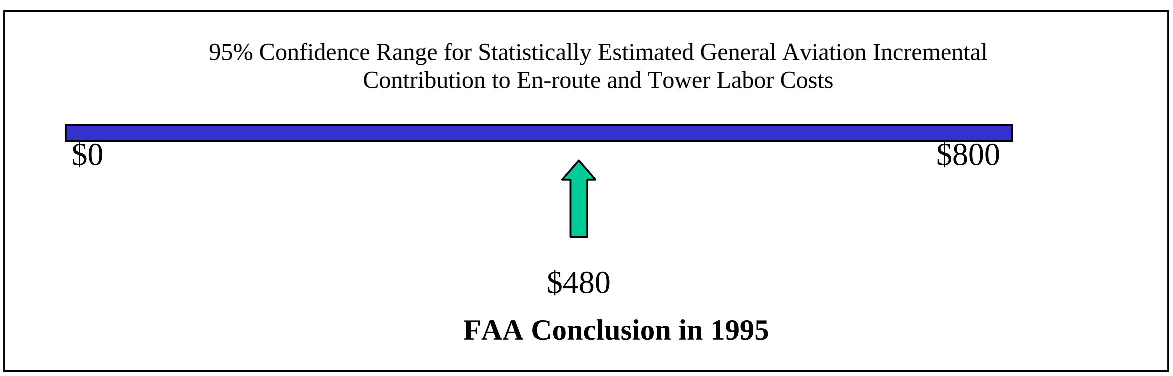
HLB conducted an independent multivariate regression analysis of the relationship between capital costs of the FAA's Enroute Centers (ARTCC) and general aviation usage and found no statistically significant relationship to support any general aviation induced capital investments. In fact, HLB's analysis was consistent with that found in the FAA's 1995 Cost Allocation Study in that most Enroute Center costs are not variable with usage but are common to all system users.

Funding for commercial airports is based strictly on commercial passenger traffic via a legislated enplanements formula, and is independent of general aviation use.

Question 3: Does General Aviation affect the labor costs of FAA joint-use ATS facilities?

Although general aviation occasions some of the labor costs at ATS facilities, the range of uncertainty in statistically measuring such costs spans a wide range. Using such results as a basis for tax policy yields a material risk of overtaxing general aviation and arbitrarily reducing general aviation economic activity. Figure 10 shows the statistical range of general aviation incremental costs for enroute centers and airport towers based on the regression coefficients for general aviation activity from the FAA's 1995 Cost Allocation Study.

Figure 10: FAA Estimated General Aviation Incremental Labor Costs for Enroute Centers and Towers



Source: HLB Decision Economics Inc. based on the FAA's 1995 Cost Allocation Study

Question 4: What is the size and scope of an efficient Flight Service Station system?

The cost of inefficiency in the AFSS system is well documented. A 2001 DOT study estimated that ongoing investments in technology improvements from increased automation (arising from

OASIS) would enable a consolidation in the number of existing facilities from the currently existing 61 stations to 23 stations[9]. The DOT study estimated that this consolidation would save $500 million over the OASIS implementation period alone. Based on the DOT study findings, HLB estimated the longer-term AFSS costs based on a reduction in flight service stations to those recommended in the DOT study. This results in $191 million in cost savings per year reducing the cost burden to general aviation from the FY 2001 costs of $566 million to $375 million. These cost savings are based on a simple elimination of direct labor costs and associated overhead costs, facility leases and avoidable OASIS implementation costs associated with the consolidated facilities. HLB's cost estimate is likely to be overstated since no adjustment was made for facilities cost for the eliminated stations. Figure 11 presents alternative cost recovery charges for a smaller, more efficient network of Flight Service Stations.

Figure 11: Cost Allocation of FAA Automated Flight Service Stations

Actual Cost in FY 2001 for 61 Flight Service Centers	Cost with Consolidation from 61 to 23 Flight Service Centers	Cost with Consolidation from 61 to 10 Flight Service Centers
$566 million	$375 million	$277 million

Source: Scenario analysis by HLB Decision Economics Inc. based on the Department of Transportation/ Office of the Inspector General analysis.

Question 5: Does general aviation affect the level of FAA non-commercial airport development expenditures?

Approximately one quarter of FAA's airport development grants are made to support general aviation through grants to reliever and other general aviation airports and through state block grants. While these airports are primarily occasioned by general aviation, the public benefits conferred create a shared cost burden.

Grants to airports address broad public policy objectives such as providing improved accessibility for the public – even in remote communities with very little air traffic and small populations. Airport development grants are prioritized based on their consistency with the FAA's strategic goals, as reflected in the national priority rating formula that ranks projects by investment purpose. Of the eight investment purposes, capacity (defined as "development items that improve an airport or system of airports for the primary purpose of accommodating more passengers, cargo, aircraft operations or based aircraft") is ranked sixth in priority for receiving airport development grants. "Safety/security" and "environmental" purposes are ranked numbers one and three.

While over $439 million in grants was awarded to general aviation airports in fiscal year 2000, the FAA's ability to recover this amount from the general aviation based on general aviation's

[9] "Report on Automated Flight Service Stations: Significant Benefits Could be Realized by Consolidating Sites in Conjunction With Deployment of OASIS", AV-2002-064, U.S. Department of Transportation, Office of the Secretary of Transportation, Office of Inspector General, December 7, 2001

direct user requirements is questionable. There is no direct statistical correlation between general aviation usage and the magnitude of these grants.

(1) Grants are prioritized based on the FAA's overall public policy objectives, which suggests that some portion of the grants should be allocated to the public.

(2) The general aviation community has inadequate input in the identification of need, prioritization of investments, or their ability or willingness to pay for grants to general aviation airports. Future considerations should include a mechanism by which the level of general aviation airport investment reflects the general aviation community's ability and/or willingness to pay.

(3) For example, when general aviation airport grants nearly doubled in fiscal year 2001 from the previous year, the user community was not consulted on their ability or willingness to pay for this increased level of funding. Neither does the general aviation community have direct input on the total envelope of grants for general aviation airports.

(4) The growth in air congestion and the ensuing difficulty in gaining access to congested commercial airports have resulted in significant investments in reliever airports. These grants serve to reduce congestion at commercial airports, providing congestion relief to the users of the commercial airports. Thus, the capital funding of these airports should not be fully recoverable from the general aviation community alone.

The appropriate amount for cost recovery purposes from general aviation should be based on an amount negotiated by the general aviation community and the FAA based on the principles of fairness, equity and general aviation industry's ability to pay for this level of investment.

Question 6: How should costs that cannot be attributed to any single user group or "common costs" be dealt with?

Numerous techniques have been used in previous FAA cost allocation studies to allocate common costs. Techniques used include allocating common costs to users based on usage of FAA facilities to using Ramsey pricing. If economic efficiency were the only cost allocation objective, the optimal cost allocation technique would be to allocate all common costs to the public and none to users of the system. Any allocation of common costs is a very subjective exercise and the results of that allocation will vary significantly depending on the approach utilized.

Due to the subjective nature of empirically estimating and allocating the common costs of the FAA, this study recommends a more pragmatic alternative approach. The approach balances the cost allocation objectives of efficiency, fairness, willingness to pay and ability to pay**.** Where services, and the costs associated with them, clearly exist for the benefit of a single user group, the entire cost to provide that service, including all common costs, is allocated to that user group. While not explicitly accounted for in this study, an allocation to the public sector should also be considered.

Thus, it is recommended that common costs be allocated as follows:

- All common costs associated with Automated Flight Service Stations should be allocated to general aviation.

- All common costs associated with other ATS should be allocated to commercial users as the current system was designed for commercial users and they are the predominant users of the system. It is worth noting that if a Ramsey pricing approach was utilized to allocate common costs, general aviation's total allocation for other ATS would likely decrease significantly (allocating common costs for non-FSS ATS using Ramsey pricing reduced general aviation's cost allocation by 35 percent in the 1995 FAA Cost Allocation Study.

- No common costs associated with other FAA lines of business should be allocated to general aviation as these activities are in place to serve commercial users. This is consistent with that employed in the 1995 FAA Cost Allocation Study.

Proposed Allocation of General Aviation Costs

Based on the discussion above, the approach most likely to achieve near-term technical consensus for general aviation cost allocation reflects the principles shown in Table 3 below.

Table 3: Cost Allocation Principles

Flight Service Stations Uniquely occasioned costs, net of assessed and negotiated inefficiency adjustments.
Joint-Use Enroute Centers and Towers Allocation based on assessed and negotiated risk-adjustment of statistical labor joint-cost estimates.
Airports ***Commercial airports***: Zero allocation. ***General aviation airports***: Uniquely occasioned costs, net of assessed and negotiated non-aviation social benefits.

Using the principles outlined above, HLB has developed a cost allocation to business general aviation jet and turbo-prop (turbine) aircraft users shown in Table 4. [10]

[10] See Appendix for more detailed explanation of cost allocation methodology.

Table 4: General Aviation Jet and Turbo-Prop (Turbine) Aircraft User Cost Allocation of FAA

Millions of FY 2001 Dollars

General Aviation Aircraft Type	Air Traffic Services				Regulations & Certification	Airports			Total ATS
	FSS	Enroute Services	Towers/ Terminals	Total ATS		Commercia l	GA	Total Airports	
Jets, Turbo-Props (fixed wing)	$18	$86	$52	$156	$6	$0	$7- $37	$7-$37	**$169 - $199**

Note: Enroute and tower estimates represent a risk adjusted forecast with a 95 percent probability of exceeding.

The specific methodology employed in deriving these estimates is given in Table 5.

Table 5: Cost Allocation Methodology

Line of Business	General Aviation Allocation
Flight Service Stations	Total flight service station costs are based on that of a more efficient FSS system of 23 centers. As flight service stations are in place to support general aviation piston aircraft, all common costs are allocated to piston aircraft. Incremental costs are allocated within general aviation and to commercial users based on their respective usage of flight service station facilities.
Other Air Traffic Services	Enroute, tower and oceanic costs are allocated to general aviation based on a Monte Carlo simulation of FY 2001 activity levels and the unit cost estimates for general aviation activity. Enroute and Tracon unit costs have been derived by HLB for fiscal year 2001. It was not possible for HLB to derive unit cost estimates for other tower types as FAA data was not available. For these towers, HLB employed the unit cost estimates from the FAA's 1995 FAA Cost Allocation Study. A risk adjusted cost allocation estimate, representing a 95 percent probability of exceeding, is used for general aviation. FAA activity data by aircraft type was not available to HLB. Activity data by aircraft type was calibrated to the FAA's 1995 estimates and forecast forward to FY 2001 based on activity data (e.g., landings by aircraft type) from 1995 to 2001.
Regulations and Certifications	The regulations and certifications allocation was derived based on FY 2001 expenditures and the proprotion of this allocation to general aviation from the previous cost allocation study.
Airport Development Grants	Airport development grants for general aviation airports (including reliever) are uniquely occasioned by general aviation. The range of airport costs reflects alternative scenario assessments of airport grants made for non-aviation purposes. The high end of range makes no allowance for non-aviation benefits and would not provide a basis for consensus: it is shown for context, in order to bracket the cost environment. The low end of range is based on the assumption that 80 percent of airport grants are for non-aviation benefits. Grants were allocated within general aviation proportional to general aviation activity (e.g., landings).

4. Business General Aviation Tax Revenues and FAA Cost Recovery

Business general aviation pays for the use of FAA services through an excise tax on non-commercial jet fuel at the rate of 21.9 cents per gallon. The tax rate includes the 0.1 cents per gallon Leaking Underground Storage Tank (LUST) tax. Table 6 shows the gross fuel taxes collected from general aviation in FY 2001[11].

Table 6: General Aviation Jet and Turbo-Prop (Turbine) Aircraft User Gross Fuel Taxes for Fiscal Year 2001

Millions of Dollars

Fuel Tax	Revenues
Non-commercial Jet Fuel (Current rate is 21.9 cents / gallon	$188

Source: PricewaterhouseCoopers LLP, SOI Bulletin, Internal Revenue Service, Volume 21, No. 4, p. 316

These revenues are net of exemptions for certain general aviation uses. Exempt uses include farming, government use, non-profit use, and certain helicopters used in the natural resources industries. Table 7 shows the general aviation jet and turbo-prop aircraft user cost recovery for fiscal year 2001 based on the allocation of costs presented in Chapter 4 and gross fuel taxes.

Table 7: General Aviation Jet and Turbo-Prop (Turbine) Aircraft User Tax Payments and Allocated FAA Costs in Fiscal Year 2001

General Aviation Aircraft Type	Jets and Turbo-Props Tax Revenues from Jet Fuel (in millions)	FAA Costs Allocated to Jets and Turbo-Props (in millions)	Cost Recovery (in percent)	
			Air Traffic Services	Total FAA Air Traffic & Non Air Traffic Costs
Jets, Turbo-Props (Turbine)	$188	$169-$199	121%	95%-111%

Source: HLB Decision Economics Inc. and PricewaterhouseCoopers LLP

General aviation jets and turbo-prop (turbine) aircraft users recovered 121 percent of their allocated air traffic services costs in FY 2001 and at least 95 percent of total allocated costs, which includes airports and non-air traffic services.

[11] Non-commercial use, as reported by the IRS, and general aviation, as used in this report, differ in minor degrees. In 2001, general aviation jet fuel tax collections were $188 million, while non-commercial jet fuel collections reported by IRS were $187 million.

5. Towards an Effective Process for FAA Cost Recovery

An effective cost recovery process, which will bring a resolution to 30 years of cost allocation controversy, will require two significant initiatives:

- Congressional guidance to the Executive Branch on the principles to be adopted in allocating costs to different aviation user groups; and

- The development of a well functioning administrative framework for managing the cost recovery process.

NEED FOR CONGRESSIONAL GUIDANCE TO THE EXECUTIVE BRANCH

Finding a long-term, stable solution to the aviation cost recovery quandary must begin with Congressional direction to the Executive Branch regarding cost allocation principles, technical definitions, and measurement guidelines that ensure a fair and equitable approach. The need for guidance is reflected in the wide range of historical cost allocation study results that illustrate alternative approaches to cost allocation and recovery goals. No single approach is inherently correct or incorrect and different approaches speak to different philosophies that mirror the tradeoffs between financial cost recovery and economic efficiency, fairness and equity. The FAA's wavering estimates over the years reflect the adoption of different methodologies at different times. No amount of new technical data or additional analysis can diminish the reality that different cost allocations emerge from different philosophical and policy perspectives. Only Congress can and should decide on which philosophy to adopt.

Congress adopted the cost-occasioned approach, in which each user pays those costs that it creates or "occasions", in highway cost allocation almost 20 years ago. The central issue for Congress in the FAA cost allocation debate is in methodological approach and the scope of recoverable costs. While both the cost-occasioned and marginal cost approaches allocate costs based on principles of cost occasioning, the definition of costs to be allocated is significantly different under each paradigm. These costs definitions range from FAA expenditures to a broader definition of economic costs and benefits.

In formulating the basis for such guidelines in similar situations, Congress has taken counsel from independent scientific bodies. In the case of highway cost allocation and recovery, for example, Congress asked the U.S. Congressional Budget Office to help formulate the basic philosophical principles upon which Congress could (and subsequently did) base its guidelines to the Federal Highway Administration as to the allocation of costs between cars and trucks. For independent, consensus-based guidance, Congress also turns routinely to the Transportation Research Board of the National Academy of Sciences.

The FAA's response to these challenges have been slow in implementation, with cost allocation systems not yet in place and delayed gains in operational efficiencies. Until explicit cost relationship can be demonstrated and the impacts on economic growth evaluated, the risk of any additional taxation would be to lower both market demand and economic productivity, leaving the FAA with less in revenues and the economy in worse shape.

The continued contribution to economic growth from general aviation, combined with mounting pressures on FAA to achieve total cost recovery, underscores the imperative for soliciting Congressional guidance and a decision on a consistent, equitable and viable framework to cost allocation.

NEED FOR A COST RECOVERY MANAGEMENT PROCESS

An effective cost recovery management process must include two essential components: (1) the ability to ensure a mechanism for market signalling between the FAA and user markets, and (2) the management of non-user costs.

Market Signalling

Market signalling and the means to act upon those signals are critical to the successful implementation and management of a cost recovery system. User charges can promote economic efficiency by giving aviation system users an incentive to signal the undesirability of investing in facilities or levels-of-service that they either do not want or cannot pay for. For these incentives to work, however, mechanisms are needed to assess users' ability and willingness to pay the full costs of proposed investments or increases in service quality before they occur. If investments are made without this signalling mechanism and increased user taxes implemented after-the-fact, there is a high risk that users will significantly reduce their use of facilities and services *that will already be fully-funded for other users.*

Leaving assets underutilized in this way offers nothing in the way of economic efficiency; indeed, it is simply wasteful.

The solution is for the FAA to gauge users' ability and willingness to pay *before* making new investments or increasing service levels. This can be done through a combination of consultations with industry groups and special studies of user demand and financial capacity. Under the FAA's current approach to managing the cost recovery process, however, there is no consultation with general aviation users regarding their willingness to pay for new airport facilities or air traffic services. Between 2000 and 2001, for example, FAA grants awarded to general aviation airports almost doubled, from $439 million to $813 million, without any mechanism to determine whether general aviation users have the ability or willingness to pay the price of these investments. Thus, the general aviation community is assessed the costs for these airport improvements, but not a party to the decision-making process, with respect to project need, project selection, or prioritization of capital spending. In this way, there is no market feedback between investor and funding source.

Such "signalling" mechanisms should be brought into place before new spending and taxation decisions are made. The feedback from such market signalling will improve the decision-making process by forcing the FAA and the general aviation industry to evaluate investment decisions and alternative, and possibly, less expensive, ways to provide services and to address the question of whether a service, or investment, is worth the costs from the users' perspective. Such a framework will build consensus among all participating parties.

Management of Non-User Costs

The other key element of a cost recovery management process is the treatment of "non-user" costs. These are costs of services provided in support of social, economic development or employment-support policies. Such costs represent inefficiencies that are deliberately incurred in support of non-user objectives. Passing on the cost of such inefficiency to the user, however, is economically inefficient because the higher than justified prices (on business grounds) dilute the economically desirable level of aviation activity. Flight Service Stations and general aviation airports are examples of public costs imposed on the general aviation community.

Thus, the key elements of a future cost recovery management framework requires the following:

- Accurate costs as a foundation;
- Valid and consistent definition of recoverable costs;
- Identification and separation of costs incurred in the public interest;
- Delineation among distinct general aviation markets;
- Maximum economic efficiency (minimum negative impact to national economy);
- Allowance for operational inefficiency; and,
- Consultation and negotiations with aviation user groups regarding ability and willingness to pay as part of the investment process.

These recommendations are not unlike those made to the Department of Transportation in 1997 by the National Civil Aviation Review Commission (NCARC)[12], which called for a new approach to a cost-based financing system that incorporates modern management systems, key stakeholder involvement, and public funding for public sector benefits.

FINDINGS AND RECOMMENDATIONS

The conclusions reported above lead to the following recommendations:

- No new general aviation tax decisions should be made at the present time;
- Congressional guidance needs to be provided to the Executive Branch regarding the principles of a fair and equitable cost allocation framework; and
- The FAA should develop a cost recovery management process with clear signalling and other appropriate attributes.

The Federal Aviation Administration can begin now to develop a cost recovery management process, with special reference to user consultation and signalling and methods of allowing for

[12] "Avoiding Aviation Gridlock and Reducing the Accident Rate: A Consensus for Change", National Civil Aviation Review Commission, December 1997

non-user costs. However, without a framework of Congressionally mandated principles and a management process to ensure appropriate market signalling between aviation industry service providers and users, tax decisions at the present time would almost certainly create the same degree of controversy and unproductive debate witnessed over the last 30 years.

National Business Aviation Association

Costs Incurred and User Fees Recovered by the Federal Government for Aviation Services to Business General Aviation

Technical Appendix

October 2004

HLB DECISION ECONOMICS INC.

RISK ANALYSIS · INVESTMENT AND FINANCE · ECONOMICS AND POLICY

Costs Incurred and User Fees Recovered by the Federal Government for Aviation Services to Business General Aviation

Technical Appendix

HLB Decision Economics Inc.

and

PricewaterhouseCoopers LLP

October 2004

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INTRODUCTION

This report provides technical documentation relating to the report "Cost Incurred and User Fees Recovered by the Federal Government for Aviation Services to Business General Aviation" prepared by HLB Decision Economics Inc. in October 2004, as published by the National Business Aviation Association. The appendix contains two sections providing the technical detail underpinning the estimated cost allocation to business general aviation.

Section A provides analysis relating to the key issues addressed in Chapter 3 of the report, such as:

1) Does General Aviation affect the FAA capital costs for the Air Traffic System? Refer to Question 2, Page 18.
2) Does General Aviation affect the labor costs of FAA joint-use ATS facilities? Refer to Question 3, Page 18?
3) What is the Degree of Risk and Uncertainty in a Cost Allocation Mechanism based on Statistical Estimation of Unit Costs? Refer to Figure 10, Page 18.
4) How to allocate costs to General Aviation. Refer to Cost Allocation Principles, Page 21.

The analysis summarized in Section A was conducted in March 2003 on behalf of the National Business Aviation Association using the Federal Aviation Administration (FAA) activity and cost data publicly available at that time.

Section B provides a re-examination of the March 2003 analysis provided in Section A based on FAA activity and cost data available as of July 2004. Section B provides a re-examination as to whether the conclusions of the March 2003 analysis still hold.

SECTION A: TECHNICAL REPORT FOR MARCH 2003 COST ALLOCATION

Introduction

This appendix provides supporting analysis and materials relating to the issues addressed and the cost allocation provided in Chapter 3 of the report " Cost Incurred and User Fees Recovered by the Federal Government for Aviation Services to Business General Aviation". Specifically, supporting documentation is provided relating to the following issues:

1) Question 2: Does General Aviation affect the FAA capital costs for the Air Traffic System (and commercial airports)?
2) Question 3: Does General Aviation affect the labor costs of FAA joint-use ATS facilities?
3) What is the Degree of Risk and Uncertainty in a Cost Allocation Mechanism based on Statistical Estimation of Unit Costs?
4) How to allocate costs to General Aviation.

Question 2: Does General Aviation affect the FAA capital costs for the Air Traffic System (and commercial airports)?

HLB conducted multivariate regression analysis using FAA cost and activity data for En Route and TRACON service delivery points (SDP)[1] to statistically assess whether general aviation activity affects ATS capital costs. Capital costs by SDP were regressed on SDP activity data by commercial, general aviation, air taxi and military users[2]. The general functional form of the regression equation is provided below:

Equation 1: Functional Form of Regression

$$SC_{ij} = K + UC\_AC * Q\_AC_{ij} + UC\_AT * Q\_AT_{ij} + UC\_GA * Q\_GA_{ij} + UC\_M * Q\_M_{ij} + T$$

where:

ij	=	service delivery point (i) at time (j);
SC	=	capital cost;
K	=	constant;
UC	=	Unit cost;
Q	=	Activity;
AC	=	air carrier (commercial);
AT	=	air taxi;
GA	=	general aviation;
M	=	military; and,
T	=	categorical variable for year 1999, 2000.

[1] FAA cost data were obtained from Cost Accounting System reports available through the FAA Office of Financial Services. Cost data by service delivery point were not publicly available for all types of tower facilities.
[2] Activity data extracted from the FAA's Air Traffic Activity Data System (ATADS) available through the FAA's Aviation Policy and Plans (APO) data systems.

The estimated regression coefficients for enroute activity data represent the best linear unbiased estimate of the incremental or unit cost per activity. Table A-1 provides a summary of HLB's regression results.

Table A-1: Regression of Enroute Center Investment Costs on Activity by User Group
Dependent Variable: Total Investment Cost
Observations: 63 (Data available for 1999 through 2001)

Independent variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$24.7 M	11.5	$21.1 M	$28.2 M
Year 1999 dummy	-$5.1 M	-3.9	-$7.3 M	-$2.9 M
Year 2000 dummy	-0.6 M	-0.5	-$2.8 M	1.5 M
Unit Costs – Incremental Investment per Activity				
Air Carrier	-$6.89	-3.68	-$10.03	-$3.76
Air Taxi	-$5.74	-1.83	-$10.98	-$0.50
General Aviation	$3.09	0.65	-$4.85	$11.03
Military	-$1.68	-0.30	-$11.07	$7.71
R-squared: 0.43 F-statistic: 6.96				

Note: M = millions

All unit cost (investment) estimates are statistically insignificant[3] or have negative coefficients. That is, based on the available data, there is no statistical evidence that enroute center investment costs are incremental to enroute center activity for general aviation and other users. Multivariate regression analysis was also conducted using in-year investment acquisition costs as the dependent variable and the results are similar in that all unit cost estimates are statistically insignificant[4]. Refer to Table A-2 for details of the regression.

[3] A t-statistic greater in magnitude than 2 is considered to be statistically significant or statistically different from zero with 90% confidence. When an estimate is statistically significant, the 90% confidence interval will not include zero.
[4] Additional regressions were estimated assuming the unit cost estimates were constant across user types and these were also found to be statistically insignificant.

Table A-2: Regression of Enroute Center Acquisition Costs on Activity by User Group
Dependent Variable: Acquisition Cost
Observations: 63 (Data available for 1999 through 2001)

Independent variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$0.3 M	0.3	-$1.3 M	$2.0 M
Year 1999 dummy	$1.7 M	2.8	$0.7 M	$2.7 M
Year 2000 dummy	-$0.3 M	-0.5	-$1.3 M	$0.7 M
Unit Costs				
Air Carrier	$0.47	0.54	-$1.00	-$1.93
Air Taxi	$0.23	0.16	-$2.22	$2.67
General Aviation	-$2.62	-1.18	-$6.32	$1.09
Military	$2.68	1.02	-$1.71	$7.06
R-squared: 0.2 F-statistic: 2.37				

Note: M = millions

A similar assessment was completed using the available data for TRACON SDPs. Table A-3 and Table A-4 provide a summary of these regression results.

Table A-3: Regression of TRACON Investment Costs on Activity by User Group
Dependent Variable: Total Investment Cost
Observations: 30 (Data available for 2001)

Independent variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$0.8 M	1.1	-$0.5 M	$2.3 M
Unit Costs – Incremental Investment per Activity				
Air Carrier	$1.22	0.41	-$3.87	$6.32
Air Taxi	$4.63	0.78	-$5.46	$14.71
General Aviation	$0.68	0.18	-$5.86	$7.22
Military	$3.32	0.20	-$25.43	$32.08
R-squared: 0.17 F-statistic: 1.25				

Note: M = millions

Table A-4: Regression of TRACON Acquisition Costs on Activity by User Group
Dependent Variable: Acquisition Cost
Observations: 30 (Data available for 2001)

Independent variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$0.2 M	0.9	-$0.2 M	$0.7 M
Unit Costs				
Air Carrier	-$0.84	-0.92	-$2.42	$0.73
Air Taxi	$2.35	1.28	-$0.77	$5.47
General Aviation	-$1.10	-0.93	-$3.13	$0.92
Military	$6.05	1.16	-$2.85	$14.95
R-squared: 0.12 F-statistic: 0.85				

Note: M = millions

All unit cost (investment and acquisition) estimates are statistically insignificant. Based on the available data, there is no statistical evidence that TRACON SDP investment or acquisition costs are incremental to activity for general aviation and other users. Due to data unavailability, similar analysis was not possible for flight service stations or other tower types. An assessment of oceanic centers was not undertaken as oceanic costs are not material to the general aviation cost allocation issue. While the 1997 CAS did not explicitly examine the specific issues of whether ATS capital costs are incremental to general aviation, they did estimate (through multivariate regression techniques) that only 36 percent of total ATS costs were incremental to ATS activity[5]. The balance was determined to be fixed and common.

There is no statistical evidence that general aviation activity occasions either enroute center or TRACON facility capital costs. HLB concludes that this finding is likely also applicable to other air traffic services.

Question 3: Does General Aviation affect the FAA labor costs for the Air Traffic System?

HLB used multivariate regression techniques to test whether general aviation and other user activity influences the field labor costs at enroute center and TRACON service delivery points using the functional form provided in Equation 2.

Equation 2: Functional Form of Regression

$$SC_{ij} = K + UC\_AC * Q\_AC_{ij} + UC\_AT * Q\_AT_{ij} + UC\_GA * Q\_GA_{ij} + UC\_M * Q\_M_{ij} + T$$

where:

ij	=	service delivery point (i) at time (j);
SC	=	labor costs;
K	=	constant;
UC	=	Unit cost;
Q	=	Activity;
AC	=	air carrier (commercial);
AT	=	air taxi;

[5] Derived from Table 6-2 (page 6-12) and Table 6-3 (page 6-13) of the 1997 CAS.

GA	=	general aviation;
M	=	military; and,
T	=	categorical variable for year 1999, 2000.

The results summarized in Table A-5 through Table A-8 indicate that it is very likely that general aviation and other user activity influences enroute center labor costs. All unit cost estimates by user type are statistically significant for enroute centers. Also, the 90 percent confidence interval for each coefficient estimate indicates that there is much statistical uncertainty associated with the degree to which general aviation activity actually influences enroute labor costs. HLB's assessment indicates that there is a 90 percent probability that general aviation's true unit cost lies somewhere between $19.75 and $42.15. Therefore it can be concluded that it is very likely that general aviation activity influences ATS labor costs.

Table A-5: Regression of Enroute Center Labor Costs on Activity by User Group
Dependent Variable: Total Labor Cost
Observations: 63 (Data available for 1999 to 2001)

Independent variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$19.9 M	6.6	$14.8 M	$24.9 M
Year 1999 dummy	-$5.6 M	-3.0	-$8.7 M	-$2.5 M
Year 2000 dummy	-$3.2 M	-1.7	-$6.3 M	-$0.2 M
Unit Costs				
Air Carrier	$18.08	6.85	$13.66	$22.49
Air Taxi	$26.12	5.91	$18.73	$33.51
General Aviation	$30.96	4.62	$19.75	$42.15
Military	$28.24	3.57	$15.00	$41.48
R-squared: 0.86 F-statistic: 59.15				

Table A-6 provides a summary of regression results where the explicit assumption is made that unit costs are equal across user groups. This regression provides an estimate of the average labor unit cost across all user groups.

Table A-6: Regression of Enroute Center Labor Costs on Total Activity
Dependent Variable: Total Labor Cost
Observations: 63 (Data available for 1999 to 2001)

Independent variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$19.6 M	6.68	$14.7 M	$24.5 M
Year 1999 dummy	-$5.2 M	-2.85	-$8.3 M	-$2.1 M
Year 2000 dummy	-$2.9 M	-1.61	-$6.0 M	0.1 M
Average Unit Cost	$22.96	18.21	$20.85	$25.07
R-squared: 0.85 F-statistic: 113.84				

Note: M = millions

The mean estimate of the average unit cost per enroute center activity is $22.96. Furthermore, there is a 90 percent probability that the actual average unit cost estimate lies somewhere between $20.85 and $25.07. The mean unit cost estimate from HLB's regression analysis represents almost a 15 percent reduction (in nominal terms) from the FAA's unit cost estimate of $25.87 from the 1997 CAS.

A similar analysis was undertaken using the available data for TRACON SDPs[6]. As seen in the results in Table A-7, only two of the four unit cost estimates are significant, perhaps underlining the need for additional years of data. From Table A-8, the mean estimate of the average unit cost per TRACON activity is $25.87, with a 90 percent probability that the actual average unit cost estimate lies somewhere in the range of $22.96 and $28.77, thus suggesting the relationship between labor costs and user activity at TRACON facilities.

Table A-7: Regression of TRACON Labor Costs on Activity by User Group
Dependent Variable: Total Labor Cost
Observations: 30 (Data available for 2001)

Independent variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	-$0.3 M	-0.37	-$1.7 M	$1.1 M
Unit Costs				
Air Carrier	$10.54	1.90	$1.04	$20.03
Air Taxi	$47.47	4.18	$28.07	$66.88
General Aviation	$33.46	4.66	$21.19	$45.73
Military	$34.26	1.09	-$19.26	$87.78
R-squared: 0.92 F-statistic: 70.46				

Table A-8: Regression of TRACON Labor Costs on Total Activity
Dependent Variable: Total Labor Cost
Observations: 30 (Data available for 2001)

Independent variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	-$0.06 M	-0.08	-$1.4 M	$1.3 M
Average Unit Cost	$25.87	15.13	$22.96	$28.77
R-squared: 0.89 F-statistic: 228.83				

Note: M = millions

The 1997 CAS did not explicitly address the question of whether ATS activity drives ATS labor costs. However, the 1997 CAS utilized multivariate regression techniques to estimate total unit costs (labor and non-labor). The analysis concluded that there was a statistical relationship between total costs and total activity. However, the 1997 CAS analysis did not find a single unit cost estimate for enroute, oceanic and towers for general aviation activity alone that was statistically significant (or

[6] TRACON labor cost data was only available for the period April-Sept 2001.

statistically different than zero). The FAA’s final cost allocation to general aviation for these ATS services is based on average unit costs across all or a subset of users. Despite these empirical results, it is quite likely that all users of the ATS system influence to some degree the total labor costs of the system.

HLB concludes that general aviation and other ATS system users do affect labor costs at enroute centers, TRACONs and other FAA facilities. However, the degree to which any one user group affects labor costs contains much statistical uncertainty. For example, based on HLB's multivariate regression analysis, there is a 90 percent probability that the unit cost per activity ranges between $19.75 and $42.15 at enroute centers.

What is the Degree of Risk and Uncertainty in a Cost Allocation Mechanism Based on Statistical Estimation of Unit Costs?

This section addresses the degree of statistical uncertainty in the 1997 CAS.

In the 1997 CAS, statistical techniques were utilized to estimate average unit costs per FAA activity for each of enroute centers, terminals/towers, flight service stations and oceanic centers. These estimates were used as the basis for cost allocation. By the properties of the statistical techniques employed, these estimates of unit costs and total joint costs are subject to empirical risk. In fact, a basic property of the statistical approach is that there will be a 50 percent probability of over-estimating unit costs. Table A-9 provides estimates of incremental aggregate costs by line of business based on the FAA's 1997 CAS[7].

Table A-9: 1995 Total Incremental Costs by Line of Business ($ Millions), 95% Confidence Intervals

Line of Business	Total Joint Costs	Lower Bound	Upper Bound
Enroute	$1,196	$804	$1,588
Oceanic	$27	$1	$52
Terminals/Towers	$875	$786	$963

The degree of empirical risk in estimating aggregate incremental costs can be significant. For example, for enroute centers the expected total incremental costs are approximately $1.2 billion and there is a 95 percent probability that the actual estimate will fall between $0.8 and $1.6 billion. Similarly for oceanic centers, there is a 95 percent probability that the total joint costs are between $1 million and $52 million. The degree of risk with respect to towers is less with the 95 percent confidence interval ranges from $786 million to $963 million. Clearly, without even consideration of any allocation to user groups, there is a significant degree of statistical uncertainty.

Allocating Joint Costs to User Groups

The degree of statistical risk escalates as costs are allocated to air carrier, air taxi, general aviation and military. The 1997 CAS did not utilize unit cost estimates by user group. Average unit costs across all user groups (or a subset of user groups) were utilized as the basis for incremental cost allocation. For example, for enroute centers, the estimates of general aviation's unit costs were statistically insignificant - or statistically were no different from a zero unit cost. However, the final cost allocation was based on the average unit cost across all user groups.

Table A-10 provides confidence intervals for the unit cost estimates derived by user group from the 1997 CAS. The 95 percent confidence interval for general aviation unit costs contains both a

[7] These estimates are based on a Monte Carlo simulation based on the FAA's the regression coefficients (unit cost and standard error estimates) from Technical Supplement B of the 1997 Cost Allocation Study and 1995 activity data.

zero unit cost estimate and the average unit cost estimate. Therefore, the unit cost estimates for general aviation traffic at enroute centers is not statistically different from zero nor is it statistically different from the overall average unit cost estimate across all users.

Table A-10: Enroute Unit Cost Estimates, 95% Confidence Intervals

Line of Business	Unit Cost	Lower Bound	Upper Bound
Unit Cost by User			
General Aviation Departures	-$52.21	-$164.29	$59.87
General Aviation Overs	$121.96	-$108.11	$352.03
Average Unit Cost			
All Departures	$51.75	$43.27	$60.23
All Overs	$25.87	$17.39	$34.35

To illustrate the degree of uncertainty in using statistical estimates of unit costs as the basis for cost allocation, two separate allocations were simulated for enroute, towers and oceanic ATS services. The full range of possible statistical outcomes using the general aviation unit cost and standard error estimates from the 1997 CAS was simulated using Monte Carlo sampling techniques.

I) Costs are allocated costs using unit cost estimates by user group; and,

II) Costs are allocated using average unit cost estimates.

The results of these simulations are contained in Table A-11.

Table A-11: General Aviation Cost Allocation for Enroute, Towers and Oceanic Using the Full Range of the Statistical Distributions Implied by Alternative Regression Results

Cost Allocation Approach	Median Estimate	95% Confidence Interval	
		Lower Bound	Upper Bound
Using General Aviation Unit Costs	$286	$0[1]	$800
Using Average Unit Costs	$480	Not available	Not available

Note 1: Simulated statistical allocations of less than zero were set to equal zero.

Based on the average unit cost of all users, the expected 1995 cost allocation is $480 million. However, if the statistical unit cost estimates for general aviation are utilized, the expected cost allocation becomes $286 million. In fact, the 95 percent confidence interval includes both the FAA allocation of $480 million and no allocation of costs to general aviation.

There is a large degree of risk and uncertainty in using statistical estimates of unit costs as the primary basis for cost allocation. If statistically estimated parameters are to be utilized, risk-adjusted forecasts should be utilized to mitigate the risk of over-charging user groups.

General Aviation Cost Allocation

This section provides a description of the methodology of how the total allocation to general aviation was determined and how the allocation was made within general aviation.

Automated Flight Service Stations

All Flight Service Station costs have been allocated to General Aviation. The 2001 DOT report[8] recommended the consolidation of the 61 flight service stations to 18-20 sites plus the five locations in Alaska, Hawaii and Puerto Rico since these present unique geographical and topographical considerations. Using these recommendations and FAA's 2000 Annual Cost Allocation System Report for Flight Service Stations, HLB calculated total AFSS costs after consolidation. Table A-12 shows the existing AFSS facilities, the consolidated facilities and the corresponding costs. The costs associated with the facilities that are consolidated in this analysis represent airway facilities operations costs (contract maintenance, flight inspections, telecommunications, National Control Center), depreciation and accrued liabilities that may not fully be eliminated. According to the DOT analysis, there is not enough information available at this time to evaluate the probable cost savings from the consolidation of systems and the corresponding reductions in ongoing maintenance costs.

Table A-12: Consolidation of FSS Facilities

61 Stations	25 Stations	2000 Costs	HLB Estimated Costs
Albuquerque	Albuquerque	$ 8,066,742	$ 8,066,742
Altoona		$ 7,007,596	$ 1,078,930
Anderson		$ 6,558,650	$ 1,263,013
Anniston		$ 6,646,301	$ 1,929,970
Bangor		$ 5,475,781	$ 1,113,803
Boise		$ 4,288,731	$ 1,143,267
Bridgeport	Bridgeport	$ 8,773,859	$ 8,773,859
Burlington		$ 6,552,603	$ 1,490,439
Buffalo		$ 4,685,410	$ 872,485
Casper		$ 4,439,781	$ 1,217,058
Cedar City	Cedar City	$ 5,621,183	$ 5,621,183
Cleveland	Cleveland	$ 7,660,909	$ 7,660,909
Columbia	Columbia	$ 9,417,265	$ 9,417,265
Columbus		$ 5,159,696	$ 1,856,714
Dayton		$ 5,895,396	$ 1,288,829
Denver	Denver	$ 8,120,929	$ 8,120,929

8 "Report on Automated Flight Service Stations: Significant Benefits Could be Realized by Consolidating Sites in Conjunction With Deployment of OASIS", AV-2002-064, U.S. Department of Transportation, Office of the Secretary of Transportation, Office of Inspector General, December 7, 2001

Table A-12: Consolidation of FSS Facilities, continued

61 Stations	25 Stations	2000 Costs	HLB Estimated Costs
DeRidder		$ 5,935,819	$ 1,797,925
Elkins		$ 5,317,895	$ 1,648,477
Fairbanks	Fairbanks	$ 17,874,756	$ 17,874,756
Fort Dodge		$ 5,579,483	$ 1,330,712
Fort Worth	Fort Worth	$ 9,689,333	$ 9,689,333
Gainesville	Gainesville	$ 7,667,634	$ 6,573,814
Grand Forks		$ 4,284,261	$ 859,374
Great Falls		$ 4,588,296	$ 1,479,508
Green Bay		$ 8,233,161	$ 2,105,493
Greenwood		$ 4,380,819	$ 1,958,848
Hawthorne	Hawthorne	$ 7,606,125	$ 7,606,125
Honolulu	Honolulu	$ 8,264,798	$ 8,264,798
Houston	Houston	$ 9,286,722	$ 9,286,722
Huron		$ 4,281,212	$ 1,052,662
Islip	Islip	$ 7,492,857	$ 7,492,857
Jackson		$ 5,383,868	$ 1,298,026
Jonesboro		$ 5,839,023	$ 1,421,632
Juneau	Juneau	$ 8,207,932	$ 8,207,932
Kanakee	Kanakee	$ 8,108,764	$ 8,108,764
Kenai	Kenai	$ 19,270,510	$ 19,270,510
Lansing		$ 9,185,884	$ 1,474,190
Leesburg	Leesburg	$ 8,709,143	$ 8,709,143
Louisville		$ 4,251,311	$ 982,063
Macon	Macon	$ 8,518,870	$ 8,518,870
McAlester		$ 6,211,577	$ 1,197,729
McMinnville		$ 5,048,891	$ 929,986
Miami	Miami	$ 10,640,305	$ 10,640,305
Millville		$ 6,208,913	$ 1,593,371
Nashville		$ 6,096,458	$ 1,642,110
Oakland	Oakland	$ 7,656,056	$ 7,656,056
Prescott		$ 7,956,187	$ 1,706,703
Princeton	Princeton	$ 8,967,467	$ 8,967,467
Raleigh		$ 7,629,609	$ 1,652,850
Rancho Murieta		$ 6,394,924	$ 1,895,765
Reno		$ 5,338,479	$ 1,391,844
Riverside		$ 6,900,867	$ 1,904,861
San Angelo		$ 6,544,568	$ 1,241,357
San Diego		$ 4,831,842	$ 937,786
San Juan	San Juan	$ 3,084,429	$ 3,084,429
St. Louis		$ 5,448,239	$ 1,067,054
St. Petersburg		$ 9,751,075	$ 1,629,668
Seattle	Seattle	$ 8,649,492	$ 8,649,492

Table A-12: Consolidation of FSS Facilities, continued

61 Stations	25 Stations	2000 Costs	HLB Estimated Costs
Terre Haute	Terre Haute	$ 7,753,294	$ 7,753,294
Wichita		$ 5,695,540	$ 1,127,375
Williamsport		$ 6,671,964	$ 730,877
System Cost		$ 69,245,625	$ 69,245,625
Total Cost		**$ 505,055,106**	**$ 334,573,930**

Using the same methodology, the consolidation of additional facilities to ten resulted in a cost estimate of $252 million. The level of AFSS operations indicates that not all general aviation users employ these services. The 2001 cost estimates in Figure 15 are based on those provided in Table A-12 prorated upwards to be consistent with the 2001 FSS budget estimate of $566 million.

Incremental costs are allocated within general aviation and to commercial users based on their respective usage of FSS's.

Other ATS Services (Enroute, Towers and Oceanic)

The allocation for non-FSS ATS services is based on the unit cost estimates for general aviation from:

1) HLB's multivariate regression analysis for enroute centers and TRACONs provided in Table A-5 and Table A-7 respectively;
2) The FAA's 1997 cost allocation study for the remaining ATS services;

and fiscal year 2001 FAA activity data.

A Monte Carlo simulation using the unit costs[9], standard error and 2001 activity data was used to simulate the potential range of cost allocations jointly for non-FSS ATS services. Due to the degree of statistical uncertainty inherent in these estimates, and the consequences of over-taxing the general aviation and dampening its overall economic contribution, a risk adjusted cost allocation estimate was employed. The final total general aviation cost allocation estimate is based on a 95 percent probability of the simulated value being exceeded in actuality. This resulted in a total allocation of $432 million for fiscal year 2001. This total allocation is in excess of that from the final general aviation allocation from the 1997 CAS[10].

The allocation within general aviation to jets/turbo-props versus piston/other was determined from the distribution of incremental costs in the 1997 CAS study and the relative growth of jets/turbo-prop and piston-other demand since 1995. For example, enroute incremental costs for "GA Turbine" represented 42.5 percent of total general aviation incremental costs in the 1997 CAS[11]. This proportion was translated into a fiscal year 2000 estimate based on the relative growth of departures from 1995 to 2000 for "GA Turbine" from the FAA's annual General Aviation and Air Taxi Survey

[9] Unit cost estimates were not put in fiscal year 2001 $ due to the labor productivity effects for enroute centers that HLB discovered from its regression analysis.
[10] The total general aviation allocation for enroute, towers and oceanic was approximately $311 million from Table 6-7 (Page 6-21) of the 1997 CAS.
[11] Derived from Table 6-2, Page 6-12 of the 1997 CAS.

data. The 2001 estimate was derived based on the assumption that the 1995 to 2000 trend continued. This translation from 1995 data increases the proportion of enroute costs attributable to "GA Turbine" to 50 percent for fiscal year 2001[12].

A similar approach was utilized to allocate Tower/Terminal costs. Approximately 20 percent of General Aviation Tower/Terminal costs are allocated to Jets/Turbo-Props.

Regulations and Certifications

The total allocation for Regulations and Certification was based on fiscal year 2001 FAA expenditure levels and calibrated to the FAA's 1997 Cost Allocation Study[13]. Approximately 6 percent of these costs were attributed to general aviation. HLB did not have access to FAA work measures and hours data to allow an independent analysis.

General Aviation Airports

General aviation airport grants were derived from fiscal year 2000 AIP grants awarded to reliever, other general aviation airports and state block grants. Fiscal year 2000 grants awarded were chosen as the basis for the cost allocation as the grants awarded in 2000 were approximately comparable in magnitude to fiscal year 2001 FAA expenditures (when adjusted for common and fixed costs)[14].

Table A-13: General Aviation Allocation of AIP Grant Awards for Fiscal Year 2000, ($ Millions)

Grant Type	2000 AIP Grants	% attributable to GA	GA Allocation
Reliever	$111.7	95%[1]	$100.5
Other General Aviation	$223.6	90%[1]	$212.4
State Block	$121.8	85%[2]	$103.5
Total	$457.1	N/A	$416.5
Scale up to FY 2001 expenditure levels – multiplied by 105%			$436.0

Notes:

1) Based on the proportion of GA operations by airport type.
2) The proportion of state block grants to non-primary commercial service airports relative to total general aviation are assumed to equate to the national average for fiscal year 2000.

The total value of AIP grant awards in fiscal year 2000 was approximately $1,873 million. The airports total funding envelope, including fixed and common costs, for fiscal year 2001 was approximately $2,179 million. The value of the total general aviation allocation of $416.5 million in

[12] This calibration to the FAA's previous cost allocation study was required, as HLB did not have access to FAA ATS activity data by aircraft type.
[13] Derived from Table 4-11, Page 4-16 of the 1997 CAS.
[14] Grant awards in fiscal year 2001 are more than 40 percent higher than FAA airport expenditures in fiscal year 2001.

Table A-13 was scaled up to be consistent with the FAA's 2001[15] cost base. The resulting final general aviation allocation for fiscal year 2001 is $436.0 million.

Within general aviation, costs were allocated in proportion to airport usage for those airports. The number of total landings for jets/turbo-props relative to piston-other aircraft general aviation from the 2000 General Aviation and Air Taxi survey was used to allocate cost within general aviation. Approximately 8.5 percent of all general aviation landings are by GA turbine aircraft.

[15] It was assumed that 10 percent of airport expenditures represent fixed and common costs. This was derived from Table 4-11, Page 4-16 of the 1997 CAS.

APPENDIX B: RE-EXAMINATION OF MARCH 2003 COST ALLOCATION

Introduction

In March 2003, HLB Decision Economics conducted analysis on behalf of the National Business Aviation Association (NBAA) examining the allocation of Federal Aviation Administration (FAA) costs to users of the aviation system. HLB concluded that general aviation cost responsibility reported by the FAA in the 1970s and 1980s was exaggerated. HLB also found a material risk that users of general aviation business aircraft are overpaying for federal services through taxes and user charges. Using the FAA's most current financial data for fiscal year 2001, including detailed cost and activity by service delivery point, HLB recommended a set of principles for a cost allocation methodology that is most likely to achieve near-term technical consensus. These principles are summarized in Table B-1.

Table B-1: Cost Allocation Principles

Flight Service Stations Uniquely occasioned costs, net of assessed and negotiated inefficiency adjustments.
Joint-Use Enroute Centers and Towers Allocation based on assessed and negotiated risk-adjustment of statistical labor joint-cost estimates.
Airports ***Commercial airports***: Zero allocation. ***General aviation airports***: Uniquely occasioned costs, net of assessed and negotiated non-aviation social benefits.

Using these principles, HLB estimated the cost responsibility to jets and fixed wing turbo-props at $169 million to $199 million of FAA costs (depending on whether all or a fraction of airport development costs are attributed to general aviation). This finding is summarized in Table B-2.

Table B-2: General Aviation Jet and Turbo-Prop Aircraft User Cost Allocation of FAA

Millions of FY 2001 Dollars

General Aviation Aircraft Type	Air Traffic Services				Regulations & Certification	Airports			Total ATS
	FSS	Enroute Services	Towers/ Terminals	Total ATS		Commercia l	GA	Total Airports	
Jets, Turbo-Props (fixed wing)	$18	$86	$52	$156	$6	$0	$7-$37	$7-$37	**$169 - $199**

Note: Enroute and tower estimates represent a risk adjusted forecast with a 95 percent probability of exceeding.

Since HLB's March 2003 analysis, detailed cost and activity data for fiscal years 2002 and 2003 have become available for FAA Air Traffic Services (ATS) facilities. NBAA has engaged HLB to re-validate the analysis underlying the cost allocation of FAA costs incorporating this additional information.

Re-Examination Framework

HLB's re-examination framework consists of the following elements:

- An evidentiary review of any new FAA cost allocation studies, analysis and commentaries;
- The re-estimation of Air Traffic Service cost equations (reflecting 2002 and 2003 cost and activity data in the regression analysis);
- A statistical comparison of allocation coefficients used in March 2003 with those of the updated analysis;
- An update of airport grants and activity data and a re-estimation of airport cost allocations accordingly; and,
- An assessment of the impact of the coefficient and activity data on the 2001 cost allocation to general aviation.

Evidentiary Review

HLB did not uncover any new studies by the FAA or others that provided new allocations of FAA costs by user group or that dealt with specific issues relevant to this study.

Re-Estimation of Air Traffic Service Cost Equations

In the March 2003 analysis, HLB collected and analyzed FAA Air Traffic System (ATS) facility cost and activity data to address two main questions in developing an appropriate allocation approach of FAA costs:

1) Does General Aviation affect the FAA’s capital costs for the Air Traffic System?
2) Does General Aviation affect the labor costs of FAA joint-use ATS facilities, and if so, to what extent?

HLB conducted a multivariate regression analysis of the relationship between FAA capital and labor costs and activity levels at enroute centers and Terminal Radar Approach Control (TRACON) facilities using data through fiscal year 2001. Since that analysis, cost and activity data have become available for 2002 and 2003. The regression analysis has been updated to incorporate this additional data.

Multivariate Regression Results

Question 1: Does General Aviation affect the FAA capital costs for the Air Traffic System?

Multivariate regression analysis has been conducted on FAA cost and activity data for enroute centers and TRACON service delivery points (SDPs)[16] to re-examine whether general aviation activity affects Air Traffic Services capital costs. Capital costs by SDP are regressed by SDP activity data by user group (i.e., commercial, general aviation, air taxi and military[17]) to estimate unit capital costs[18].

Five years of cost and activity data are utilized for each of the twenty-one enroute centers. The estimated regression coefficients for enroute activity data represent the best linear unbiased estimate of the unit capital cost per activity. Table B-3 provides a summary of the regression results.

Table B-3: Regression of Enroute Center Investment Costs on Activity by User Group
Dependent Variable: Total Investment Cost
Observations: 105 (1999 through 2003 for 21 enroute centers)

Independent Variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$27.1 M	14.4	$24.0 M	$30.2 M
Year 1999 dummy	-$5.9 M	-4.1	-$8.3 M	-$3.5 M
Year 2000 dummy	-$1.5 M	-1.0	-$3.9 M	$0.9 M
Year 2001 dummy	-$0.9 M	-0.6	-$3.3 M	$1.5 M
Year 2002 dummy	-$3.0 M	-2.1	-$5.4 M	-$0.6 M
Unit Costs – Incremental Investment per Activity				
Air Carrier	-$6.75	-3.98	-$9.56	-$3.93
Air Taxi	-$5.70	-2.32	-$9.78	-$1.62
General Aviation	$1.96	0.47	-$4.93	$8.85
Military	-$8.49	-1.71	-$16.71	-$0.26
R-squared: 0.39 F-statistic: 7.79				

Note: M = millions

The unit capital cost estimate for general aviation activity is statistically insignificant[19]. That is, based on the available data, there is no statistical evidence that enroute center investment costs are incremental to enroute center activity for general aviation.

[16] FAA cost data were obtained from Cost Accounting System reports available through the FAA Office of Financial Services. Cost data by service delivery point were not publicly available for all types of tower facilities.
[17] Activity data extracted from the FAA's Air Traffic Activity Data System (ATADS) available through the FAA's Aviation Policy and Plans (APO) data systems.
[18] The full regression specification is provided in the March 2003 report.
[19] A t-statistic greater in magnitude than approximately 1.66 is considered to be statistically significant or statistically different from zero with 90% confidence. When an estimate is statistically significant, the 90% confidence interval will not include zero.

Multivariate regression analysis is also conducted using in-year investment acquisition costs as the dependent variable and the results are similar in that all unit cost estimates are statistically insignificant[20]. Refer to Table B-4 for the details of the regression.

Table B-4: Regression of Enroute Center Acquisition Costs on Activity by User Group
Dependent Variable: Acquisition Cost
Observations: 105 (1999 through 2003 for 21 enroute centers)

Independent Variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$0.6 M	1.1	-$0.4 M	$1.7 M
Year 1999 dummy	$1.5 M	3.2	$0.7 M	$2.3 M
Year 2000 dummy	-$0.4 M	-1.0	-$1.2 M	$0.3 M
Year 2001 dummy	-$0.2 M	-0.3	-$0.9 M	$0.6 M
Year 2002 dummy	-$0.2 M	-0.5	-$1.0 M	$0.5 M
Unit Costs				
Air Carrier	$0.30	0.54	-$0.62	$1.23
Air Taxi	$0.17	0.21	-$1.17	$1.51
General Aviation	-$1.89	-1.34	-$4.15	$0.37
Military	$1.52	0.94	-$1.18	$4.21
R-squared: 0.2 F-statistic: 3.05				

Note: M = millions

A similar assessment is conducted for TRACONs. Cost and activity data are available for three years (2001-2003) in this case. Table B-5 and Table B-6 provide a summary of these regression results.

Table B-5: Regression of TRACON Investment Costs on Activity by User Group
Dependent Variable: Total Investment Cost
Observations: 90 (2001 through 2003 for 30 TRACONs)

Independent Variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$1.5 M	3.3	-$0.7 M	$2.3 M
Year 2001 dummy	-$0.9 M	-1.9	-$1.6 M	-$0.1 M
Year 2002 dummy	-$0.7 M	-1.5	-$1.4 M	$0.1 M
Unit Costs – Incremental Investment per Activity				
Air Carrier	$3.25	2.07	$0.64	$5.85
Air Taxi	$2.20	0.81	-$2.33	$6.73
General Aviation	$0.27	0.14	-$2.94	$3.48
Military	$6.05	0.73	-$7.78	$19.87
R-squared: 0.27 F-statistic: 5.25				

Note: M = millions

[20] Additional regressions were estimated assuming the unit cost estimates were constant across user types and these were also found to be statistically insignificant.

Table B-6: Regression of TRACON Acquisition Costs on Activity by User Group
Dependent Variable: Acquisition Cost
Observations: 90 (2001 through 2003 for 30 TRACONs)

Independent Variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$0.1 M	0.6	-$0.2 M	$0.3 M
Year 2001 dummy	$0.1 M	0.8	-$0.1 M	$0.4 M
Year 2002 dummy	$0.1 M	0.6	-$0.1 M	$0.3 M
Unit Costs				
Air Carrier	-$0.50	-0.99	-$1.35	$0.34
Air Taxi	$1.65	1.87	$0.18	$3.12
General Aviation	-$0.93	-1.48	-$1.97	$0.12
Military	$6.10	2.27	$1.62	$10.59
R-squared: 0.10 F-statistic: 1.35				

Note: M = millions

Unit cost (investment and acquisition) estimates are statistically insignificant for general aviation activity. Thus, based on the available data, there is no statistical evidence that TRACON investment or acquisition costs are incremental to general aviation activity.

HLB's finding that general aviation does not affect FAA capital costs for the Air Traffic System is re-validated. There is no statistical evidence that general aviation activity occasions either enroute center or TRACON facility capital costs.

Question 2: Does General Aviation affect the FAA labor costs for the Air Traffic System and if yes, to what extent?

Multivariate regression analysis is conducted to test whether general aviation and other user activity influences the labor costs at enroute center and TRACON service delivery points. Total labor costs by SDP are regressed on SDP activity data by user type (i.e., commercial, general aviation, air taxi and military users). The results for enroute centers are provided in Table B-7.

Table B-7: Regression of Enroute Center Labor Costs on Activity by User Group
Dependent Variable: Total Labor Cost
Observations: 105 (1999 through 2003 for 21 enroute centers)

Independent Variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$21.6 M	9.2	$17.8 M	$25.6 M
Year 1999 dummy	-$9.9 M	-5.5	-$12.9 M	-$6.9 M
Year 2000 dummy	-$7.7 M	-4.3	-$10.7 M	-$4.7 M
Year 2001 dummy	-$4.5 M	-2.5	-$7.5 M	-$1.6 M
Year 2002 dummy	-$0.8 M	-0.4	-$3.7 M	$2.2 M
Unit Costs				
Air Carrier	$18.50	9.19	$14.98	$22.02
Air Taxi	$32.07	10.46	$26.98	$37.16
General Aviation	$29.52	5.70	$20.92	$38.12
Military	$31.10	5.03	$20.82	$41.36
R-squared: 0.88 F-statistic: 88.98				

All unit cost coefficients are statistically significant, meaning that enroute center activity affects total enroute facility labor costs. Specifically, each additional unit of general aviation activity is expected to result in a $29.52 increase in total labor costs. There is statistical uncertainty in all such estimates. There is a 90 percent probability that the actual unit cost estimate lies between $20.92 and $38.12.

A similar analysis is undertaken for TRACONs. As provided in Table B-8, all labor unit cost estimates except military activity are statistically significant. Specifically, each additional general aviation activity count is expected to result in a $44.54 increase in total labor costs. There is statistical uncertainty inherent in this estimate. There is a 90 percent probability that the actual unit cost estimate lies between $36.14 and $52.94.

Table B-8: Regression of TRACON Labor Costs on Activity by User Group
Dependent Variable: Total Labor Cost
Observations: 90 (2001 through 2003 for 30 TRACONs)

Independent Variables	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
Constant	$1.7 M	1.5	-$0.2 M	$3.5 M
Year 2001 dummy	-$2.3 M	-2.1	-$4.1 M	-$0.5 M
Year 2002 dummy	-$1.2 M	-1.2	-$2.9 M	$0.5 M
Unit Costs				
Air Carrier	$12.68	3.1	$5.75	$19.60
Air Taxi	$36.37	5.2	$24.71	$48.02
General Aviation	$44.54	8.8	$36.14	$52.94
Military	$9.10	0.4	-$26.79	$44.99
R-squared: 0.92 F-statistic: 151.96				

HLB's finding that general aviation activity affects FAA labor costs for the Air Traffic System is re-validated. There is statistical evidence that general aviation activity occasions enroute center and TRACON facility labor costs.

Statistical Comparison of Allocation Coefficients

Table B-9 and Table B-10 provide a comparison of the unit labor cost estimates based on the most updated multivariate regression results and developed in the March 2003 analysis for general aviation. The current mean unit cost estimate for enroute centers is $29.52 per general aviation activity compared to the previous $30.96 estimate. The precision of the unit labor cost estimate has also improved. These two estimates of unit labor costs are not statistically different from one another at the 5 percent statistical significance level.

Table B-9: Comparison of General Aviation Unit Cost Estimates at Enroute Centers

General Aviation Estimate	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
July 2004	$29.52	5.70	$20.92	$38.12
March 2003	$30.96	4.62	$19.75	$42.15

The current mean unit cost estimate for TRACONs is $44.54 per general aviation activity compared to the previous $33.46 estimate. These two estimates of unit labor costs are not statistically different from one another at the 5 percent statistical significance level.

Table B-10: Comparison of General Aviation Unit Cost Estimates at TRACONs

General Aviation Estimate	Coefficient	T-statistic	90% Confidence Interval	
			Lower Bound	Upper Bound
July 2004	$44.54	8.8	$36.14	$52.94
March 2003	$33.46	4.7	$21.19	$45.73

The updated unit labor cost estimates are not statistically different from those estimated in March 2003.

Airport Grants

The proportion of airport development grants received by general aviation airports has remained relatively constant since fiscal year 2000. Therefore, the cost responsibility assigned to general aviation in the March 2003 analysis remains valid. Within general aviation, the allocation to (i) piston, rotorcraft and others and (ii) jets-turbo-props also remains stable as activity levels identified in the most recent general aviation survey (2002) is in-line with previous survey data.

Impact of Updated Coefficient Estimates on ATS Cost Allocation

The impact of the Air Traffic Services cost allocation to general aviation is re-assessed based on a Monte Carlo simulation of fiscal year 2001 activity levels and the updated unit labor cost estimates for general aviation activity. A risk adjusted cost allocation estimate representing a 95 percent probability of exceeding is developed for general aviation. The updated unit cost estimates result in an increase to the general aviation cost allocation for Air Traffic Services in fiscal year 2001 of $80 million or approximately 10 percent. This increased allocation stems solely from the re-estimation of TRACON unit labor costs. The two factors that contribute to this result are:

1) An increase in the mean unit labor cost to $44.54 from $33.46; and,

2) An increase in the precision of the estimate. The standard error of the estimate is reduced significantly thereby narrowing the confidence interval.

The increase in the ATS cost allocation to general aviation is not statistically significant at the 5 percent level and thus does not materially alter the March 2003 conclusions.

The updated cost allocation does not impact the relative allocation within general aviation to (i) piston, rotorcraft and others; and (ii) jets-turbo-props is stable.

Impact On Overall General Aviation Cost Allocation

Using updated cost and activity data for ATS and airport development grants from that employed in the March 2003 analysis, does not result in statistically different cost allocations to general aviation users. Using the updated information, the total allocation of FAA costs to general aviation increases by $80 million. This represents a 6.4 percent to 8.8 percent increase relative to the March 2003 estimates (depending on whether all or a fraction of airport development costs are attributed to general aviation).

Re-examination Findings:

The re-examination of HLB's March 2003 analysis yields the following:

1) HLB's conclusion that general aviation does not affect FAA capital costs for the Air Traffic System is upheld;
2) HLB's conclusion that general aviation does affect FAA labor costs for the Air Traffic System is upheld;
3) The unit labor cost estimates for enroute centers and TRACONs are not statistically different from that estimated in the March 2003 report;
4) The March 2003 allocation of airport development grants to general aviation is upheld; and,
5) Utilizing the updated unit costs estimates does not yield a statistically different cost allocation to general aviation.

HLB recommends that the findings of this report be attached as an addendum to the March 2003 analysis to provide evidence that the conclusions of that report remain valid and are robust over time.