Policy Study No. 166
August 1993

HOW TO SPIN OFF AIR TRAFFIC CONTROL

by
Robert W. Poole, Jr.

EXECUTIVE SUMMARY

Aviation experts are nearing consensus that the air traffic control (ATC) system needs to be removed from operation by the Federal Aviation Administration (FAA) and spun off as a user-funded corporation. This change would free the ATC system of federal budget constraints, micromanagement by the administration and Congress, civil service constraints, procurement-system problems, and conflict of interest between safety regulation and operations.

Valuable lessons on how to go about this restructuring can be gained by reviewing similar spinoffs already accomplished or under way in New Zealand, Germany, Switzerland, and South Africa (and under study in Canada and many other countries). Key success factors appear to include: 1) shifting to 100 percent user fees rather than tax support; and 2) separating safety regulation from ATC operations, by leaving regulation within government, at arms-length from the ATC corporation. Overseas ATC corporations are able to obtain liability insurance from private carriers. In addition, military and government users now pay for ATC services, just like private-sector users.

A major problem in devising a user-fee system is the degree to which "general aviation" (GA) is subsidized in the current excise-tax regime. Resolving this problem involves distinguishing between business and commercial GA users—who typically fly turboprops and turbojets on cross-country flights—and noncommercial GA users—who typically fly single-engine piston aircraft on local flights. The latter seldom use ATC services; they should only be charged when they do file a flight plan or land at an airport with a control tower, and they should be charged only the marginal costs of serving them. Commercial GA users should pay commercial rates, based on their fair share of overall system costs.

A U.S. Airways Corporation based on these principles would permit rapid modernization of the ATC system, with significant increases in safety levels. Another benefit would be a significant reduction in airline delays, which cost airlines and travelers some $5 billion per year. The transition to an Airways Corporation could take place within one year.

I.INTRODUCTION: THE NEED FOR CHANGE

Air traffic control (ATC) is an integral input to the production of safe and efficient air transportation. Like the operation of airports and airlines, ATC operations have significant safety overtones. Yet no one suggests that the federal government operate airlines or airports in order to make sure they are safe. Rather, the Federal Aviation Administration regulates these entities, on an arms-length basis.

Increasingly, FAA operation of the ATC system is being recognized as an impediment to a healthy aviation industry in this country. For more than two decades, a steady stream of reports from the General Accounting Office, the Congressional Budget Office, and other expert bodies have faulted the agency for being poorly structured for the demanding task of operating a high-tech, 24-hour-a-day system on which air travelers and private pilots depend for safe, efficient flights.

In the early 1990s, additional voices have been added to this chorus. A 1991 special report on the air transport industry since deregulation by the National Research Council's Transportation Research Board (TRB) called for fundamental structural change in the way ATC is provided. In 1992 the Aviation Consumer Action Project (ACAP) issued a highly critical report on airline delays, calling for the spinning off of ATC operations from the Federal Aviation Administration (FAA). And in 1993, the Infrastructure Subcouncil of the Competitiveness Policy Council concluded that there is "an overwhelming consensus in the aviation community that the ATC system requires fundamental change if aviation's positive contribution to trade and tourism is to be maintained."

In August 1993 the National Commission to Ensure a Strong Competitive Airline Industry seconded these concerns. Its report recommended the creation of an independent federal corporation to manage and fund ATC, with safety oversight remaining within the federal government.

Five principal problems underlie the criticisms in these and other assessments of the ATC system, as discussed in the following paragraphs.

A.Budget Constraints

Because it is a part of the FAA, a federal agency, the ATC system receives its funding via annual congressional appropriations. Despite the majority of these funds originating as user taxes (whose proceeds are deposited in the Aviation Trust Fund), annual spending is determined via the ordinary federal budget process. Because both Congress and the administration typically seek to increase federal revenues and reduce federal outlays, nearly every year the amount the FAA is allowed to spend on Aviation Trust Fund purposes is less than is collected from users and deposited in the Trust Fund.

Besides providing insufficient funding to deploy adequate numbers of fully trained air traffic controllers and to make needed investments in modernizing the ATC system, the federal budget process's unpredictability plays havoc with the need for long-term planning, both for research

and development and for major investments in modernizing the ATC system. Hence, TRB consultant Herbert Jasper's conclusion that "the FAA tends to lag behind the state of the art, and [its] obsolete systems have been sorely taxed by the significant growth in [air traffic] volume." Likewise, the Competitiveness Policy Council's report cites the FAA's lack of direct control over its funding as a serious problem.

One of the strongest indictments of the ATC system's inadequate funding comes from the ACAP study. Using a mathematical model, Drs. Darryl Jenkins and Douglas Frechtling concluded that up to half of all airline delays are due to ATC problems. They maintain that the FAA is still compensating for a lack of sufficient controllers by restricting flight operations to the level that can be safely handled with existing personnel and equipment. Traffic flow control, they argue, is responsible for a drop in daily aircraft utilization rates from 10 hours to 8 hours between 1988 and 1992.

B.Micromanagement

The TRB report echoes many previous studies in highlighting the problem of excessively detailed oversight of the FAA and its ATC operations. Because of aviation's high visibility, the FAA is subject to detailed oversight by a number of congressional committees. In addition, as an executive branch agency, it is subject to detailed oversight by its parent agency, the Department of Transportation, and by the White House's Office of Management & Budget. Micromanagement substitutes the often-conflicting priorities of these outside bodies for the priorities and best judgement of the FAA's professional managers. It is not surprising that, as a result, the agency has seldom attracted top-flight executives from industry and that a typical FAA Administrator serves for only 2 to 2.5 years.

C.Civil Service Constraints

The large majority of FAA employees are involved in designing, operating, and maintaining the complex, 24-hour-a-day service business of air traffic control. Yet they are recruited, trained, managed, and compensated by the same civil service system that was designed for 8-hour-a-day office workers in government bureaucracies. Virtually every study of the ATC system's problems identifies this mismatch as a serious problem.

Among the specific problems cited by the TRB study are shortages of air traffic controllers in high cost-of-living areas, lack of authority to pay relocation allowances, arbitrary personnel ceilings, generally uncompetitive pay levels, restructuring and cutting back of retirement benefits, and threatened furloughs (due to delays in approving a federal budget). It also cited the impending retirements of large numbers of maintenance technicians and problems with FAA recruitment and training. The federal "one-size-fits-all" personnel system is increasingly seen as incompatible with the demands of a high-tech service business such as ATC.

D.Procurement Problems

As noted by the Airline Commission, the ATC system's modernization program (the NAS Plan) is 3 to 5 years behind schedule and billions of dollars over budget. Many observers attribute

these problems to the costly and cumbersome federal procurement regulations under which the FAA must operate. The TRB, CPC and Airline Commission reports fault the lack of flexibility in procurement as a major problem. Former DOT Secretary Jim Burnley has noted that "it takes years even in fairly simple, straightforward purchases, [hence] high-tech systems may be technological relics by the time they are actually installed."

On the other hand, the General Accounting Office, which has made numerous investigations of FAA/ATC procurement problems, attributes much of the blame to poor planning and management by the FAA. In fact, the answer is probably a combination of a complex, cumbersome procurement system and an FAA management system ill-suited to developing and operating real-time high-tech systems. The FAA's quasi-military corporate culture has been cited by many observers, including the TRB report, as another contributing factor.

E.Conflict of Interest

A number of studies have also cited two ways in which the FAA's assigned roles present the agency with built-in conflicts. The first is the conflict between the FAA's role as the aviation system's safety regulator and its role as the operator of the ATC system. While the agency operates on an arm's-length basis in regulating airframe manufacturers and aircraft operators, and in licensing pilots and mechanics, when it comes to the ATC system the FAA is essentially regulating itself. The Aviation Safety Commission noted this role conflict in its 1988 report. The other conflict is between the FAA's regulatory role and its responsibility to promote the health of the aviation industry. This type of dual charter is not present in other federal safety regulatory agencies (e.g., the Food & Drug Administration, the Consumer Product Safety Commission).

The five problems discussed above are structural; they derive from the institutional setting in which ATC services are provided today in the United States. Similar high-tech, 24-hour-a-day services are provided routinely by investor-owned utilities: e.g., the telephone system, electricity transmission, and natural gas pipelines. These service businesses raise their capital in the financial markets and generate revenues directly from fees charged to their customers. They can and do attract the needed executive talent by paying whatever is necessary in the marketplace. Likewise, they must design personnel recruitment, training, compensation, and evaluation systems to attract and keep a highly skilled work force. These considerations have led numerous observers to suggest that ATC be spun off from the FAA into some form of user-funded corporate entity. That is precisely what a number of other countries has begun to do.

II.ATC CORPORATIZATION OVERSEAS

A.New Zealand

In 1987 New Zealand corporatized its air traffic control system. In other words, the portion of its Transport Ministry that provides ATC services was legally separated from the agency and incorporated as a commercial, but government-owned, company. It was given a board of directors and required to value its assets and liabilities and keep its financial records in

accordance with normal commercial accounting practices. And it was given the authority to charge all users of its services, with the fee schedule subject to Commerce Ministry oversight.

Airways Corporation of New Zealand recently celebrated its sixth anniversary. Its corporatization is considered highly successful throughout the aviation industry. Its accomplishments include introducing New Zealand's first ATC user fees, which are the sole method of financing Airways Corp.'s operations, since it no longer receives any tax funding. The company implemented a four-year, $50-million airways modernization program, completed in 1992. A follow-on navigation aids upgrade valued at $16 million was launched in 1992. A major cost-cutting program, launched in 1988, cut the firm's operating expenses by 20 percent, about $11 million per year.

In the four years prior to corporatization, the service had expenses that were $21 million greater than its income. In the first four years of corporate operation, Airways Corp. posted a $30-million profit. A possible offering of stock in the company to private investors continues to be talked about, but no formal decision to do so has been announced by the government.

B.Switzerland

In 1988 the Swiss Bundesrat (congress) separated the ATC service from the nonprofit RadioSchweitz telecommunications firm and set it up as a partially private company called Swisscontrol. The Swiss government retained 71 percent of the shares, with 7 percent owned by the two Swiss airlines, 12 percent owned by the three main airports, and the remaining 10 percent owned by various aviation employee and user groups. During its initial two-year probationary period, the company received all its funding from the government, drawn from user fees collected by the federal government.

Swisscontrol's initial two-year probationary period was considered a success, in terms of making the changeover to a commercial corporate form of organization. But the initial structure did little to change either the financing or the decision making authority. Transport Ministry studies led to recommendations for legislation, and versions of that legislation passed both houses of the Swiss parliament. Final approval was given in June 1993, with the changes expected to go into effect by January 1, 1995. The major changes were as follows:

1.Swisscontrol itself will be allowed to charge user fees and retain the proceeds. (Currently, the government charges the fees and reimburses Swisscontrol for its costs.) Transport Ministry approval of fee levels is required.

2.The government will pay the company only for its own use of Swisscontrol services.

3.The government's share of ownership can be reduced to 51 percent.

4.The government will formally delegate responsibility for ATC operations to Swisscontrol. (This had not been done previously, and had raised legal questions.)

Swisscontrol will continue to operate on a not-for-profit basis, with any annual surplus reinvested in the business. Shareholders will not receive dividends; their motivation to be part-owners is simply to have a voice in decision-making.

C.Germany

As of January 1, 1993, German ATC was shifted over to a newly created, government-owned company: Deutsche Flugsicherung, Gmbh (generally known as DFS). The change required two constitutional amendments: one to merge civil and military ATC into a single organization, the second to convert that organization into a corporation. DFS acquired 5,000 existing employees from its predecessors, and has recruited additional management staff from private industry. Some former military enroute personnel now work for DFS, but other military controllers still work for the military (dealing with exclusively military air space). All capital facilities and equipment were transferred from government to the new company.

DFS funding comes from user fees, of three types: 1) fees for overflights of Germany, which are remitted by Eurocontrol to DFS; 2) enroute charges within Germany; and 3) landing charges at ATC-equipped airports. The latter two categories account for 90 percent of DFS's income. DFS no longer gives discounts to domestic users. Since it has a monopoly, DFS's rates must be approved by the Transport Minister. DFS has also begun to charge for services to third parties (e.g., when it provides engineering consulting services to airports).

In its start-up phase, DFS is to operate on a nonprofit basis, though making profits and paying dividends is not excluded by law. It is not clear whether DFS would be able to offer shares to outside investors, as Swisscontrol has done.

D.South Africa

The South African government in 1992 decided to transfer ownership of its ATC system to a commercial (but 100% government-owned) corporation. The legislation was enacted on April 1, 1993, and the new Air Traffic & Navigation Services Co. came into existence on August 1, 1993. It will be funded solely by user fees, which have not previously existed in South Africa. Safety regulation will remain with the Department of Transport.

E.Canada

The Air Transport Association of Canada made a formal proposal to Transport Canada in November 1991 to corporatize the Canadian ATC system along the lines of New Zealand's successful creation of Airways Corporation of New Zealand. The proposal called for repeal of Canada's ticket tax, with funding to come instead from direct user fees. Transport Canada continues to study the proposal, and the new Deputy Minister has ordered a departmental review which is considering all options, including corporatization. No action to change Canada's ATC system is likely until after the 1993 elections.

F.Other European Countries

Planning studies are under way to consider corporatizing the Austrian ATC system along the lines of what Germany and Switzerland have done. Discussions have also begun on modernizing the Irish and Italian ATC systems along the lines taken by Germany. And Portugal has also begun to study the German and Swiss models for possible application to its own ATC system. Several central and eastern European countries are also studying ATC corporatization.

In addition, the Association of European Airlines in 1989 published a study on fundamentally restructuring Europe's ATC system. It proposed the creation of a single Europe-wide system, to be managed by a Central Holding Corporation, a nonprofit, user-owned public/private company operating on a user-funded basis. The CHC would initially contract with the existing 22 national ATC entities, but over time these entities and their en-route centers would be rationalized into a smaller number of geographically appropriate centers, independent of national boundaries. The CHC would be run on a commercial but not-for-profit basis.

III.ORGANIZATIONAL ALTERNATIVES

While consensus has been growing within aviation circles about the need to remove air traffic control from its current institutional constraints, there appear to be two schools of thought on how to accomplish this. One approach is to spin off the entire FAA as a new government corporation, outside the Department of Transportation. The other is to commercialize just the ATC portion of the FAA, as either a government-owned or private corporation, retaining the FAA's grant-making and safety regulatory functions within a revised FAA within the government. These alternate approaches will be termed the FAA Corporation and the ATC Corporation in this paper.

A.FAA Corporation Model

When the Air Transport Association in 1985 proposed that the ATC system be spun off from the FAA as a user-funded government corporation (as discussed further in subsection B, below), it asked the National Academy of Public Administration to review the proposal. In doing so, a NAPA panel recommended that instead of spinning off just ATC, converted the entire FAA to a self-financed government corporation. The NAPA panel argued that the safety regulation function should be included in the corporation, since "safety must be regarded as an integrated system in which all elements must be coordinated." NAPA also recommended that the corporation's CEO be appointed by the President and subject to the supervision and direction of the Secretary of Transportation.

Two years later, the congressionally chartered Aviation Safety Commission made a similar recommendation for converting the entire FAA into a public "authority," with a nine-member Board of Governors including the Secretaries of Transportation and Defense, all appointed by the President. One board member would be a Director of Aviation Safety.

These proposals to some extent resemble Britain's Civil Aeronautics Authority (CAA), which was converted into a Crown corporation in 1972. As such, the CAA is funded by user fees and

makes an operating profit. In 1989, former FAA Associate Administrator Albert Blackburn proposed converting the FAA into a government corporation modeled after the CAA, except that it would be funded by the (then) 8 percent ticket tax rather than by user fees.

Most recently, yet another proposal along these lines was released by the FAA Conference of the Federal Managers Association. The corporate FAA would be funded by fees charged to all users (including the military), based on the actual cost of operating the flight segments involved. All ATC and safety-regulatory functions would be included in the corporation.

In an appendix to the TRB's *Winds of Change* report, Herbert N. Jasper reviews the advantages and disadvantages of the FAA corporation approach. He notes that it would offer the potential to change the corporate culture of the entire FAA, not just its ATC portion. In addition, based on the experience of other federal corporations, it is plausible that such an entity could win exemption from at least some of the burdensome federal constraints, such as civil service and procurement regulations. He also notes that this type of restructuring would be less disruptive than splitting off ATC alone.

On the other hand, Jasper cites a number of problems with this approach. First, attempting to make the corporation fully independent (so that it can operate like a business) is difficult to reconcile with the idea of giving it a board composed of government officials. Jasper points out that even oversight by the DOT Secretary alone could still result in micromanagement, one of the problems that restructuring is intended to avoid.

Similarly, any use of federal tax funds for such a corporation would potentially subject it to the federal budgeting process, with all the problems of funding limitations and congressional oversight (micromanagement) that ATC restructuring is intended to avoid. Thus, any such FAA corporation would have to be funded entirely by transaction-based user fees.

One of the FAA's current functions is grant-making. A major effect of the airport grant program is redistribution of funds from the large air-carrier airports to smaller airports, including relievers. This would appear to be an inherently governmental activity, and one best funded from tax revenues and under congressional control. To fund such activities from transaction-based user fees, rather than taxes, would strike many users as unfair. Yet introducing tax revenues would return the corporation to the constraints of the federal budgeting process.

Another problem with the FAA corporation approach is the conflict of interest between safety regulation and system operation. The ASC and some other observers argued that ATC safety would be compromised by separating safety regulation organizationally from ATC operations. ASC proposed a very complicated structure for embedding safety within its FAA corporation, via a presidentially appointed board member in charge of safety.

Yet the same logic which rejects an arms-length relationship between the safety regulator and the ATC system operator should also reject an arms-length relationship between the FAA and the following: 1) airport operators; 2) airlines; 3) general-aviation owners; 4) pilots; and 5) mechanics. By this logic, all of these parties should be organizationally part of a single enterprise, for maximum coordination on system safety. Instead, our present system recognizes

that each of these elements of the aviation system should be regulated at arms-length by an independent safety regulator with the power to set and enforce objective standards. Only when it comes to the ATC component of the aviation system has this principle been violated.

B.ATC Corporation Model

The idea of spinning off ATC as a corporate entity dates back to aviation consultant Glen A. Gilbert, who in 1975 proposed setting up a Comsat-like corporation funded half by user fees and half by taxes. A nonprofit, user-funded, user-owned corporation was proposed by Robert Poole in 1982, and in a revised form in 1986. As noted above, the Air Transport Association proposed a user-funded National Aviation Authority (NAA) to take over ATC, in 1985.

The actual reorganizations which have taken place (or are being planned) overseas in the past decade all follow the ATC corporation model. That is, they involve:

1)separating out the ATC function from the national government aviation agency (usually a transport department);

2)creating a commercial-type corporate organizational form, with a board of directors consisting of private-sector executives and making use of commercial accounting practices;

3)100 percent user-charge funding, with no tax support and complete independence from the government budget process; and

4)retention within government of the safety regulatory functions; in no case has this function been spun off along with ATC services.

This is the model that has been followed by Germany, New Zealand, South Africa, and Switzerland; it is also the model that has been proposed for Canada and for the Central Holding Corporation for Europe-wide ATC.

In reviewing the ATC corporation model in the TRB report, Jasper summarizes its advantages as follows:

· It can readily be financially self-sufficient via user charges, therefore becoming free of both of the present budgetary constraints (not enough funds to modernize and unpredictability of funding levels).

· It would be free of both legislative and executive micromanagement.

· It would be free to use businesslike personnel and procurement methods, resulting in higher-quality management and equipment.

· The present conflicts of interest between safety regulation and operations (and between promotion and regulation) would be removed.

· Long-range planning would be enhanced, thanks to longer tenure of the CEO and independent financing.

· Either user ownership or federal rate-review would prevent overcharging of users.

· It would be freed from the mixed incentive systems inherent in a federal agency and enabled to build a private-sector corporate culture related to innovation and performance.

Jasper also notes three objections to this approach. One is that developing and implementing a user-fee schedule sufficient to fund the corporation would raise political difficulties, especially regarding general aviation. This issue is addressed below in section V. Another concern relates to possible problems of maintaining continuity and reliability in safety regulation, if it is separated from ATC operations. This issue is addressed in section IV, below.

Jasper's third potential problem would arise only under a hybrid form of ATC corporation under which the inherently governmental functions of FAA such as safety regulation are assigned to a public entity embedded within the private ATC corporation. Since this hybrid corporate/government structure has not been used overseas or proposed by any other policy study, it is not addressed further in this paper.

To sum up, the ATC corporation approach has many advantages over the FAA corporation approach. As Jasper himself concludes in the TRB report, "it appears to be clearly superior in many respects to the other options....It is the only option that could assure the replacement of a federal agency culture and modus operandi with the incentive systems of a private company." It is also the model that has thus far been adopted by four industrialized countries (and is under serious consideration by a number of others, including Canada). The two real concerns are whether safety regulation and ATC can be separated organizationally without a loss of system safety, and whether a politically feasible user-fee structure can be developed and implemented. Those issues are addressed in the next two sections.

IV.SEPARATING SAFETY REGULATION FROM AIR TRAFFIC CONTROL

The FAA is already divided organizationally between safety and ATC functions. The Regulation and Certification branch has the primary safety rule-making authority. This includes certificating aircraft and developing and enforcing operating rules and procedures. Other safety functions reside in the Aviation Standards branch (pilot and mechanic licensing, accident investigation), the Airports branch (airport safety), and the Aviation Safety branch (safety analysis and information). These units would continue with their current safety functions if ATC were spun off to an ATC corporation.

The FAA's largest branch is Air Traffic, which operates the ATC system and is headed by the Associate Administrator for Air Traffic. Certain rule-making authority has been delegated to this Associate Administrator, in the form of specific Federal Air Regulations (FARs) which relate in some way to the ATC system. If Air Traffic were moved out of FAA and turned into an ATC corporation, the question is: what rule-making authority should go with it and what should be transferred to the remaining FAA?

Precisely this question was addressed in detail in a 1985 report prepared by aviation consultants Raymond Belanger and Charles Newpol in a report prepared for the Air Transport Association. Their conclusion was that some of the FARs are directly related to the operation of the ATC system and could be transferred to the new corporation. Others, though now under Air Traffic's jurisdiction, more properly should be the responsibility of Regulation and Certification and should be transferred to it and retained within the new FAA.

Actually, Balanger and Newpol found that several alternative allocations of the rule-making authority would be workable. Transferring all FARs now administered by Air Traffic to the new ATC corporation would be feasible, they conclude, though they note that many of these FARs are more properly considered safety standards that should be promulgated and enforced by a separate entity (Regulation & Certification).

In fact, they conclude, it would also be workable to put all of this rule-making authority with Regulation & Certification, i.e., with the new FAA. One advantage of this to the new ATC corporation would be that "It would get them out of the regulatory responsibility and permit them to fully concentrate on the operation of the System." In this case, the enabling legislation should provide that the ATC corporation's concurrence be required on certain actions, they recommend.

Balanger and Newpol's preference is to split rule-making authority between the new ATC corporation and the new FAA. The corporation would be responsible for those rules that identify what airspace is within the system and the FAA's Regulation & Certification branch would be responsible for all the others. "This would be more in keeping with [the latter's] overall safety role in defining how the airman and aircraft will operate and [the ATC corporation's role] in operating the system," they state. It would put the new FAA at arms-length from the new ATC corporation, just as it is now at arms-length from the airlines, airports, airframe and engine manufacturers, and other aviation system participants.

Interestingly, despite the many claims that ATC and safety regulation cannot be separated because they form an integrated system essential to safety, Balanger and Newpol conclude by stating that the clear-cut separation that they recommend "would eliminate much of the confusion that exists today as to which organization [within FAA] is responsible for the various aviation rules."

They also note that neither the new FAA nor the new ATC corporation could operate in a vacuum from the other. The legislation creating the corporation must address coordination and concurrence requirements, so that input from all affected parties continues to be obtained before any rule-making. This kind of input and coordination has occurred in New Zealand and Switzerland, and is being developed in the two newest countries to spin off ATC, Germany and South Africa.

V.USER FEE STRUCTURE

A.The Problem: Cross-Subsidies

Perhaps the most daunting challenge facing ATC spinoff proposals is developing a user-fee structure that is politically feasible yet fully funds the corporation (so that it can remain completely free of any tax funding and the accompanying budget-process and oversight constraints). The fundamental problem is that the current aviation excise tax structure (which provides the source of funds for the Aviation Trust Fund, which funds the majority of FAA activities) involves considerable cross-subsidies among user groups.

Table 1 shows the sources of current aviation user revenues, by source. As can be seen, the airlines pay 97 percent of these taxes while general aviation pays only 3 percent. These are the only current user payments; there are no direct charges to use any aspect of the ATC system (as there are in Europe and many other countries).

AVIATION USER TAX REVENUES, 1991 ($ millions)

Airlines	Tax Revenues	Percent
Passenger ticket taxes	$4,341	88.0%
Air cargo/waybill taxes	222	4.5
Int'l departure taxes	217	4.5
Subtotal	$4,780	97.0%
General Aviation		
Piston-gasoline tax	$47	1.0%
Turbine-fuel tax	95	2.0
Subtotal	$142	3.0%
TOTAL	$4,922	100.0%

By contrast with the sources of revenue, Table 2 breaks down ATC operations by type of user. As can be seen, general aviation accounts for 21 percent of the ATC transactions at centers (ARTCCs), towers, and TRACONs, though paying only 3 percent of the user taxes. Moreover, government users (military and other federal agencies) also account for significant numbers of operations for which they do not pay.

ATC OPERATIONS BY USER TYPE, 1990

	Enroute (ARTCC)	Towers & TRACONs

	# (millions)	Percent	# (millions)	Percent*
Airlines	18.5	49%	12.9	20%
Commuters/taxis	5.6	15%	8.8	14%
General aviation	7.9	21%	39.0	61%
Government	5.5	15%	2.8	4%
	37.5	100%	63.5	100%

B.Sorting Out General AviationB.Sorting Out General Aviation

The key to developing a workable user-charge structure is to go beyond the umbrella term "general aviation" to examine more carefully the types of aircraft and flight activities making up this large and important segment of aviation.

Figure 1 provides a graphical depiction of the total GA fleet, as of 1991. Each of the circles is proportional in area to the number of aircraft of that type. As can be seen, 78 percent of the fleet is single-engine piston, and piston aircraft together comprise a full 90 percent of the total. Just 6 percent of the fleet consists of turboprops, turbojets, and turbine-powered helicopters. More details on the composition of the fleet are provided in Table 3, from which Figure 1 is derived.

Figure 1 also depicts the primary type of use of each type of aircraft in the GA fleet. Overall, 67 percent of the fleet is used for personal and instructional flying, while 24 percent is used for business, executive, or commuter/taxi operations. For turboprops, 81.5 percent are used for these business purposes, and for turbojets the corresponding figure is 87 percent. By contrast,

83.5 percent of single-engine piston aircraft are used for personal, instructional, and other (nonbusiness) purposes.

These differences are reflected in the types of flight operations carried out by the different types of aircraft. Table A-1 in the Appendix provides a detailed breakdown for each aircraft category, derived from FAA surveys. These data are summarized in Table 4, for turbine and piston aircraft as groups. Thus, we see that although turbine aircraft make up just 6 percent of the GA fleet, they account for 26 percent of all cross-country flights and 29 percent of all flight plans filed. They also account for 20 percent of cross-country flight hours and 32 percent of cross-country miles flown.

TURBINE VS. PISTON OPERATIONS						
	Turbine		Piston		Total	
	# (millions)	Percent	# (millions)	Percent	# (millions)	Percent
Local Flights	0.88	10%	8.03	90%	8.91	100%

Cross-County Flights	3.55	26%	10.29	74%	13.84	100%
TOTAL	4.43	20%	18.32	80%	22.74	100%
Flight Plans	2.80	29%	6.99	71%	9.79	100%
Towered Landings						
Local	1.50	41%	2.19	59%	3.69	100%
Cross-Country	4.34	38%	7.02	62%	11.36	100%
TOTAL	5.84	39%	9.21	61%	15.05	100%
Cross-Country Miles	1199	32%	2521	68%	3720	100%
Flight Hours	4.9	17%	24.7	83%	29.6	100%
Cross-Country Flight Hrs.	3.59	20%	14.69	80%	18.28	100%

Control towers are an important component of the ATC system. Out of all 5,400 public-use airports in the country, only 486 (9 percent) possessed towers as of 1990. But the use of those airports is heavily skewed toward turbine-powered, business-oriented GA flight activity. Out of all landings at towered airports, 39 percent are by turbine-powered aircraft.

Thus, it seems clear that GA can be separated, conceptually, into two broad categories of user: 1) commercial/business users, represented in a first approximation by turbine-powered aircraft; and 2) personal/recreational noncommercial users, represented (approximately) by piston-powered aircraft. The former group are heavy users of controlled airspace and ATC services, while the latter are not. While this two-part categorization is definitely too over-simplified to use in developing an actual user-charge system, it will suffice to develop order-of-magnitude estimates of prices and revenues from the different GA user groups.

C.Developing a Pricing Structure

The general principles for charging airspace users should be:

1)no one pays for services they do not use;

2)noncommercial ("true" GA) customers pay only the marginal costs they impose on the system; and

3)charges should be based on long-run economic costs.

The pioneering work on understanding and quantifying the costs of ATC services has been done by Richard Golaszewski of Gellman Research Associates, Inc. Using FAA databases of site-specific activity measures for each type of ATC facility, he developed marginal cost estimates for the services provided by air route traffic control centers (ARTCCs), flight service stations (FSSs), terminal radar control facilities (TRACONs), and air traffic control towers (ATCTs). These costs were developed separately for the four principal user categories: airlines, commuters, general aviation, and military.

Since marginal costs reflect only those elements of total costs that vary with the type or amount of activity, a pricing structure based solely on charging users their marginal costs would cover only a fraction of the total costs. Hence, Golaszewski used cost-allocation methodologies to allocate site-specific joint costs, ATC (nonsite) equipment maintenance, facilities and equipment, research and development, and general overhead to the four user groups, as well (see Table 5). The ratio of total cost to marginal cost for each group was then designated as that group's "total cost factor." When multiplied by the marginal cost of each ATC service, the result is a price for that service which will recover the fully allocated cost. A user-charge system based on these prices will cover total ATC costs.

TOTAL ATC SYSTEM COSTS, 1985 ($ millions)

Cost Category	Air Carrier	Commuter	General Aviation	Military
Site Marginal Costs	$377.9	$122.0	$408.2	$185.5
Site Joint Costs	127.0	52.8	105.5	65.1
ATC Equip. Maint. (nonsite)	155.0	50.0	107.1	76.1
Facilities & Equipment	753.6	215.3	226.8	150.8
Research & Development	177.3	56.1	20.3	11.8
General Overhead	239.0	82.0	185.2	121.3
TOTAL ATC System	$1,829.8	$578.2	$1,053.1	$610.6
Marginal Cost as % of Total	20.7%	21.1%	38.8%	30.4%
Total Cost Factor	4.83	4.74	2.58	3.29

The resulting unit prices for ATC services are shown in Table 6. Two changes have been made to Golaszewski's price schedule in developing Table 6. First, the price levels have been adjusted from his 1985 levels to 1991 levels, based on the 35.2 percent increase in the FAA's ATC costs between 1985 and 1991. Second, Golaszewski's "total unit costs" for GA users (i.e., the marginal cost multiplied by the total cost factor from Table 5) have been used only for the business-oriented turbine-equipment segment of GA. For the nonbusiness piston-equipment segment, only the true marginal costs have been used. Thus, whereas a business jet would pay $5.03 to land at an airport with a small tower, the single-engine piston user would pay $1.95. Likewise, while the business jet would pay $88.11 for an IFR departure, the piston plane would pay $17.08.

This differential pricing structure for GA users has both an economic and a political rationale. In economic terms, as Golaszewski points out, the nonbusiness GA users are the most highly price-sensitive, and in many cases may be discretionary users. In other words, if full-cost prices are charged, many of them will go elsewhere rather than pay those prices. (In economists' jargon, they have a high "price elasticity.")

In political terms, the vast majority of GA flyers are nonbusiness, single-engine piston users. They will not accept a pricing system that drastically increases their costs of flying, and they have the lobbying clout to make their concerns known to every member of Congress. Charging

them only the true marginal costs makes good political sense, if a user-fee structure is to have any hope of being adopted as part of the shift to an ATC corporation.

D.Impact of User Charges

Who would bear what share of the costs of an ATC corporation, funded by the pricing schedule proposed in Table 6? A detailed derivation of activity levels for each type of user and each type of ATC transaction is presented in the Appendix and summarized in Table A-2. A summary of the GA transaction numbers is presented here in the top half of Table 7. While the numbers of transactions for which prices would be charged is large, it is only a fraction of all GA flight activity. The bottom half of Table 7 shows that the majority of all GA takeoffs and landings would not carry any charge; only 39 million out of 95 million would be charged for. And out of nearly 23 million GA flights, only 7.1 million paid traverses of an ARTCC would occur.

Legitimate questions can be raised about whether charging noncommercial GA users for the services of flight service stations, for example, would lead to adverse safety impacts (e.g., pilots declining to obtain a $9 briefing or to pay $18 for a flight plan). There might also be some reduction in demand for ATC services from GA users, both corporate and non-commercial, in response to the imposition of direct user charges. These impacts would need to be reviewed in more detail in coming up with the final pricing structure.

Table 8 summarizes the estimated ATC corporation user-charge revenues at 1991 activity levels, by type of user. Airline users (air carriers plus commuter/taxi) would provide 74 percent of the total revenues. GA-turbine users would pay 7 percent, while those GA-piston flyers actually using ATC services would pay 5 percent of the total. The large majority of GA-piston flyers, who do not use towered airports or other ATC services, would pay nothing at all.

ESTIMATED ATC CORP. USER REVENUES AND ACTUAL ATC EXPENDITURES, 1991

	$ (millions)	Percent
Revenues[1]		
Air Carriers	$3,014	54%
Commuter/Taxi	1,125	20
GA-Turbine	372	7
GA-Piston	298	5
Government	764	14
	$5,573	100%
Spending[2]		
ATC Operations	$3,063	
Facilities & Equip.	1,512	

Research, Engineering, & Equip.	179	
Overhead, Admin.	848	
	$5,602	

VI.MISCELLANEOUS ISSUES

A.Liability Insurance

One concern that has been raised in discussions of spinning off ATC is whether or not the large risks involved in managing air traffic are insurable, or whether the government itself must bear the liability for ATC-related accidents (as it does at present). In principle, the fact that airlines are able to obtain liability insurance suggests that ATC liability also ought to present risks that are insurable. Nevertheless, the magnitude of these risks might be so large as to present difficulties for private-sector insurance.

Some perspective on this issue may be obtained from the experience of ATC corporatization overseas. As noted in Section II, Airways Corporation of New Zealand has been in business since 1987. It was able to obtain its initial liability coverage from Lloyd's of London. After the first two years of operation without accidents, the annual premium was cut in half. Airways currently has $1 billion of liability coverage in force.

The new German ATC corporation DFS has been in operation since the beginning of 1993. DFS obtained liability coverage of DM1.5 billion ($855 million) via an insurance pool within Germany. Its first-year premium is DM1.5 million. Losses above DM1.5 billion would be covered by the German government.

In Switzerland, now that Swisscontrol is being made into a more commercial corporation, it is also in the market for liability insurance. It expects to purchase SwFr1 billion ($975 million) in coverage during 1993. Losses in excess of that amount will be covered by the Swiss government.

The overseas experience with insurance of ATC corporations suggests that reasonable amounts of coverage can be purchased via insurance pools. Because of the much larger size of the U.S. ATC system, the amount of such coverage that may be available via this means cannot be estimated at this time. There may well be a need for the federal government to provide coverage for losses in excess of whatever sum (presumably, several billion dollars) can be purchased privately. In fact, such a guarantee would amount to a reduction in the federal government's exposure, since today it provides de-facto coverage for 100 percent of ATC-related liability. Under the proposed system, the government's role would be reduced to that of providing backup coverage only. This is similar to the government's role in nuclear power insurance, whereby

private insurance provides coverage up to $7 billion, with the government standing by to provide coverage of any larger amounts, via the Price-Anderson Act.

Having private insurance provide coverage for basic ATC liability would be a very important change for the better. Insurance companies provide vital ongoing feedback on safety procedures intended to minimize risks and consequently insurers' exposure to loss. This can be a valuable supplement to the new FAA's safety regulatory oversight of the ATC corporation.

B.Employee Transition

Another important issue is the transfer of current ATC employees to the new corporation. The 26,000 FAA Air Traffic employees and 11,000 Airway Facilities employees would be transferred to the ATC company en masse. Although they would lose civil service status (which is one of the objectives of spinning off ATC), their current pension rights would be guaranteed by the new corporation. In addition, controllers in high-stress, high cost-of-living areas of the country would be likely to receive compensation increases, as pay levels were adjusted to attract sufficient staff to those locations.

Given the general industry consensus that today's ATC system is capacity-constrained, there is little question that all of the current ATC work force would be needed. Indeed, the new corporation would be free to hire additional controllers from such sources as the military (which is now downsizing) and possibly some of the former PATCO controllers whom the FAA has been unable or unwilling to rehire. In addition, the corporation would very likely recruit a number of new managers (especially its top management) from private industry, to speed the change to a high-tech, commercial corporate culture.

Employee transitions have gone relatively smoothly in Germany, New Zealand, and Switzerland. To ease the transition in Germany, those ATC staff within five years of retirement have been permitted to remain in the civil service system for the remainder of their years, with pre-existing salaries and benefits. Other current staff are being phased over to commercial salaries and benefits on a five-year transition schedule. New hires begin at the commercial scale.

Switzerland retains separate military and civilian ATC systems. By contrast, Germany has merged the two into the single corporate DFS. Hence, a number of military enroute controllers now work for DFS (although military controllers for military-only airspace continue to work for the German air force).

In New Zealand, the military retains the right to provide its own ATC operations for military airspace. However, currently all military ATC in New Zealand is provided by Airways Corporation, under contract. For example, the approach control facility for the central North Island is a dual-use Royal New Zealand Air Force base at Ohakea. All ATC services at Ohakea are provided by Airways Corporation using civilian controllers. Those controllers, though employed by Airways, take special military training, receive air force commissions, and wear uniforms on duty at the base.

C.Charging Military Users

The revenue estimates in Section V assumed that government users of civilian ATC services would pay charges based on their fully allocated marginal costs for the services used. Since the military is the largest government aircraft operator, this means that it is assumed that the military would pay ATC user charges when it used the civil ATC system.

Charging military users is becoming standard practice overseas where ATC has been corporatized. Airways Corporation of New Zealand and DFS in Germany are now charging military users in this manner. In Germany, military transports pay regular enroute charges whereas fighter aircraft pay a fixed amount per flight, since they typically do not fly regular routes. In South Africa, where corporatized operations begin in August 1993, there will be a one-year transition period during which no fees will be charged to military aircraft. Thereafter, the military will negotiate an annual contract providing for a fixed fee for its use of civilian ATC services during that year.

Though it has not traditionally paid for ATC services (nor have any other U.S. users), the U.S. military pays market prices for other needed goods and services when it does not produce them itself—gasoline, boots, aircraft maintenance, leased telephone lines, management consulting, etc. There is no reason in principle why it should not pay normal rates for ATC services, once the ATC system has been changed to a user-funded system.

VII.U.S. AIRWAYS CORPORATION

A.Initial Transition

Based on the foregoing, it is recommended that the air traffic control function be divested from the FAA and vested in a new federally chartered corporation, the U.S. Airways Corporation. All current ATC-related staff, facilities, and equipment would be transferred to the new corporate entity. It would have a corporate charter and a normal corporate board of directors, with initial members appointed by the President and Congress, but with subsequent membership determined by the company itself. Airways Corporation would keep its books in accordance with Generally Accepted Accounting Principles. Initially, 100 percent of its shares would be held by the federal government, though possible user ownership (as in Switzerland) and/or investor ownership (as planned in New Zealand) should not be ruled out. The company would operate on a fully self-supporting, though not explicitly for-profit, basis.

The remaining functions of the FAA would remain within that agency; the primary two functions are the airport grant program and safety regulation and enforcement. U.S. Airways Corporation would be subject to safety regulation by the new FAA, on the same arms-length basis as airlines, airports, and aircraft manufacturers. In view of its monopoly status, the rates charged by Airways Corporation would be subject to review by the U.S. Department of Transportation.

U.S. Airways Corporation would have exclusive authority to provide enroute air traffic control services within the United States and its territories. Consistent with its commercial charter, the company would be free to contract with other entities for specific services—e.g., control tower operation (as the FAA does via its contract tower program) and flight service stations. It would

have all the usual powers of commercial corporations, including the right to hire and fire staff, to buy and sell property, and to issue bonds.

The company's predictable revenue stream from essentially captive customers would make Airways Corporation very attractive to the bond market. Once its management team was in place and modernization plans were developed and verified, the company's major capital expenditures could readily be financed by investment-grade bonds. This is in sharp contrast to the FAA's current requirement to finance capital improvements on a pay-as-you-go basis, with large annual uncertainties in its investment abilities due to the congressional appropriations process. A $5 billion annual revenue stream could easily support the issuance of $40 billion or more in bonds for modernization projects.

B.Expected Benefits

Corporatization of ATC would lead to major changes. In the short term, eliminating the civil-service constraints would provide the ability to attract and retain (via higher levels of compensation) additional controllers at TRACONs and towers in some of the system's most critical locations: New York, Chicago, Los Angeles, etc. Shifting experienced controllers to those locations would free up spaces for hiring additional controllers, thereby increasing both overall and full performance level (FPL) staffing levels.

Corporatization would also permit the recruitment of dynamic managers from private industry to develop and implement the corporation's business plan, including major modernization of air traffic control. Freed from the constraints of federal procurement regulations and external micromanagement, the new management could streamline and speed up the current ATC system upgrades, while reviewing and rethinking the longer-term plans.

One likely change in direction would be an accelerated movement toward satellite-based air traffic control. The military's Global Positioning System (GPS) provides the basis for a higher-technology approach to ATC. When supplemented by ground stations (so-called Differential GPS), this system appears to be capable of providing for precision approaches to airports, making it possible to scrap the FAA's ill-advised plan to shift to Microwave Landing Systems (MLS) for this purpose. Continental Airlines president Robert R. Ferguson has testified before Congress that a GPS-based ATC system could save the airline industry $525 million per year via delay reduction, more direct flight routing, and other savings.

Cost savings of that magnitude are consistent with DOT estimates of the current costs of airline delays, at approximately $5 billion per year ($3 billion in costs to airlines and $2 billion in passenger time wasted). Sources differ on the fraction of delays due to ATC limitations. At one end, the Aviation Consumer Action Project simulation model attributed some 50 percent of airline delays to this source, while the FAA's figure is only 10 percent. Those two extremes give a range of potential ATC-improvement cost savings of between $300 million and $1.5 billion per year.

The impact on general aviation from this transition would be surprisingly modest. Under the user-fee scheme outlined here, the majority of GA flyers (flying single-engine piston aircraft, for

personal or training purposes) would pay no fees at all, since they would not be using control towers or flying in controlled airspace. When such users did land or take off at a tower-equipped airport, they would pay about $2 for that service. To file a flight plan, small GA users would pay $9–18, and on those rare occasions when they made an IFR departure from a larger airport, they would pay $17. Turboprop and turbojet users, nearly all business and commercial, would pay fees of three to four times those levels—very small in proportion to the total hourly cost of operating such an aircraft. In exchange, they would receive the benefits of a modernized ATC system responsive to user needs.

C.Political Feasibility

After many years in which versions of this idea have been discussed and debated, the time appears to have come for spinning off ATC. The airline industry is strongly supportive of the recommendations to this effect from 1993's Airline Commission. Indeed, the Air Transport Association has been on record since 1985 supporting this idea. Modernizing the ATC system, not merely technologically but institutionally, so that it can keep pace with the dynamic airline industry, is very strongly in the airlines' interest.

Another important supporter is the consumer and union-oriented Aviation Consumer Action Project. As noted previously, this group's 1992 study called for divesting ATC from the FAA in order to remove this major capacity constraint from the airline industry. ACAP was part of the coalition that supported airline deregulation, and it may be able to build support for ATC spin-off among other consumer groups. In addition, its recommendations have been supported by air traffic controllers.

The FAA's ATC personnel are another group whose views will affect the feasibility of implementing this approach. Organized labor has a long history in support of spinning off ATC. The now-defunct Professional Air Traffic Controllers Association (PATCO) called for spinning off ATC as early as 1969. During the 1981 PATCO strike union leaders Lane Kirkland (AFL-CIO) and William Winpisinger (IAM) both made public endorsements of the idea. And in 1984, Larry Phillips of the U.S. Air Traffic Controllers Organization wrote an op-ed article advocating ATC privatization. The current controllers' union, NATCA, has not set forth a position on this issue, but the prospect of alleviating controllers' long-standing complaints about FAA's management of the system makes it plausible that they would support corporatization.

General aviation groups have been highly critical of the FAA's costly, bungled ATC modernization program. They have called for accelerated development of satellite-based ATC as an alternative. Their principal concern has been to limit the extent to which new taxes or user charges would be levied on the GA sector. The proposal in this paper has been crafted with these concerns in mind. Whether the various GA organizations will consider this approach (modest user charges in exchange for a major ATC system modernization) a reasonable trade-off remains to be seen. In the court of public opinion, however, asking business jets to pay their way in the ATC system will be seen as fair and reasonable, as will not charging small piston-engine planes that do not use ATC services. One hopes that charging the small users a few dollars when they do use ATC services will also be seen as fair and reasonable.

Is Congress likely to take this proposal seriously? Two factors argue in favor of this outcome. First, Congress is rightly concerned about the economic health of the airline industry. When its own commission recommends spinning off ATC as a key reform to help the industry recover, Congress can be expected to listen.

Secondly, this proposal deliberately separates the inherently governmental functions of the FAA from its service-business functions and leaves the former in government. Deciding on the amount and distribution of airport grants is inherently governmental, and should remain under congressional oversight as an FAA function. Likewise, the proposed restructuring will leave the new FAA free to focus its attention and resources on being a stronger, arms-length safety regulator. The Congress should welcome the opportunity to focus its oversight attention on airport grants and aviation safety, and leave the development and operation of a high-tech service business to the commercial sector.

VIII.IMPLEMENTATION STEPS

The first step toward spinning off ATC has been taken, as the National Commission to Ensure a Strong Competitive Airline Industry has recommended this reform. What is required to bring this restructuring about?

Congress should appoint a top-level industry/government Working Group, operating out of the DOT Secretary's office, to plan the transition. Industry representation should include the airlines, general aviation, and ATC systems firms, while government participants should include FAA Air Traffic and safety representatives as well as the Office of the Secretary. Their work should address in more detail the issues discussed in this paper, including the separation of Air Traffic and safety-regulation responsibilities, the user fee structure, itemizing and valuing the ATC system's physical facilities, assessing the availability of liability insurance, etc.

The Working Group should be given no more than six months to develop a transition plan, including draft enabling legislation to be submitted to Congress to create the new corporation and transfer existing ATC staff and facilities to it. Included in the enabling legislation should be the criteria for competitive selection of a private-sector management team to assume the leadership of the new corporation. Selection criteria should include not only the qualifications of the team members but also the credibility of their business/technological modernization plan.

Also included in the enabling legislation should be provisions for continued funding of the new FAA, with its responsibilities for airport grants (AIP) and safety regulation. The FY 1991 FAA budget for those functions was $1.54 billion for AIP and $950 million for the remainder, a total of $2.49 billion. That sum could be raised by continuing the present freight/waybill tax, international departure tax, and GA fuel taxes, plus an airline ticket tax of 3.5 percent (compared with the current 8 percent ticket tax for aviation purposes). Funding airport grants and aviation safety in this way would mean that airlines (including cargo and international) would pay for 95 percent and GA just 5 percent, not that different from the present incidence of aviation excise taxes.

ABOUT THE AUTHOR

Robert Poole received his B.Sc. and M.Sc. in engineering from MIT and has worked as an aerospace engineer. He is the author of numerous policy studies on aviation issues, and has advised the U.S. Department of Transportation on several occasions. He serves as president of the Reason Foundation.

APPENDIX

ATC Transaction Levels and User Payments

Obtaining quantitative estimates of flight activity levels for the different categories of airspace users is not easy. Three principal sources of data were used as a starting point. A 1992 Congressional Budget Office study of possible user-fee systems for transportation infrastructure provided overall 1990 activity levels for the principal types of ATC services, by major user group. But this document does not break down general aviation (GA) transactions by type of GA aircraft.

A starting point for those data were two detailed FAA reports, each issued only at several-year intervals; one covered 1990 and the other 1991. Since those reports were not intended to provide data directly related to ATC transactions, it was necessary to make several assumptions and then to derive missing transaction statistics from the reported data and the assumptions.

A summary database on GA transactions is presented in Table A-1. All data are broken down by aircraft type, using the standard FAA categories for piston and turbine GA aircraft. The first six columns are simply reproduced from the FAA reports. The number of landings per cross-country flight was not provided, and had to be estimated using ratios of total trip length to last-leg distance, as reported in Table 3.4 of the 1990 report. With this number in hand, it was then possible to solve simultaneous equations to derive the numbers of local and cross-country flights and the average number of hours per cross-country flight for each type of aircraft. The remaining data in Table A-1 were either taken from the two FAA reports or derived from other data in the table, with one exception. The number of towered landings for cross-country flights had to be estimated, since no data were available. The following fractions of cross-country flights were assumed to involve a towered landing: none for rotary-wing piston, one-third of single-engine piston, three-fourths of rotary-wing turbine, and all multi-engine piston, turboprop, and turbojet cross-country flights.

The database in Table A-1, plus the CBO data, then permitted a calculation of hypothetical ATC transaction payments, as summarized in Table A-2. The price schedule from Table 6 was used in these calculations.

Part A of Table A-2 derives airline payments. These are based on both enroute transactions involving ARTCCs and TRACON/large-tower transactions. Making the assumptions shown about the fraction of each type of transaction (for which different prices apply) leads to the total revenues shown, just over $3 billion at 1990 flight activity levels.

Part B repeats this type of calculation for commuter and air taxi operators, again relying on CBO operations data for 1990. Given the assumptions shown as to the relative numbers of each type of transaction, the resulting revenues total $1.1 billion for this category of user.

Part C then uses the GA activity data from Table A-1 to estimate the payments to be made for various ATC transactions by turbine and piston GA users. For ARTCC operations, the 7.9 million transactions were divided between turbine and piston based on those two groups' share of total GA cross-country miles flown, 32 percent versus 68 percent. The transactions were charged at the prices given in Table 6. For ATCTs, the 39 million operations were divided between turbine and piston based on those groups' shares of towered landings, 39 percent and 61 percent, respectively. Similar rules of thumb were used to allocate FSS transactions. For pilot briefings, the relative shares of cross-country flights was used (26/74); for flight plans, the relative share of flight plans (29/71); and for air contacts, the relative share of cross-country flight hours (20/80). The total payments based on these calculations are $371 million for turbine users and $298 million for piston users.

Finally, part D calculates the government user payments, using assumptions similar to those made in the case of air carriers. The result is estimated payments of $764 million.

It should be emphasized that these numbers are not precise; indeed, there are a number of inconsistencies between the two FAA survey reports. The purpose of this exercise is not to derive an exact pricing scheme, but merely to illustrate the magnitudes of the numbers of transactions likely to be involved in a user-fee system, and the relative magnitudes of the payment levels by different types of ATC users.

Table A-1

GA ACTIVITY LEVELS, BY TYPE OF AIRCRAFT, 1990–1991

					Local		Cross-Country	
	Landings (M)	Flight Hours (M)	Local Flight Hrs. (M)	Cr-Cntry Flight Hrs. (M)	Landings per Flt.	Hours per Flt.	Landings per Flt*	Hourspe r Flt**
Single-Engine Piston	33.9	20.5	9.08	11.39	2.8	1.22	1.54	1.34
Multi-Engine Piston	3.6	3.6	0.51	3.08	2.6	1.55	1.58	1.78
Rotary Piston	2.0	0.6	0.40	0.20	7.3	1.55	2.41	3.64
TOTAL PISTON	39.5	24.7	9.99	14.67	---	---	---	---
Turbo Prop.	2.0	1.5	0.05	1.45	1.5	0.97	1.35	1.02
Turbojet	1.0	1.2	0.02	1.18	2.1	0.54	1.29	1.66
Rotary Turbine	4.7	2.2	0.87	1.33	3.4	1.37	1.64	0.79

TOTAL TURBINE	7.7	4.9	0.94	3.96	---	---	---	---
Other	0.7	.5	0.5	0	2.7	0.76	N/A	N/A
TOTAL	47.9	30.1	11.43	18.63	---	---	---	---

Table A-1 (Continued)

GA ACTIVITY LEVELS, BY TYPE OF AIRCRAFT, 1990–1991

	No. of Flights (M)**		Cross-Country			Landings		Towered Landings*	
	Local	Cr-Cntry	Avg. Trip dist (mi)	Total Miles Flown (M)	Flight Plans (M)	Local (M)	Cr-Cntry (M)	Local (M)	Cr-Cntry (M)
Single-Engine Piston	7.44	8.50	225.8	1,919	5.21	20.83	13.09	1.33	4.29
Multi-Engine Piston	0.33	1.73	341.6	591	1.58	0.86	2.73	0.86	2.73
Rotary Piston	0.26	0.06	185.2	11	0.20	1.90	0.14	---	---
TOTAL PISTON	8.03	10.29	---	2,521	6.99	23.59	15.96	2.19	7.02
Turbo Prop.	0.05	1.42	288.2	409	1.17	0.08	1.92	0.08	1.92
Turbojet	0.04	0.71	782.5	556	0.59	0.08	0.92	0.08	0.92
Rotary Turbine	0.79	1.22	191.7	234	1.04	2.69	2.00	1.34	1.50
TOTAL TURBINE	0.88	3.35	---	1,199	2.80	2.85	4.84	1.50	4.34
Other	0.70	0	---	---	---	0.70	---	---	---
TOTAL	9.61	13.64	---	3,720	9.79	27.14	20.80	3.69	11.36

* estimated

** derived

SOURCES: FAA General Aviation Pilot and Aircraft Activity Survey, 1990; FAA General Aviation Activity and Avionics Survey, 1991.

Table A-2

DERIVATION OF ATC USER REVENUES

A. AIR CARRIER PAYMENTS

1. ARTCC18.5 million (M) operations—1990

Assume:Each flight averages

1 IFR departures 20%

4 Overs 80%

		5 Operations 100%	
		Hence:0.2(18.5 M) = 3.7 M @ $181.92 = $673.1 M	
		0.8(18.5 M) = 14.8 M @ $90.96 = $1,346.2 M	
Table 2 (Continued)			
DERIVATION OF ATC USER REVENUES			
		2. TRACON/towers12.9 M operations—1990	
		Assume: 80% of these are TRACON/large tower ops	
		20% of these are small towers	
		Hence:0.8(12.9 M) = 10.3 M @ $83.58 = $860.9 M	
		0.2(12.9 M) = 2.6 M @ $51.66 = $134.3 M	
3.Σ Air Carrier Payments = $3,014.5 M			
B. COMMUTER & TAXIS PAYMENTS			
		1. ARTCC5.6 M operations—1990	
		Assume:50% are IFR departures	
		50% are overs	
		Hence:0.5(5.6 M) = 2.8 M @ $178.54 = $499.9 M	
		0.5(5.6 M) = 2.8 M @ $89.26 = $249.9 M	
		2. TRACON/ATCT8.8 M operations—1990	
		Assume: 30% are TRACON/large tower ops	
		70% are small towers	
		Hence:0.3(8.8 M) = 2.64 M @ $82.02 = $216.5 M	
		0.7(8.8 M) = 6.16 M @ $11.92 = $73.4 M	
3.Σ Commuter Payments = $1,124.8 M			
C.General Aviation Payments	Total	Turbine Operations	Piston Operations
1.ARTCC	7.9 M	(32%) = 2.53 M	(68%) = 5.37 M
Assume:		IFR departures = 1/3 = 0.835 Overs = 2/3 = 1.695 M	

Hence:		0.835 M @ $88.11 = $73.6 M 1.695 M @ $44.06 = $74.7 M	5.37 M @ $17.08 = $91.72 M
2.ATCT	39.0 M	(39%) = 15.2 M	(61%) = 23.79 M
3.FSS		15.2 M @ $5.03 = $76.46 M	23.79 M @ $1.95 = $46.39
Pilot Brief	11.5 M	(26%) = 2.99 M 2.99 M @ $23.93 = $71.55 M	(74%) = 8.51 M 8.51 M @ $9.27 = $78.89 M

Table 2 (Continued)

DERIVATION OF ATC USER REVENUES			
IFR F.P.	5.3 M	(29%) = 1.54 M 1.54 M @ $23.93 = $36.85 M	(71%) = 3.76 M 3.76 M @ $9.27 = $34.86 M
VFR F.P.	1.6 M	(29%) = 0.46 M 0.46 M @ $47.71 = $21.95 M	(71%) = 1.14 M 1.14 M @ $18.50 = $21.09 M
Air Contact	6.1 M	(20%) = 1.22 M 1.22 M @ $13.49 = $16.46 M	(80%) = 4.88 M 4.88 M @ $5.23 = $25.52 M
4.Σ GA Payments		$371.57 M Turbine	$298.47 M Piston
D.GOVERNMENT USER PAYMENT			
1.ARTCC$5.5 M operations Assume:80% overs0.8(5.5) = 4.4 @ $94.75 = $416.9 M 20% IFR depart 0.2(5.5) = 1.1 @ $189.48 = $208.4 M			
2.TRACON/ATCT$2.8 M operations Assume:80% TRACON/lg. towers 0.8(2.8) = 2.24 @ 56.93 = $127.5 M 20% small towers0.2(2.8) = 0.56 @ 19.79 = $11.1 M			

3.Σ Government User Payments = $763.9 M