

**IMPROVING THE AIR TRAFFIC CONTROL SYSTEM:  
AN ASSESSMENT OF THE NATIONAL AIRSPACE SYSTEM PLAN**

**The Congress of the United States  
Congressional Budget Office**

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NOTE

Unless otherwise indicated, all dates are expressed in fiscal years, except those referring to legislative actions.

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## PREFACE

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In the coming years, the Congress will consider legislation appropriating funds for the National Airspace System Plan, a comprehensive strategy for modernizing the nation's air traffic control system. At \$11 billion over the next two decades, the costs of the Federal Aviation Administration (FAA) plan would exceed 36 times the total federal funding provided in 1982 for investment in air traffic control, making this one of the largest federal expenditures ever for a public works project. The Congress will, therefore, want to weigh the plan's costs against its potential benefits, judge whether it will prove a sound investment with a good rate of return, and assess its financial prospects. To provide information for these deliberations, the Congressional Budget Office has prepared this study of the FAA plan at the request of the Senate Committee on the Budget and the House Committee on Appropriations, Subcommittee on Transportation.

David L. Lewis prepared the study in the Congressional Budget Office's (CBO) Natural Resources and Commerce Division under the supervision of David L. Bodde and Everett M. Ehrlich. The author owes special thanks to Johanna Zacharias for editing the manuscript and to Kathryn Quattrone for typing the several drafts and producing it for publication. Patricia H. Johnston and Nancy H. Brooks also provided editorial assistance. For invaluable advice and assistance with the analysis, the author wishes to acknowledge Joseph S. Revis of J. S. Revis Associates; staff members of the World Bank, especially Pedro Taborga and Jenifer Wishart; Richard R. Mudge, of the CBO; Seymour Horowitz and S. B. Poritzky of the Federal Aviation Administration; as well as persons at the Office of Technology Assessment, the General Accounting Office and in other governmental, aviation, and electronics manufacturing organizations. Other staff members of the CBO who provided valuable comments include Robert Hartman, Robert Lucke, Suzanne Schneider, and Peyton Wynns. James N. Daukas, Jonathan Gifford, and Lauren Wasserman also assisted in preparing the analysis. In keeping with the CBO's mandate to provide objective analysis, this paper offers no recommendations.

Alice M. Rivlin  
Director

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## SUMMARY

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The Federal Aviation Administration (FAA) has formulated its comprehensive National Airspace System Plan to modernize and improve the efficiency of the nation's air traffic control system. Last year, the FAA spent more than \$2.4 billion to equip, maintain, and staff the existing system. The system today is a blend of several generations' engineering and equipment, much of which has been outmoded by technological advances. Though still adequate to maintain a high standard of safety, the system is already the cause of rising operating costs, and its effectiveness may soon be limited by the demands of increased air traffic. Further, because the system is made up of numerous installations and is heavily labor intensive, there is significant potential for improved effectiveness with fewer facilities and less manpower.

The FAA plan would achieve such efficiency gains, but at considerable investment cost both to the federal government and to users of the air traffic control system. On the basis of FAA data, the Congressional Budget Office (CBO) has placed the total cost of implementing the plan at \$10.7 billion (in 1982 dollars) between 1982 and the turn of the next century, while estimating savings in operating and maintenance costs alone at \$24 billion over the same period.

If fully implemented, the FAA plan offers the nation a sound economic investment. Indeed, such an investment appears overdue. The cost effectiveness of the plan, however, depends on organizational changes in the FAA, including a consolidation of facilities and a reduction in staff. In the past, such changes have been of great concern to the Congress, the FAA work force, and aviation interests. Failure to follow through with these changes could result in investment costs that exceed benefits to the FAA.

### LEGISLATIVE STATUS OF THE PLAN AND PENDING QUESTIONS

Recognizing the need to modernize the air traffic control system, the Congress has already authorized the first five years' funding for the FAA plan under 1982 legislation. What remain are decisions regarding the yearly appropriation of these considerable investment monies. In this context, two questions are of particular concern:

- o **How do the plan's costs weigh against its potential benefits? and**

- o **Does it have an assured source of funding?**

### THE FAA PLAN--ITS AIMS AND ASSUMPTIONS

The FAA plan would automate and consolidate elements in the air traffic control system. Through automation, it would increase capacity to handle traffic, diminish risks of mid-air collision and other hazards, and shorten flight times by allowing aircraft to follow more direct routes. Facility consolidation and staff reductions would reduce operating and maintenance costs. The FAA assumes that the present 25 en route navigation centers and 188 airport approach facilities would be consolidated into about 30 facilities by the year 2000. In addition, the 317 flight service stations would be reduced to 61 by the year 2000. Staffing would be reduced accordingly, from its authorized level of 37,122 in 1983 to 30,600 in 1985, and to 23,500 by the turn of the next century. (The current FAA work force of about 33,700 is some 9 percent below its authorized strength because of the lingering effects of the air traffic controllers' strike of 1981.)

#### Key Assumptions

As with any long-range investment, the FAA plan's estimated benefits and costs would hinge on a number of forecasts and assumptions about the future. The major assumptions that underlie the FAA plan, and the doubts that may cloud them, include these:

- o **Facility consolidation.** If accomplished, closure of facilities and attendant reductions of personnel would yield significant savings in operating costs. Resistance to such consolidation has been manifested not only by labor and aviation groups, however, but also by the Congress itself.
- o **Rapid growth in air traffic.** Should the growth in air traffic resume the rapid rate seen in the late 1970s, both justification for and the resources to finance the plan would be available. Some analysts, however, see aviation traffic growing at a more moderate rate and suggest that an assumption of slower growth may represent a more realistic and certainly more stringent test for assessing the plan's economic value. (The assumption of slower air traffic growth is termed a "maturity scenario," reflecting the possibility that only gradual market expansion is to be expected.)
- o **Sufficient revenues to the Airport and Airway Trust Fund.** Should air travel resume earlier rapid growth rates, revenues to

the trust fund--which is now in sound financial shape--would be more than adequate to cover the FAA plan's costs. (Trust fund financing comes mostly from an 8 percent tax on airline tickets.) But economic recession and airline deregulation have caused a sharp reversal in the market, leading to depressed levels of patronage and to fare wars that have driven air travel prices steeply downward.

On the basis of its assumptions, the FAA has projected that its plan would save the federal government \$24 billion (in 1982 dollars) between 1982 and the year 2000--about two-thirds the value of all the benefits it expects from the plan. The remaining one-third of the benefits, taking the form of lower operating costs and reduced delays, would accrue to the airlines and to general aviation (owners of small planes used for business or recreation). The FAA has made no attempt to place a dollar value on the improved safety expected from the plan.

Most of the \$10.7 billion cost--about 72 percent--is public, representing direct federal investment in computer hardware and software and in other improved equipment. The remainder is private, representing investment expense for the airline industry and general aviation users. One key component of the plan's technological and economic success is institution of the microwave landing system, designed to hasten and improve the accuracy of airport landings. This system would require aviators to purchase compatible cockpit equipment.

#### RATE OF RETURN

On the basis of these benefit and cost projections, the CBO calculates that the annual rate of return to be expected from the FAA plan over the two decades is 24.3 percent--a healthy return by any standard (see Summary Table). Indeed, measured against the commonly used if somewhat arbitrary standard of 10 percent set by the Office of Management and Budget (OMB) for federal investment, the FAA plan appears to offer very good value.

Another useful guide to the economic value of a capital project is the present value of the expected benefits minus the costs. Using FAA assumptions and 10 percent as the discount rate to adjust future costs and benefits to their present-day values, the benefits of the FAA plan are estimated to exceed its costs by \$9.1 billion.

The foregoing conclusions are, of course, only as valid as the assumptions and forecasts on which they are based, and these cannot be absolutely certain. Thus, it is useful to look at what could happen to the plan if things do not go as the FAA has assumed.

SUMMARY TABLE. ECONOMIC EVALUATION OF THE NATIONAL AIRSPACE SYSTEM PLAN UNDER ALTERNATIVE ASSUMPTIONS, 1982-2005

Assumptions	Annual Rate of Return (In percents)	Discounted Benefits Minus Discounted Costs (In billions of dollars) <u>a/</u>	Ratio of Benefits to Costs <u>a/</u>
Under FAA Assumptions	24.3	9.1	2.3:1
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FAA Operating Cost Savings Delayed Five Years	13.9	3.1	1.5:1
FAA Operating Cost Savings of Half Those Assumed by FAA <u>b/</u>	9.1	-0.4	0.9:1
Traffic Forecasts Under Maturity Scenario <u>c/</u>	21.3	6.8	2.0:1

SOURCE: Congressional Budget Office and FAA data.

NOTE: The analysis period begins at 1982, the year of the plan's approval in the Congress.

- a. All benefits and costs are discounted to their present (1982) values at the rate of 10 percent per year.
- b. This line includes only federal investment costs and federal benefits in the form of savings in FAA operating costs. It excludes avionics costs to airlines and general aviation users, as well as direct benefits to them.
- c. Assumes slower growth rate in air traffic than that assumed by the FAA.

### Savings in Operating and Maintenance Costs

The plan's economic success would depend critically on the Congress' decision to close hundreds of manned facilities and to effect a personnel reduction of some 14,000 FAA employees. Failure to follow through with these changes could result in costs that exceed benefits. If the opposition--already expressed both by aviation groups and the Congress to similar changes--delayed the plan's changes by as much as five years, the project overall would still be worthwhile--with a rate of return of 13.9 percent. The project would take longer to pay off, though, and the Congress would be relying on more distant, and thus more speculative, forecasts to achieve an acceptable return on its investment. If reluctance to make organizational changes obviated half the total projected savings in operating costs, then the FAA would actually lose money by implementing the plan. That is, the discounted federal investment costs would exceed the discounted savings in FAA operating and maintenance costs (see Summary Table).

### Growth in Air Traffic

In other areas, however, even quite pessimistic assumptions appear not to weigh heavily against the plan. Analysis by the CBO suggests that, under conditions considerably less advantageous than the FAA assumes, the plan would still yield worthwhile savings.

For example, although modernization can yield sizable gains in efficiency independent of traffic growth, slower growth than expected would diminish the benefits of the FAA plan. The FAA's forecasts assume that the relationship between the growth in air traffic and in the economy as a whole will continue as it has in the past, with economic recovery bringing robust new growth to aviation. The CBO's statistical analysis of recent trends, however, suggests the possibility that future demand for aviation services could mature and grow at a slower rate than the FAA assumes because of gradually slowing demand for commercial air travel and for general aviation planes. Such a pattern has, for example, affected the market for passenger cars. Under such a "maturity scenario" in aviation, activity could fall below FAA projections by 11 percent in 1987 and by 30 percent in the year 2000.

Even under the slower growth predicted by a maturity scenario, however, the overall annual rate of return of the FAA plan would exceed 20 percent, and discounted benefits would exceed discounted costs by about \$6.8 billion (see Summary Table). This is because system modernization and consolidation would yield sizable savings in FAA operating costs even if there were little growth in traffic.

## Financing the Plan

Financing for the FAA plan is subject to some of the same uncertainty that shrouds the plan's investment value. Like most other federally financed aviation activity, the FAA plan would be financed by taxes on aviation users that are paid into the Airport and Airway Trust Fund. The most important of these taxes is the 8 percent tax on commercial airline tickets. At present, the trust fund is on solid financial ground, with an uncommitted cash surplus of \$1.8 billion projected for the end of 1983.

The trust fund's present financial solidity, however, derives from the rapid growth in air travel of several years ago. With a great many high-priced tickets being sold and 8 percent of the price of each going to the trust fund, revenues--and interest-bearing balances--were high. In a much changed market climate today, however, the trust fund may be looking ahead to leaner times. As stated earlier, economic recession has depressed ridership, and the lifting of federal regulation has triggered a round of price wars and competition for service on routes. Together, these factors have caused a drop in the projected yield to the trust fund from taxes on ticket sales, and the FAA plan therefore faces some risk of finding the trust fund inadequate to cover investment costs.

Even with a slow recovery in ticket prices, however, outlays and receipts would remain in overall balance. Although unpaid authorizations would temporarily exceed available cash by a minor amount in 1986, the fund would remain financially sound. Financial problems could arise if, in addition to low ticket prices, passenger traffic is lower than expected by the FAA. This could necessitate a small tax increase in 1986 or 1987. But the risk of lower traffic would be diminished by the attraction of lower-cost air travel.

Appropriations from the trust fund for 1984 have now been set at half the authorized levels. Although this reduces the risk of a shortfall in trust fund revenues, it raises important questions of economic efficiency and equity. By slowing the pace of air traffic control system improvements, this action diminishes the economic timeliness of the FAA plan. In addition, the entire burden of operating the air traffic control system would fall on the general taxpayer, in contradiction of the user-pays principle embodied in the trust fund philosophy.

## CONCLUSION

Modernization of the air traffic control system seems to be well timed, and the FAA's National Airspace System Plan appears to offer the

nation a good return on its \$10.7 billion investment. This conclusion holds even after allowing for a wide range of uncertainty and possible major errors in some of the plan's underlying assumptions. On the basis of ranges, that CBO estimates for major costs and benefits, the FAA plan has a 20 percent chance of falling below an acceptable (10 percent) rate of return. Though the risk of economic failure appears to be fairly small, the Congress will need to ensure that the potential savings in FAA operating costs are actually achieved; closure of hundreds of facilities and a substantial reduction in FAA personnel will be necessary to guarantee the plan's financial success.

