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Mr. Chairman, I am pleased to appear before your Committee to discuss CBO's economic appraisal of the National Airspace System Plan of the Federal Aviation Administration (FAA)--a multi-billion dollar long-range capital program to modernize and expand the nation's air traffic control system. Funding for the first five years of the program was authorized under the Airport and Airway System Development Act of 1982, and the Congress now faces major decisions regarding the appropriation of these investment dollars.

The weight of technical opinion is that we must modernize the nation's air traffic control infrastructure. The economic question is how and when to do this. Our appraisal indicates that, 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.

My remarks this morning will cover three topics:

- o Flaws in the current air traffic control system;
- o The FAA plan and its major assumptions; and
- o Our economic analysis of the effect that errors in the FAA assumptions might have on the plan.

FLAWS IN THE CURRENT SYSTEM

The Federal Aviation Administration's first responsibility in operating the nation's air traffic control system is to ensure the safe and efficient movement of planes. Today the system is a blend of several generations of technologies and equipment, much of which is labor intensive and obsolete by modern standards. Indeed, the present equipment was designed to be most efficient at air traffic volumes below today's level and below the level projected for the future. This system has been adequate to assure that air transportation remains a very safe means of travel. But limitations in the system already cause delays for air travellers, as well as very high operating and maintenance costs for the FAA. As the skies become more crowded in the future, the present system may not be able to maintain the highest standards of safety, and costs can be expected to grow disproportionately.

THE FAA PLAN: ITS AIMS AND ASSUMPTIONS

The FAA plan would automate and consolidate the air traffic control system. Through automation, it would increase traffic handling capacity, diminish the risk of mid-air collision and other hazards, and reduce flight times by allowing aircraft to use more direct routes. Through facility consolidation and staff reductions, the plan would reduce operating and maintenance costs. 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 30,200 in 1985, and to 24,200 by the turn of the 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 controller strike.)

Key Assumptions

As with any long-range investment, the estimated benefits and costs of the project hinge on a number of assumptions and forecasts about the future. The major assumptions that underlie the FAA plan include:

- o An ability to consolidate facilities and thus achieve significant savings in operating costs;
- o Continued rapid growth in air traffic;
- o No cost overruns;
- o Little likelihood of early technological obsolescence; and
- o Cost-effectiveness for each element of the plan.

Based on these assumptions, the FAA has projected that its plan would save the federal government $25 billion (in 1982 dollars) between 1982 and the year 2000--about two-thirds of the total benefits it expects from the plan (see Appendix Table A). The remaining one-third of the benefits would accrue to the airlines and general aviation users in the form of lower operating costs and reduced delays. No attempt was made to place a dollar value on the increases in safety expected from the plan.

The FAA estimates the major cost of modernization at $10.7 billion in 1982 dollars (see Appendix Table B). Most of this cost--about 83 percent--represents direct federal investment in computer hardware and software improvements and in other equipment. The remainder represents investment expense for the airline industry and general aviation users, who would need to purchase compatible cockpit equipment (transponders and other avionics equipment).

Based on these benefit and cost projections, the CBO calculates that the annual rate of return to be expected from the National Airspace System Plan over the next 20 years is 24.3 percent--a healthy return by any standards (see Table 1). Indeed, compared with the commonly used (though somewhat arbitrary) standard of 10 percent set by the Office of Management and Budget (OMB) for federal investment, the FAA plan appears to represent 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.

When should modernization begin? One index of whether a project is well timed is how long the nation must wait before the investment begins to pay off. A long waiting period means that success of the plan hinges on ever more distant forecasts, and such distant forecasts inevitably tend toward speculation. Based on the FAA estimates of costs and benefits, the plan would begin to pay for itself (that is, achieve a 10 percent or greater rate of return) within the next five years. This would suggest minimum risk in going ahead with the project now.

TABLE 1. ECONOMIC EVALUATION OF THE NATIONAL AIRSPACE SYSTEM PLAN UNDER ALTERNATIVE ASSUMPTIONS

Assumption	Annual Rate of Return (in percent)	Discounted Benefits Minus Discounted Costs (in billions of dollars) a/	Ratio of Benefits to Costs a/
FAA Assumptions	24.3	9.1	2.3
FAA Operating Cost Savings Delayed Five Years	13.9	3.1	1.5
FAA Operating Cost Savings of Half Those Assumed by FAA b/	9.1	-0.4	0.9
Traffic Forecasts Under "Maturity Scenario"	21.3	6.8	2.0
Cost Overrun of 25 Percent, with Maturity Scenario	17.1	5.0	1.6
Technological Obsolescence by the Mid-1990s, with Maturity Scenario	16.5	2.1	1.3

a. All benefits and costs are discounted to their present (1982) values at the rate of 10 percent per year. The analysis period is 1982 to 2005.

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.

EFFECT ON THE PLAN OF ERRORS IN THE FAA ASSUMPTIONS

The foregoing conclusions are, of course, only as valid as the assumptions and forecasts upon 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 assumed.

Savings in Operating and Maintenance Costs

The FAA projects savings of $25 billion (in 1982 dollars) in operating and maintenance costs over the next 20 years. These savings depend critically upon the closure of hundreds of manned facilities, and a reduction of 14,800 in the number of FAA employees, or 40 percent of the authorized work force level. Such changes have encountered opposition in the past in the Congress and among labor and aviation groups. If this reluctance delayed the changes this time by as much as five years, the project overall would still be worthwhile--with a rate of return of 13.9 percent; however, the project would take longer to pay off, 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 wiped out 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 (Table 1).

Growth in Air Traffic

Modernization can yield sizable gains in efficiency independent of traffic growth. But if FAA's traffic forecasts should prove to be too high, benefits overall would be lower than anticipated. Past FAA forecasts of the long-range growth in air traffic have, in fact, been too high. This has led some Congressional agencies (such as the General Accounting Office and the Office of Technology Assessment) to question whether the FAA plan is well founded. The CBO has evaluated the FAA forecasts from two perspectives--FAA's past forecasting performance, and an analysis of recent trends.

Past Forecasting Performance. In the past, the FAA's long-range projections have averaged 50 percent or more above actual air traffic (see Appendix Table C). In 1968, for example, the FAA forecast 61 percent more aircraft using en-route navigation services in 1980 than actually occurred,

33 percent more take-offs and landings, and 63 percent more aviation fuel consumption. The last verifiable long-range forecast was made in 1970, however, and there is reason to expect that some improvements have been made. An examination of the FAA's medium-term (five-year) projections shows substantially more accurate results. Nevertheless, FAA's forecasts of general aviation traffic--which represents about 65 percent of anticipated future growth--have been somewhat less accurate than its forecasts of total civilian aircraft traffic. (See Appendix Table C.)

Alternative Trend Interpretations. 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. CBO's statistical analysis of recent trends suggests the possibility that the demand for aviation services could mature and grow at a slower rate than that assumed by the FAA, because of gradually diminished demand for air travel and for privately owned airplanes. Similar cycles have affected other markets such as that for automobiles. Under such a "maturity scenario" (see Figures 1 and 2), aviation activity would fall below FAA projections by 11 percent in 1987 and 30 percent in the year 2000.

Effect on the Plan. Even under the slower growth predicted by a "maturity scenario," 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 Table 1). This is because system modernization

FIGURE 1

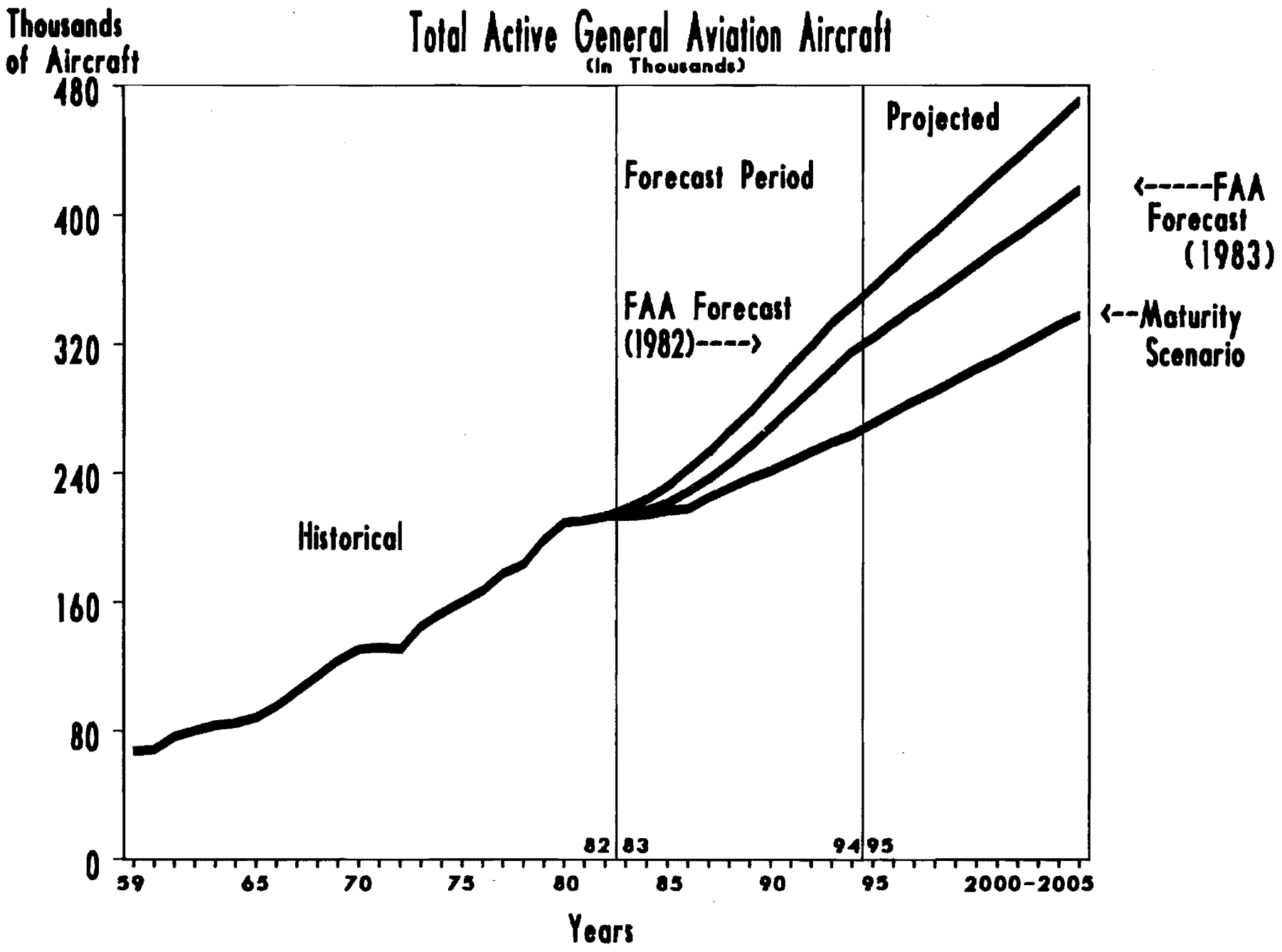
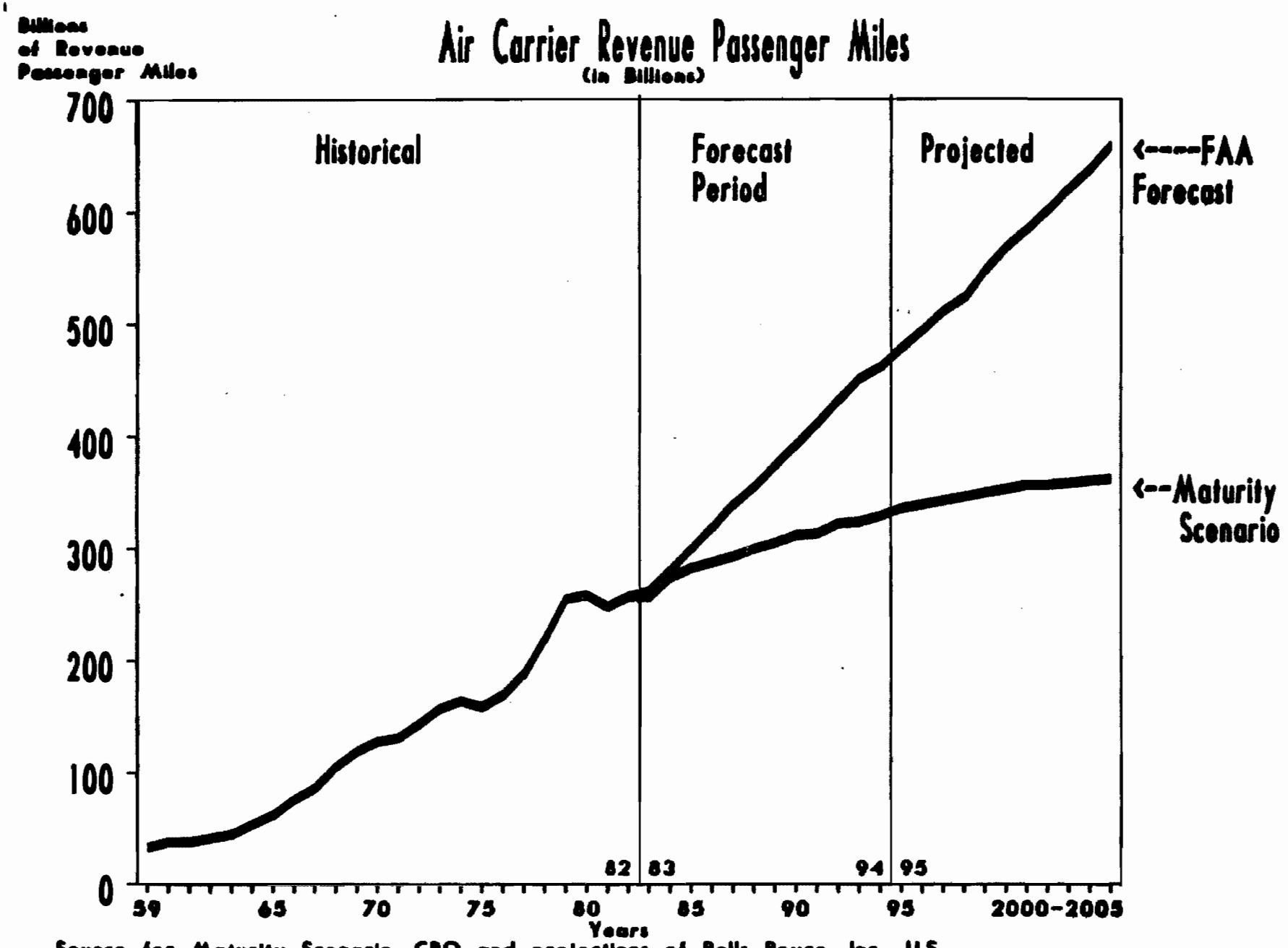

Thousands of Aircraft
Total Active General Aviation Aircraft
(In Thousands)
480
400
320
240
160
80
0
Projected
Forecast Period
FAA Forecast (1982)---->
Historical
<-----FAA Forecast (1983)
<--Maturity Scenario
82
83
94
95
59
65
70
75
80
85
90
95
2000-2005
Years

FIGURE 2



Source for Maturity Scenario: CBO and projections of Rolls Royce, Inc., U.S. Airlines Indicators and Projections, July, 1981.

and consolidation would yield sizable savings in FAA operating costs even if there were no growth in traffic.

Cost Overruns

Although CBO has not made a detailed assessment of FAA's cost estimates, cost overruns are common in both private and public investments. Higher costs would diminish the value of the FAA plan, but the overruns would have to be quite large to cause its economic failure. For example, a 25 percent cost overrun would still yield net benefits of $5 billion, even with lower traffic than forecast. In fact, capital costs would need to double before the costs would exceed the benefits, even with the lower traffic forecasts.

Technological Obsolescence

Another risk common to projects of this type is that technological developments may render the new facilities obsolete before their full benefits have been realized. Although the FAA plan calls for the introduction of state-of-the-art computer hardware and software technology, rapid technological developments could make such equipment obsolete before the

end of its currently planned economic life--just as some of the FAA's current equipment is now being phased out before the end of its designed life. From an economic point of view, however, the CBO analysis indicates that the FAA plan is reasonably safe from the risks of technological obsolescence. Even under lower traffic forecasts, if the equipment were to be replaced again in the mid-1990s (rather than in the early 21st century as planned), net benefits would still be positive--somewhat over $2 billion. While this is below the $9 billion of benefits under the FAA assumptions, it remains an acceptable investment with an annual rate of return of about 16 to 17 percent.

Cost-Effectiveness of Different Components of the Plan

Although the FAA plan as a whole appears to offer the nation a good return for its money, questions might be raised about individual components of it. One important part of the FAA plan is the $2.3 billion Microwave Landing System (MLS)--a new instrument landing device that allows shorter flight times by reducing the approach path for incoming aircraft. The value of the MLS system depends on the monetary value assigned to reduced delay. Time is an economic resource, in the sense that delay reduces time spent in productive work or other activities, and the value that air

passengers place on their time would determine their willingness to pay for the introduction of the MLS system through ticket taxes and other user fees.

The FAA has valued time at 100 percent of a person's hourly earnings, and on this basis the net benefits of MLS total $583 million. Research indicates, however, that people may value their time at as little as 30 percent of their hourly earnings. If that lower value were assumed, MLS would lose $177 million since discounted costs would exceed discounted benefits by that amount. Under such an assumption, selective application of MLS rather than system-wide implementation might be considered. It should be added, however, that not all of the potential safety and environmental benefits of MLS can be quantified.

CONCLUSION

System modernization seems to be overdue, and the FAA's National Airspace System Plan appears to offer the nation good value for its money. This conclusion holds even after allowing for a wide band of uncertainty in some of the plan's underlying assumptions. The Congress will need to ensure, however, that the potential savings in FAA operating costs are actually achieved. The closure of hundreds of facilities and a substantial reduction in the work force will be necessary to guarantee the success of this $11 billion investment.

APPENDIX A. FEDERAL AVIATION ADMINISTRATION ESTIMATES OF THE BENEFITS FROM THE NATIONAL AIRSPACE SYSTEM PLAN (In millions of 1982 dollars)

	Total Benefits, 1983-2005		Net Present Value with 10 Percent Discount Rate	
	In Dollars	As Percent of Total	In Dollars	As Percent of Total
Savings in FAA Operating Costs from Increased Productivity	37,085 a/	62.2	10,639	66.5
Savings in Fuel From Transponders and TCAS b/				
Air carriers	11,290	18.9	2,622	16.4
General aviation	5,070	8.5	1,127	7.0
Savings From Microwave Landing System				
Improved safety	279	0.5	77	0.5
Reduced disruptions	2,521	4.2	655	4.1
Reduced outages	240	0.4	69	0.4
Reduced ground and air restrictions	1,994	3.3	500	3.1
Reduced path length	1,118	1.9	298	1.9
Total	59,595	100.0	15,987	100.0

a. The FAA estimates that savings in operating costs would total $25 billion by the year 2000. The CBO has projected another five years of savings for analytic purposes. However, the discounting of future costs makes this difference of very little significance.

b. TCAS = Traffic Alert and Collision Avoidance System.

APPENDIX B. FEDERAL AVIATION ADMINISTRATION ESTIMATES OF THE COSTS OF IMPLEMENTING THE NATIONAL AIR-SPACE SYSTEM PLAN (In millions of 1982 dollars)

	Total Cost 1983-2005		Net Present Value with 10 Percent Discount Rate	
	In Dollars	As Percent of Total	In Dollars	As Percent of Total
Federal Investments	7,646	71.7	5,730	82.7
Avionics Costs to Users				
Transponders and TCAS a/	2,420	22.7	879	12.7
Microwave landing system	592	5.6	321	4.6
Total	10,658	100.0	6,930	100.0

a. TCAS = Traffic Alert and Collision Avoidance System.

APPENDIX C. ACCURACY IN FAA FORECASTS OF THE NUMBER OF AIRCRAFT HANDLED AT TRAFFIC CONTROL CENTERS (Twelve-year and five-year errors, as percent above or below actual)

Year in Which Forecast Was Made	Total Civilian Aircraft		General Aviation		Air Carriers a/	
	Twelve Years	Five Years	Twelve Years	Five Years	Twelve Years	Five Years
1966	24.7 b/	3.0	30.4	23.7	21.9	-3.1
1967	61.0	32.2	67.1	38.5	57.7	30.3
1968	60.6	25.4	95.5	26.1	41.8	25.2
1969	64.0	24.7	89.9	15.7	49.4	28.1
1970	74.9	17.2	185.3	30.9	23.1	11.7
1971	---	7.6	---	43.3	---	-8.0
1972	---	10.2	---	43.5	---	-5.5
1973	---	1.3	---	15.4	---	-5.8
1974	---	-1.2	---	-9.1	---	3.1
1975	---	-1.2	---	-11.2	---	4.2
1976	---	8.5	---	11.2	---	7.6
1977	---	23.8	---	50.1	---	11.3

a. Includes air taxi.

b. For example, the 1966 forecast of total aircraft to be handled 12 years later (1978) turned out to be 24.7 percent too high.