Chapter 1

EXECUTIVE SUMMARY

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The National Airspace System includes about 6,500 public-use airports connected by a network of air routes defined by navigational aids. Aircraft operating along these routes and in terminal areas near airports are monitored and controlled by a system of ground-based surveillance and communications equipment—the air traffic control (ATC) system—operated by the Federal Aviation Administration (FAA).

In 1980, the 435 airports with FAA towers handled some 180,000 takeoffs and landings per day, or roughly 66 million per year, of which 74 percent are general aviation flights and 4 percent are military. The remaining 22 percent of operations are commercial flights (air carrier, commuter, and air taxi) and are heavily concentrated in a few large airports. The 66 top airports handle 77 percent of commercial operations and 88 percent of passenger enplanements; the 10 largest handle 33 percent of operations and 47 percent of passengers.

This concentration of air traffic at a few large hubs creates congestion and delay, which in turn increases airline operating costs and, ultimately, the cost of air travel for the public. As air traffic and fuel prices increase, the cost of these delays will be magnified. General aviation users of major hubs also feel the effects of delay in the form of access restrictions imposed during peak hours to deal with airport congestion.

Concern about these problems, and about the feasibility and cost of the proposed solutions, prompted the House Committee on Appropriations (Subcommittee on Transportation) to request that OTA undertake an assessment of airport and terminal area capacity and related ATC issues. The Senate Committee on Commerce, Science, and Transportation endorsed the request of the House Committee on Appropriations, which directed OTA to concentrate on four major topics:

- scenarios of future growth in air transportation;
- alternative ways to increase airport and terminal area capacity;
- technological and economic alternatives to the ATC system modifications proposed by FAA; and
- alternatives to the present ATC process.

OTA's major findings are presented below.

AVIATION GROWTH SCENARIOS

FAA expects air traffic to increase considerably over the next 10 to 20 years, and with it the demand for ATC services. Its plans for modernizing and expanding the National Airspace System are predicated on accommodating continued rapid growth. **A key assumption** in FAA's *Aviation Forecasts* has been that there will be **no constraints on future growth** and that new facilities and equipment will be deployed where and when needed to meet demand. FAA **forecasts have consistently exceeded actual demand in the past,** however, with lo-year projections of growth as much as 50 percent higher than actually occurred. This raises questions about the usefulness of FAA forecasts as a basis for long-term planning and about how quickly FAA needs to proceed with capacity-related improvements in its 1982 National Airspace System Plan (NASP).

Most other aviation forecasts generally support FAA's projections, but some do not. This is not surprising in light of the uncertainty about the factors that may affect future traffic growth. The Air Transport Association and a major aerospace firm have suggested that the U.S. airline industry may already be approaching its mature size, which would mean that air carrier operations may level off or even decline by the end of the century. Airline deregulation has destabil-

ized market structure and airline profitability, leading to questions about the ability of the industry to finance badly needed new equipment. There are questions about the future price and availability of aviation fuel and about the long-term impacts of the Professional Air Traffic Controllers Organization walkout.

There is also uncertainty about the future distribution of operations among user groups and among airports. FAA expects general aviation users to account for 75 percent of the increase in demand, but there are large uncertainties about the continued growth of the general aviation fleet. One such uncertainty is the future price and availability of the aviation gasoline used by small personal aircraft. **As for air carriers, market forces and the restrictions imposed following the strike have already resulted in a redistribution of operations** away from congested hubs to second-tier airports that have excess capacity. **This new trend, in combination with improved facilities for general aviation traffic at reliever airports, could make it possible to accommodate some increases in aggregated operations within existing system capacity.**

AIRPORT CAPACITY ALTERNATIVES

At any given airport, delay occurs when demand for terminal airspace or runways approaches the capacity to handle aircraft safely. Some delay is normal and inevitable, especially during peak traffic hours or when capacity is reduced because of adverse weather. At some major airports, however, the level of demand is now such that delay is chronic and severe. These delays inconvenience passengers, increase airline operating costs, and waste over a hundred million gallons of fuel each year.

One way to deal with delay is to increase the capacity of hub areas, either by adding runways to an existing airport or by building a new airport to relieve other, overcrowded airports. Large amounts of land are required, however, and there are strong community objections to airport noise. These factors have made major airport construction and expansion rare in the past decade. In addition, building new runways or airports requires years of planning (and, in some cases, litigation) before it can be implemented. At some airports, however, independent "stub" runways for propeller aircraft could increase effective capacity and minimize land-use and noise problems.

A more immediate way to alleviate delay is to manage traffic so that demand fits within existing capacity. This could be done through **economic measures,** such as differential pricing schemes to help divert traffic from peak to off-peak hours, or perhaps from congested to underutilized airports. **Administrative measures,** such as hourly quotas or user restrictions, could induce a similar reallocation of demand.

Improved ATC technology could also help ease airport congestion. Automated terminal-area metering and spacing, to smooth and expedite the flow of traffic, and the Microwave Landing System, to permit more flexible use of crowded airspace close to the airport, might permit existing capacity to accommodate more operations. The magnitude of the potential benefits varies widely with local conditions, runway configuration, and traffic mix.

There is no single "best" way to increase capacity or reduce delay. A variety of measures—economic, administrative, and technological—will be needed and the optimum solution for any given airport will be determined largely by local conditions.

AIR TRAFFIC CONTROL

FAA is planning a program of technological improvements intended to enable the National Airspace System **to handle a higher volume of traffic with increased efficiency and safety.** This new technology will replace present equipment —some of which has been in use for over 40 years—with a **modern integrated system that will be more reliable and productive.** This should allow new or improved forms of service to be offered to airspace users. **Operating costs** should be lower than with the current generation of ATC equipment, but there would also be major capital cost requirements. Many of these improvements can be implemented during the next 10 years, but the full modernization program will not be completed until the late **1990's.**

Two technologies are at the heart of the new generation of ATC: 1) advanced computers; and 2) a two-way digital data link between aircraft and the ground. Advanced high-speed computers and new software will permit the ATC system to improve the overall management of traffic flow, as well as to formulate tactical measures that will ensure conflict-free, expeditious, and fuel-efficient flight paths for individual aircraft. Replacement computers will be installed first in en route ATC centers, then in terminal areas, and finally in a central flow control facility that will manage air traffic on a national basis. **In addition to safety and capacity benefits, these computers will permit a level of automation in ATC that will greatly reduce the workforce** needed to handle future traffic loads.

The improved data link between aircraft and ground facilities will permit a rapid and extensive exchange of information and instructions without relying exclusively on voice radio for communication—for example, transmittal of clearances and weather information. FAA **also proposes to use this data link as the basis for the Traffic Alert and Collision Avoidance System (TCAS)** which will provide aircraft with an independent, airborne supplement to ground-based separation assurance.

In terminal areas, the use of **the Microwave Landing System (MLS) will provide more precise and reliable guidance for landing** in adverse weather conditions. **In combination with procedural changes, MLS could also lead to more efficient use of airport capacity** because it allows aircraft to follow any of several curving or segmented approach paths to the runway, thereby easing some of the constraint imposed by the present Instrument Landing System (ILS), which provides only straight-line guidance along a single path.

In general, OTA finds that the ATC system improvements proposed by FAA are **technologically feasible** and **desirable with respect to safety, capacity, and productivity,** although there are alternatives that might be equally effective. In most of the programs reviewed, **detailed cost and benefit information is not yet available, making it difficult to judge the cost effectiveness of the FAA proposals** in relation to the possible alternatives. For the same reason, it is not yet fully **clear whether the overall benefits will exceed the capital expenditures** needed to effect the improvements, **how the benefits will be distributed** among user groups, and how system cost will be allocated. Further information will be needed on implementation plans and specific costs and benefits throughout the Congress' consideration of the FAA's 1982 National Airspace System Plan.

Funding Issues

Based on information available at the end of 1981, OTA estimates that the costs of airport development grants-in-aid, modernization of ATC facilities and equipment, and related research and development could average roughly $1.5 billion per year over the next 10 years, about **50** percent higher than the level of recent years. **Congress has several options to provide funding for these programs.** One would be to cover these expenditures by **general fund appropriations.** This option, while it would afford the Congress continuing close control of FAA programs through the annual appropriations process, might not provide the assured continuity of funding needed for undertaking a 10-year program of the scope envisioned by FAA.

Alternative options involve **reestablishing, in one form or another, the Airport and Airways Trust Fund** which expired in October 1980. Possible approaches to reinstituting the trust fund include: **1) a user tax structure and tax rates similar to those that existed before; 2) higher user tax rates—raised either uniformly or selectively by type of user; or 3) a different scheme of taxation that would levy fees in proportion to benefits received or costs imposed** by each type of airspace user.

All of these options are controversial, and the search for a solution is complicated by many long-standing issues about the equity of user charges and the appropriate distribution of trust fund revenues. Other issues that could emerge in the debate are **how to use the present uncommitted balance in the trust fund** (amounting to about $3 billion) and **whether to use trust fund moneys to help meet operating and maintenance costs.** In the past, trust fund allocations derived from user fees have covered only about 15 percent of these costs, and many feel that users should pay a larger share of them. Others argue that trust fund moneys should be reserved exclusively for capital improvements and R&D expenses,

RESPONSE TO FUTURE GROWTH

Basically, there are three forms of action that can be taken to affect growth: regulatory, economic, and technological. **Regulatory actions** include measures imposed by the Government that would restrict the use of airspace or the availability of ATC services according to user class or types of activity. Economic **measures** are those that would affect the cost of using the airspace or that would allow the market forces of competitive pricing to determine access to facilities and services that are in high demand. **Technological responses** include not only improved forms of ground-based and avionic equipment to increase the efficiency of airspace use, but also increases in airport capacity through the construction of new or improved landing facilities. **All three approaches are likely to be used; the issue is not which to adopt, but what combination and with what relative emphasis.** Ultimately, the measures adopted to deal with growth will reflect a more fundamental policy decision: **is growth to be accommodated wherever and whenever it occurs; or is it to be managed and directed so as to make the most effective use of existing resources, with the costs fairly borne by the beneficiaries.**