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AIRPORT LAND BANKING

Report of the Secretary of Transportation to the United States
Congress pursuant to Section 26 of the Airport and Airway Development
Act Amendments of 1976 (P.L. 94-353)



U.S. DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C. 20591
AUGUST 1977



THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

SEP 5 1977

Honorable Thomas P. O'Neill, Jr.
Speaker of the House of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

I am pleased to transmit the "Airport Land Banking" report. This report is submitted in accordance with Section 26(1) of Public Law 94-353 signed by the President on July 12, 1976.

The report assesses the potential of land banking as a means of ensuring the future availability of land for airport development through the year 2000. The analysis considers alternatives to airport development and land banking, land banking precedents, the legal issues and the economics of land banking, its advantages and disadvantages, airport financial capability, and alternative programming methods.

A report has also been sent to the President of the Senate.

Sincerely,

A handwritten signature in black ink, appearing to read "Brock Adams". The signature is written in a cursive, flowing style with large, sweeping letters.

Brock Adams

Enclosure



THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

SEP 5 1977

Honorable Walter F. Mondale
President of the Senate
Washington, D.C. 20510

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CHAPTER I

EXECUTIVE SUMMARY

This study was performed in response to Section 26(1) of Public Law 94-353 (the Airport and Airway Development Act Amendments of 1976) which directed the Secretary of Transportation to conduct a study with respect to the feasibility, practicability, and cost of land bank planning and development for future and existing airports to be carried out through Federal, state, or local government action and report the results to Congress by July 12, 1977.

The amount of land occupied by the Nation's airports has grown to 1.8 million acres or approximately 3,000 square miles over the past three-quarters of a century. In the past, there has been plenty of room for airport and other urban land needs, but today there are signs the picture is changing. During the past decade, acquiring additional airport land necessary to accommodate the steadily increasing demand for air transportation has become more and more difficult at some locations due to stiffening community resistance to noise and spiraling costs as the amount of available undeveloped land dwindles.

In the face of these growing difficulties, land banking has been suggested by some authorities as a potential way to insure future availability of additional airport land at reasonable cost. Airport land banking is defined in this study as any acquisition of land to insure its availability for or compatibility with future airport operations, where such acquisition is carried out sooner than otherwise necessary in order to make the acquisition more economical or practical.

Land acquisition for future airport development has been eligible for Federal participation under the Airport Development Aid Program (ADAP) since its inception in 1970. Although several large airports have banked land using their own funds, very little land banking as defined herein has occurred under the program. This is mainly because long-range needs experience difficulty in competing with more urgent, immediate needs for limited program funds.

The primary purpose of this study was to examine the feasibility, practicability, and cost of airport land banking to assess whether the Federal Government could or should take additional action to foster the concept. The study provides the framework for this assessment but does not propose any definite course of Federal action.

While data and analyses used in this study were drawn from a widespread search through existing literature, three primary sources were utilized. First was a March 1975 study prepared for the Federal Aviation Administration (FAA) by Urban Systems Research and Engineering, Inc., of Cambridge, Massachusetts, entitled Buy Now, Fly Later: Land Banking for Airport Development, which dealt with many of the noneconomic issues. The second was a data-gathering and computer analysis effort for FAA performed in 1976 and 1977 by Human Resources Management, Inc., of Washington, D.C., specifically in response to this study. Economic data was gathered for a representative sample of 26 large, medium, and small air carrier airports through field visits and analyses of existing airport master plans. Finally, FAA's Office of Aviation System Plans provided overall management direction, analyzed the findings, and prepared the final report. Data developed during performance of a study of new major air carrier airports which Congress directed to be carried out simultaneously with this study was also incorporated here.

The principal findings and conclusions of the study are as follows:

1. Airport land banking could result in a potential savings of \$180 million (1980 dollars) in land acquisition costs at existing airports through the year 2000 based upon conservative but reasonable estimates of future land prices and other forecasts. This would amount to a 22% savings over delaying land acquisition until it is needed. If land prices increase beyond 1980 at the high rates experienced during the last five years, however, greater savings would be realized. For example, at the unusually high long-term land price increase rate of 7%, savings would approach \$500 million or close to a 40% savings over delaying land acquisition until it is needed.
2. Land banking shows greater promise in acquiring presently undeveloped land that is likely to become developed for nonairport use before it is needed for airport facilities. Generally, vacant land that will eventually be required by an airport should be purchased early. Residential properties should also be purchased in advance if a reasonable level of revenue can be anticipated. Only in relatively few cases should commercial or industrial properties be acquired before they are actually needed for airport purposes.
3. Land banking is not new; it has been used in this country to secure land for future use by schools, parks, highways, and airports. While there continues to be some legal uncertainty concerning the concept, primarily because advance acquisition of land is not specifically addressed

in state enabling statutes, it appears that present trends in the courts favor it. Therefore, it can be concluded that land banking is a feasible solution to the problem of securing land for future airport development.

4. Zoning and other land-use controls have not been an effective means of ensuring the future availability of land for airport expansion or new airport development. The economic incentives operating in an urban area have been strong enough to overcome local regulatory devices in the past and this situation is expected to continue.
5. Depending upon future aviation demand, purchase timing, and other variables, between \$0.5 and \$1.3 billion (in 1980 dollars) in additional land may need to be acquired for existing air carrier and general aviation airports through the year 2000. These estimates represent an equivalent annual investment in current dollars averaging between \$40 and \$110 million.
6. Under conditions considered most likely to occur, 32,000 acres of additional land will be needed by the year 2000 to expand the Nation's existing airports. The cost of this land will be approximately \$835 million if it is not purchased until needed but could be reduced to approximately \$655 million if \$385 million of the total is purchased early and land banked. For direct comparison of purchases between the years 1978 and 2000, these figures are 1980 dollars calculated at a 10% discount rate.
7. The economic viability of land banking sites for new airports depends on the future availability of undeveloped sites. Where adequate undeveloped sites will be available in the future, land banking is not economically justified. If a community is committed to a specific site, however, it may cost much more to delay acquiring land until it is needed than to land bank it up to 15 years early. In terms of risks, land banking when not necessary may double land costs, but not land banking when other undeveloped sites are not available in the future may multiply ultimate land costs seven times.
8. Airport land banking could provide a mechanism for advance completion of environmental assessments, community consultation, relocation programs, and related social processes that in recent years have more and more often imposed long delays on many airport expansion projects.
9. Only the largest airports enplaning 250,000 or more passengers annually have the financial capability to finance moderate capital improvements, including land acquisition, from airport revenues. With annual enplanements of less than 100,000 annually, an airport usually relies on outside support just to meet operating expenses.

10. If some type of Federal support were to be provided for airport land banking, it could take the form of an extension to the existing Airport Development Aid Program (ADAP), either within authorized funding levels or as an add-on, or it could operate as a loan program, a loan guarantee program, or a combination grant/loan program. To achieve maximum economic effectiveness, any such land banking program should begin soon. Under study assumptions, such a program would be extremely active during the period 1978-1985. If an extension of the existing ADAP were used over this time period, the Federal share would amount to approximately \$308 million in 1980 dollars or approximately \$45 million per year on an annual basis in current dollars. This compares to a total \$610 million 1980 ADAP under existing legislation.

CHAPTER II

INTRODUCTION

This study was produced in response to Section 26(1) of Public Law 94-353 (The Airport and Airway Development Act Amendments of 1976) which directed the Secretary of Transportation to conduct a study with respect to the feasibility, practicability and cost of land bank planning and development for future and existing airports to be carried out through Federal, state or local government action. An interest in the potential for land banking results from a growing public awareness that land is a fixed resource for which there is an ever-increasing demand.

At the turn of the century, when it took at least four days to travel from New York to Los Angeles, the population of the United States was 76 million, and there were no airports. By 1975, the Nation's population had grown to 212 million, and 1.8 million acres or approximately 3,000 square miles were occupied by airport facilities. For most of the past three-quarters of a century in the United States there was plenty of land to accommodate this growth as well as other urban land needs. Today there are signs the picture is changing. Populations are rapidly increasing in metropolitan area suburbs, and this is where large and medium-sized airports are most often located. The New York City area population has grown from 3.4 million in 1900 to 11.4 million today. Los Angeles has grown from a mere 102,000 in 1900 to 9.0 million since the turn of the century. And the population shift to metropolitan areas continues. The fraction of the Nation's total population in urban areas is expected to rise from 64 percent in 1959 to 85 percent by the year 2000.

Not only has the demand for air travel increased in urban areas because of growing populations, but a much greater public acceptance of intercity air travel has occurred since inauguration of jet aircraft. Since 1960, the percent of total annual common carrier intercity travel handled by the certificated air carriers has risen from 45 percent or 44 billion passenger miles to over 80 percent or 130 billion passenger miles; and this does not include air travel by general aviation aircraft, which in 1975 flew nearly six times as many hours as the scheduled air carrier fleet. Existing airports have been forced to continuously expand in size and capacity to accommodate this ever-increasing demand. At the same time many urban areas have sprawled out to the point where they surround their airports and severely restrict further expansion. This pattern has been repeated time and again across the Nation in recent years to the point where it is now questionable whether or not sufficient land will be available to accommodate urban area airport expansion in the future.

In addition to this, new "giant" airports are beginning to appear around the world. The newest large airport in the United States, Dallas/Fort Worth Regional, opened in 1974 and introduced this concept to the United States. The airport occupies 17,500 acres, or more than 27 square miles. By way of comparison, the airport is larger than Manhattan Island, or greater than John F. Kennedy International, Chicago O'Hare and Los Angeles International Airports combined.

Even where undeveloped land appears available, airport operators have met sharply stiffening community resistance to airport development during the past decade on environmental and social grounds. Also land values have escalated steeply in many areas during the past five years as competition for available land grows.

In response to these related but conflicting phenomena of an expanding air transportation system on the one hand and, dwindling land availability on the other, airport land banking has been suggested as one tool to allow continued airport growth, but until now it has not been closely examined. The term itself has loosely covered anything that amounted to acquiring some sort of control over property for the purpose of expediting its airport-related use at some future time.

Timing is important in large public works projects because large costs result when capital is invested in such projects either before or after they are needed. In the case of airports, if development is not undertaken until after it is needed, costs are incurred as a result of congestion and delay. For example, one major U. S. airline estimated that six minutes of delay per flight results in a cost of \$3 million to the airline each month. When to this is added the cost to all carriers plus the delay cost to the public, some perspective of total cost is obtained. On the other hand, if facilities are installed before they are needed, unnecessary loan and interest costs usually result.

The two major capital costs of large projects are associated with construction and land acquisition. Usually, determining construction timing to provide completed facilities neither before nor after they are needed is largely a matter of considering length of construction time. With land acquisition, however, other factors such as escalating values and future land use enter the picture that may cause the time for optimum acquisition to occur significantly before construction. Airport land banking is defined in this study as any acquisition of land to insure its availability for or compatibility with future airport operations, where such acquisition is carried out sooner than otherwise necessary in order to make the acquisition more economical or practical.

One of the purposes of this study is to examine the need, if any, for the Federal Government to more specifically foster airport land banking. A Federal airport land banking program, as distinguished from current ADAP eligibilities of land purchase, is examined in this study. Further, several alternative ways of structuring such a program to encourage land banking through more flexible and attractive funding assistance to airport operators are considered.

The approach taken in this study is to first examine alternatives to physical airport expansion and alternatives to land banking. Then land banking precedents and legal issues are examined. Following this, the economic viability and potential of land banking as a long range planning tool to reduce the social impact of airport development are studied. Finally, various possible types of land banking programs are identified and discussed in terms of total cost and possible savings, Federal, state, and local participation, and impact on future airport development.

In 1976, land acquisition for noise compatibility purposes became eligible for Federal assistance under the Airport Development Aid Program (ADAP). The Department of Transportation's Aviation Noise Abatement Policy, adopted November 18, 1976, states that such acquisition will be given high priority. Approximately six million U. S. citizens currently reside on 900,000 acres of land exposed to levels of aircraft noise that create a significant annoyance for most residents. To have included an assessment of future land acquisition for noise compatibility in this study would have confused existing needs with future needs and broaden this study to the point its original purpose would not have been accomplished. For this reason banking land not needed for airport purposes but needed only for noise compatibility was not considered. This issue is sufficiently complex to warrant a separate analysis.

CHAPTER III

ALTERNATIVES TO AIRPORT EXPANSION

Anticipated growth in air traffic can be accommodated either by changing the pattern of demand for airport services or by expanding the physical capacity of the airport.

INFLUENCING DEMAND FOR AIRPORT SERVICES

The demand pattern for air carrier airport services can be influenced in a number of different ways including such methods as peak spreading, increasing aircraft load factors, imposing quotas, and shifting of general aviation traffic from air carrier airports.

The existing regulatory powers of the FAA allow it to affect demand by placing quotas on the number of aircraft that can land or take off at an airport during a specified time. This power was used in the late 1960's and early 1970's at five of the Nation's most congested airports. This action was considered a temporary measure to reduce congestion and delay and to lessen safety hazards in an extreme situation.

The current regulatory authority of the CAB influences demand primarily by changing air carrier incentives and thus, indirectly, the air carrier load factors and number of operations. The CAB regulates fares charged on any particular route; allowing increased fares may reduce passenger demand and possibly the number of operations, while requiring reduced fares (a rare occurrence) could mean increased passenger and operations demand. Additionally, CAB approval of "special fare" programs for certain times of the day can redistribute demand to off-peak periods.

The CAB's mandate includes the "promotion" of air transportation; therefore, it is unlikely as a matter of general policy to limit air carrier operations, except for temporary reasons. Furthermore, the CAB regulatory process is slow, and its impacts are often indirect. It is difficult to forecast these impacts for planning purposes. CAB policies and regulations can, nonetheless, be an important factor in reducing demand.

The airport operator can affect demand (in operations) at his airport by pricing mechanisms, by the facilities and levels of services provided, and by attempting to influence the actions of other "suppliers" at the airport, particularly the FAA and the airlines. An airport operator cannot unilaterally limit the number of air carrier operations, but he can charge high landing fees to deter air carrier or general aviation demand. High rents, fixed-based operator charges, and parking fees may also have similar results. Demand may also be reduced if the aviation facilities (terminals, hangars, aircraft parking facilities, runways, etc.) or services provided at an airport such as refueling and repair are not adequate for demand above a certain level or for certain aircraft.

The airport operator may exert more direct control over operations by revising agreements with Air National Guard units or other military units using the airport and by limiting certain types of operations such as flight training, touch-and-go's, etc. However, any attempt by the airport operator to limit operations may bring legal and political problems, unless a severe capacity problem exists. Peak period pricing such as charging higher landing fees during peak hours is another mechanism at the disposal of the airport operator to redistribute demand.

To the extent possible, alternative ways of affecting demand were taken into account in determining the need for land and when the land would be needed. Estimated capacity increases due to implementation of a mix of low-capital alternatives were made on a case-by-case basis for each airport analyzed in the study.

INCREASING AIRPORT CAPACITY

Physical airport capacity can be increased either by building new airport facilities or by expanding the capacity of existing facilities through the implementation of technological improvements or changed procedures. While the provisions of new facilities such as runways, taxiways, roads, parking lots for aircraft and cars, and terminal buildings all require land, many airports now have sufficient land available to accommodate such development, and expansion of the airport beyond its present boundaries would not be needed.

The major change in the technology of air traffic control expected between now and the year 2000 is implementation of what is termed the upgraded third generation air traffic control system (UG3RD). This is the name given to a collection

of technical improvements that are currently under development and are expected to be available after 1980. The goals of the UG3RD are to increase and improve system performance, maintain or improve safety in the face of increasing aviation activity, and constrain or reduce costs. Specifically, airport capacity is expected to be increased through the following improvements:

- Improved delivery rate of aircraft to the runway threshold through automation of the metering, sequencing, and spacing functions (reduce uncertainty from 20 seconds to as low as 8 seconds).
- Reduced longitudinal separation between aircraft on final approach by use of automated control under most meteorological conditions.
- Implementation of more closely spaced runways on existing airports for simultaneous parallel approaches through the use of improved landing aids, an improved surveillance system, and automated approach monitoring (from 5000 feet to as low as 2500 feet).
- Provision of an improved highly reliable landing system to permit continuity of operations under all weather conditions (Category I, II, and III visibility conditions, as required).
- Improved efficiency of aircraft and vehicle operations on runways, taxiways, and ramps, particularly under restricted visibility conditions.

Time schedules for the availability of these technological improvements and specific capacity increases at each of the airports considered in this study can only be approximated at this time. For the purpose of estimating amounts of land that will be needed for physical airport expansion through the year 2000, it was assumed that major features of the UG3RD will be installed at the largest airports in the early 1980's and that the entire system will be in general use at the larger airports by 1990. Using this guideline, judgment was used to estimate the impact of implementation of the UG3RD on future land requirements at the airports studied. This judgment recognized that the larger airports will be the first recipients of major features of the UG3RD and that very limited capacity benefits will occur to airports dominated by general aviation aircraft operations.

CHAPTER IV

ALTERNATIVES TO LAND BANKING AS A MEANS OF ENSURING LAND IS AVAILABLE WHEN NEEDED

Although some restructuring of demand and upgrading of the air traffic control system is expected and will be able to handle part of the expected increase in air traffic, and in some cases airports already have sufficient land for future development, additional land will still be needed at some airports to accommodate forecast activity to the year 2000. Land banking is one way of ensuring that this land will be available for use by the airport when it is needed. However, land can also be reserved for future use by regulation.

Since land banking requires considerable outlay of public funds in advance of actual need, regulation is often the politically and financially more attractive option.

ZONING REGULATIONS

Since Village of Euclid, Ohio v. Ambler Realty, Co. in 1926, zoning has been widely used as a valid exercise of the police power. Zoning attempts to promote the health, safety, and general welfare by grouping together compatible activities. Proper use of zoning does not require compensation because the limitations imposed on an individual's right to free use of his property are held to be reasonable and fairly related to the health, safety, and general welfare. Before discussing specific types of existing zoning techniques and several new proposals, the general limitations of zoning will be noted.

Zoning regulations are not retroactive. Although zoning is a regulatory scheme which designates the permitted uses (residential, industrial, commercial, etc.) of specified areas, zoning will not eliminate preexisting nonconforming uses. For example, if a single-family residential zone is imposed on an area in which there is a small factory, this industrial use becomes nonconforming. The factory will have the right to remain in the zone for a "reasonable" to an indefinite amount of time. To remove nonconforming uses, compensation must be paid.

Since a property owner has the right to a "reasonable" beneficial use of his property, zoning cannot be used to depress the value of property that the government intends to acquire for public use. Zoning may incidentally have this effect, but to withstand

a court test the regulation must be reasonably related to the public health, safety, and welfare. For example, imposing an agricultural zone on property in a potential airport expansion area where the reasonable use is more intensive could be considered "arbitrary and capricious," because it is not reasonably related to the public health, safety, and welfare, and thus confiscatory.

The previous example indicates one of the major difficulties with zoning: When does regulation of property become "taking" of property? The last pronouncement by the U. S. Supreme Court on this subject was handed down in 1922: "The general rule at least is that, while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking." Since then, hundreds of cases have been decided by the courts in the fifty states. Since no one state court feels bound by courts in any other state, these decisions have been described as "chaotic." There is heavy reliance on the particular facts in each case.

Most legal specialists in this subject area agree that there are no universal principles which consistently explain the results.

A basic problem with regulatory devices is the fact that airport operators have little effective control over them. A number of other agencies usually control, or partially control, these devices and have goals or constituencies which run counter to the interests of the airport. Even if an airport has substantial influence with such agencies at one point in time, this situation may change with the next election, with different administrators, with different citizen concerns, with different court interpretations.

Keeping in mind the general limitations of zoning regulation, the following material will briefly discuss types of regulation used around airports and some possible future developments of regulatory devices, including timed development control and development right transfers.

AIRPORT RELATED ZONING

There are two distinguishable types of "airport zoning." One protects the airport from the community by regulating flight hazards; the other protects the community from the airport's noise pollution and congestion by allowing only "compatible uses" within airport "impact" areas. All but five states

specifically provide for hazard zoning in airport enabling legislation, although its constitutionality has not always been upheld in all jurisdictions. This is a special form of zoning that is used to protect airspace in the vicinity of the airport and its runway approaches from intrusion by high objects (natural or manmade) or other forms of interference. The objective is to protect the public investment in the airport by assuring that full runway lengths are available for use and that instrument landing systems are not restricted.

Zoning to implement a land-use plan which is compatible with the development of the airport is the second type of "airport zoning." This type of zoning is a normal exercise of the zoning authority of a local government and does not require any specific enabling legislation. Since its purpose is to ensure compatible land use, not to prevent development, structures such as warehouses or factories may be constructed in an airport compatible use zone.

It does not seem likely that either of these "airport zoning" techniques could be used to hold a new site for future airport expansion.

An innovative approach to the airport zoning question has been attempted in the Minneapolis-St. Paul area, which mitigates the multijurisdictional problem. In 1943, the Minneapolis-St. Paul Metropolitan Airports Commission (MAC) was created for the purpose of planning construction and operating airports within 25 miles of each city hall.

In 1967, the Minnesota Legislature created the Metropolitan Council, which also has power to implement policies and programs related to airport planning. It has jurisdiction over the seven counties of the Twin City area. The Metropolitan Council is specifically charged with the development and adoption of a Metropolitan Development Guide dealing with the physical, social and economic needs of the area, including the necessity for the location of airports. It has referral powers over comprehensive plans by special districts, and under the Airport Zoning Act it has authority to develop standards related to development around the major new airport.

The Airport Zoning Act was passed by the Minnesota Legislature in 1969 in order to control development around a proposed new airport. Under the act, MAC holds public hearings on sites it tentatively selects, during which time all local land use and development controls affecting land within a five-mile radius of the site must be submitted to the Metropolitan

Council for review. The Metropolitan Council must then pass on whether the proposed site is in conformance with the goals of its Metropolitan Development Guide. When a site is ultimately approved, all land use in the airport development area (the five-mile radius) will be frozen. All unzoned lands will be zoned agricultural except for prior nonconforming uses. No building permits shall be issued unless approved by the Metropolitan Council. The Council then (within 120 days) will develop standards for development within the area which will reduce noise impact problems and protect natural resources. Local government units must then bring their land-use controls into conformance with these standards.

As of now, no site has been selected, so the functions of the Airport Zoning Act in practice have not been tested. The Act does have several interesting features as an innovative zoning approach. The standards and criteria to be developed in the Metropolitan Council will apply not only to zoning itself, but to all other land use controls, such as subdivision regulations, the official map, housing and building codes. Furthermore, the standards it will promulgate will apply not to governmental districts uniformly, but to irregularly shaped noise impact areas, cutting across different jurisdictional boundaries. The authority for developing the standards and criteria rests with the Council, but they are enforced locally through diverse land-use control systems, a new departure for this type of planning. This is a compromise solution between leaving land-use control authority with local governments and raising it to the regional level. Lastly, the Zoning Act has no provision for variances--instead it must condemn and acquire land where courts find the application of standards to exceed the boundaries of the police power.

AGRICULTURAL ZONING

Under certain circumstances, agricultural zoning has been used successfully by local governments to keep land undeveloped. Unlike most other zoning classifications, agriculture excludes all other uses (variances and nonconforming uses permitted). This fact makes agricultural zoning a potentially useful device for keeping a future airport site from being developed.

Agricultural zoning is less useful where airport expansion is planned. Often airport-induced development pressures drive up the price of surrounding land. The resulting increase in tax burden makes farming unprofitable, thus removing the legal basis for the zone.

LARGE LOT ZONING

Another zoning technique used by some local governments to keep vacant land undeveloped is to zone the land for residential use, requiring house lots of several (4-6) acres. This zoning classification also permits farming. As in the case of agricultural zoning, this type of zoning is most effective on possible new sites which are vacant. However, zoning land around an airport for residential use would be inconsistent with compatible use and thus constitute a legally untenable attempt to prevent "reasonable" use and to lower the price of land to be acquired.

OFFICIAL MAPS

The concept of the Official Map is sometimes useful in transportation planning. After legislative establishment of an official map showing the location of proposed public improvements, a locality is not required to pay compensation for the value of improvements on the designated sites unless a building permit had been granted. Reasons for granting permits vary from state to state. Although this device has been used most frequently for street rights of way, it has not always been held constitutional. Thus, it is not likely that large areas of land could be reserved by this method for new airport construction or expansion of present airports. In the past, reservation of parklands has been attempted but has usually failed in the courts. Parks are not a health and safety necessity. They are a concentrated rather than a dispersed burden, affecting a few individual landowners. Airports would surely be treated in the same way.

SLOW GROWTH TECHNIQUES

A second category of regulatory devices under the police power has been brought to public attention by the "environmental crisis." These devices are moratoria on building permits, sewer extensions, and other infrastructure necessary for development. They are the prime weapons of the "no-growth" movement.

Most of these devices are what might be called "interim development controls." Legally, a building permit can be withheld only for limited periods of time. Otherwise, it becomes a "taking" without compensation. Therefore, these techniques are most useful to airports for preventing further development for short periods of time (up to two or three years) until permanent control can be obtained.

The informal nonprovision of municipal water and sewer extensions can be sustained for much longer periods of time than the official building permit ban, but it should be remembered that the developer may provide his own water and sewer system.

The "population cap" is another slow growth technique being tried in several states. There are often two components to the device: a limit on the number of dwelling units the jurisdiction will ultimately accept (often combined with a yearly quota) and the establishment of an urban expansion line beyond which new construction will not be permitted.

The Minneapolis-St. Paul area is attempting to avoid the constitutional problems of an urban/rural line by using it in combination with another new device: timed development control. Development timing is currently the most significant and sophisticated antigrowth technique. In Ramapo, New York, for example, the allowable development of land is tied to the provision of public service based on an eighteen-year capital improvement plan. If an owner of the land wants to develop land ahead of the city schedule, he must provide the required public facilities. This particular plan was upheld by the New York Court and not overturned by the U. S. Supreme Court. This technique may be useful in holding back urban development pressure around expandable airports, as well as at some potential new sites. However, timed development controls have not been tried on the regional level. It seems possible that if they could be used on a regional level (as is being attempted in the Minneapolis-St. Paul area), the larger area freed from development pressure would make a "rural use" designation more plausible as "reasonable use" and thus be better able to meet constitutional "taking" objections. Regardless of the possible uses of timed development controls, it is doubtful that they will be implemented widely in the near future. Furthermore, they suffer most of the limitations discussed in relation to general problems with zoning.

DEVELOPMENT RIGHTS TRANSFER

The newest concept under consideration in several states is known as DRT (development rights transfer). Under this system all units of land are assigned an equal number of development rights; then the entire jurisdiction or area is permanently divided into low-, medium-, and high-intensity development zones. In order for owners in high-intensity zones to develop their land up to the legally permissible intensity, they must purchase development rights from owners in low-intensity zones who cannot legally use them. For example, all units of land in a town (acres, square feet, or whatever type of unit is functional) are given five development rights. The town is then divided into high-, medium-, and low-intensity zones.

It takes fifteen "Development Rights (DR's)" to construct an apartment building; but since the owner has only five DR's, he must have ten from owners in the low zone areas who only need one DR to farm. In this manner, open space is preserved without public cost or private harm. Similarly, the system would prevent development on future site and expansion areas. Unless the owner(s) in the airport designated areas had sold their excess development rights, i.e., those they could not use because the area is designated as low-intensity, the airport would have to purchase them. The airport could then sell them.

CONCLUSION

The utilization of zoning and other land use control methods to limit the development of areas near airports to prevent encroachment and to allow for future airport expansion has rarely worked in the past. The economic incentives operating in an urban area have been strong enough to overcome local regulatory devices which can be changed or varied at the local level on a case-by-case basis. City planners and airport operators interviewed in an earlier study done for FAA on land banking believe that such devices will not work and that the only way to keep land open for possible future airport development is to purchase the land.

CHAPTER V

LAND BANKING PRECEDENTS

Land banking experiences can be divided into three categories as seen in the following table.

CATEGORIES OF LAND BANKING EXPERIENCE

	CATEGORY I	CATEGORY II	CATEGORY III
Purpose:	Best site at minimum cost for small public facilities	Best site at minimum cost for large public facilities	Urban development control (physical and price)
Examples:	Schools, fire stations, parks, highways	Airports, reservoirs	Stockholm, Puerto Rico
Size:	Small: several acres	Medium: up to 10,000 acres	Large: up to 50 sq. mi.; need not be contiguous
Term:	2-10 years	10-25 years	variable
Frequency:	Several sites per year	Few sites per decade	Possibly many parcels per year

In the United States, most land banking programs have been of the type described in Category I. Unfortunately, only limited information about these programs is available, because this data is not collected on a regular basis by local governments. Airport land banking falls into Category II. Category III land banking, although widely discussed among United States planners, is in operation only in Western European countries, Great Britain, and, to a limited extent, Puerto Rico.

NONAIRPORT LAND BANKING

The most recent study of advance land acquisition by local governments was conducted in 1966. On the basis of question-

naires sent through the National League of Cities and National Association of Counties, this HUD-sponsored study estimated that about a third of the cities with populations of over 50,000 had land banking programs (defined as acquisition of land three years or more in advance of use). County-operated land banking programs were found to be "uncommon."

Although most of the city programs had been active for more than seven years, the level of activity was low--usually fewer than six acquisitions per year. The main reasons localities gave for land banking were (1) to avoid rising land prices, (2) to secure the best locations, and (3) to avoid structure acquisition and demolition costs. The most frequent use of land banking has been to acquire sites for schools, parks, and other government buildings. The legal problems associated with land banking were not reported to be significant, but the study suggests that this finding may reflect the low activity level of the program.

The benefits of land banking for the orderly provision of public facilities were recognized in the Housing and Urban Development Act of 1965. Section 704 of the act provided a subsidy in the form of "reasonable interest charges" for not more than five years on funds used for advance land acquisition, but the funds were not widely used because of poor publicity and regulatory requirements which were difficult to comply with. The funds had to be used for a specific purpose, a master plan was required, and the subsidy had to be returned if the project was not constructed within five years. Despite the minimal incentive of this program, two airports did use 704 funds for land banking. With the expected advent of community development block grants, the program was terminated by Executive Order in 1970.

The major users of advance land acquisition have not been local governments but state highway departments, perhaps because the land component is often over a third of total project cost. California, for example, has had a revolving fund for advance right-of-way acquisition since 1952. Over a 12-year period (1952-1964), the state spent \$66 million on land that they estimate would have cost \$366 million had it been acquired when needed for construction--an average saving of \$25 million per year. The Federal Highway Administration has also conducted a land banking program in conjunction with federally-supported state highways.

The first Federal land banking program for highway rights-of-way was authorized by the Highway Act of 1956. However, the application process was rather difficult and the program was underutilized until procedural changes were made by the Highway Act of 1968. This program used the Federal Highway Trust Fund to establish a revolving fund for advance acquisition of rights-of-way. States may request interest-free loans from this fund for the entire cost of acquisition, interim property management and relocation costs. The land must be held no less than two years and no more than 10 years. The state reimburses the revolving fund with the state's share (10 percent) and its Federal aid credits (90 percent) at the time of construction. In effect, the states are borrowing against their future matching fund allotment.

Although about thirty states are participating in the program at any one time, there is some reluctance to use the fund for the following reasons: (1) the Office of Management and Budget releases only \$50 million per year for the program, which some states feel is too little to warrant working through the process; (2) the requirements of the National Environmental Protection Act must be met at the time land is acquired, so many states have indicated that it is more sensible to proceed immediately with construction; and (3) the fund is essentially a mortgage on future Federal aid allotments, and some states want to be free to undertake special projects if necessary.

In spite of its drawbacks, the revolving fund does allow advance acquisition to reduce costs and keep rights-of-way available. In addition, some states have used the advance acquisition fund to finance projects sooner than would otherwise be possible to avoid the inevitable increases in construction costs.

Land banking programs of the Category III type usually have been undertaken to control and guide the growth of communities. Land banking programs on this scale are more common to the European experience than to the American. Notable programs have been in effect in Stockholm, Sweden, in the Netherlands and to some extent in Great Britain. The land banking program of the Land Administration in Puerto Rico provides an example of this type of program operating within a political-legal system similar to that of the United States. The Puerto Rican Land Administration (PRLA) is a public corporation empowered to acquire land by condemnation, if necessary, up to 15 years in advance of its use for a broad range of social and economic welfare purposes. The PRLA started with a \$20 million appropriation and can issue revenue bonds. The Land Administration was created in response to the problems created by rapid increases in land prices, such as scattered patterns of development.

To date, the Land Administration in Puerto Rico has not initiated programs of its own. Rather, it serves other departments of government by assembling land for future projects and by condemning land around existing projects in order to capture increased land values for the public benefit.

In summary, nonairport land banking is not new or uncommon in the United States. Thus far it has not run aground on fundamental legal issues. Although holding periods have not been long, the banked land has in some cases been a source of income. Highway land banking, for instance, has yielded approximately \$5 million to states annually, net of management costs. Not only does land banking reduce the purchase cost of land itself, it also allows communities to escape the cost of acquiring and demolishing newly developed structures by preventing their construction. Occupants of land are given adequate time to relocate, the most appropriate site for the required purpose is secured, and orderly community development is encouraged.

AIRPORT LAND BANKING

Land banking for airports is not new. Five of the 26 airports in the study sample have ongoing land banking programs.

The Houston airport, when built several years ago, was originally designed to allow for expansion through the late 1990's. As a result, the facility has, in effect, land banked since its conception, and it has land available for new runway configurations, as well as alternative landside requirements, that will handle its projected growth.

The Pittsburgh authorities have recently added a large tract of land (approximately 5,000 acres) to the facility for future expansion. Atlanta airport owns two 10,000-acre tracts, one of which will be used for development of a new facility when needed. Salt Lake City airport already has over 7,000 acres and it has banked additional acreage for future expansion. Sacramento has banked land for future expansion as well as for noise buffer zones.

A major land bank has also been established between Phoenix and Tucson to reserve a site for a regional air carrier airport that may be developed more than 20 years from now. The site will accommodate an airport similar to Dallas/Fort Worth Regional airport. The 17,500 acres acquired for Dallas/Fort Worth Regional Airport actually includes a substantial amount of land banked for future growth as well as provision of an environmental buffer.

In fact, advance land acquisition for future development has been eligible for funding under the Airport Development Aid Program since its inception in 1970. However, long range airport needs experience difficulty in competing with more urgent, immediate needs for limited program funds.

CHAPTER VI

LAND BANKING: THE LEGAL ISSUE

LEGAL ISSUES OF LAND BANKING

The legal context of land banking is not uniform throughout the United States. Each state has different statutes, case law, and legal assumptions affecting the legality of land banking. Each authorizes different bodies to acquire, hold, convey, and condemn land for airports and each puts separate qualifications on these grants of power. Before examining variations on the state level, however, we will review the constitutional issues.

CONSTITUTIONAL LAW

On the constitutional level, the major issue affecting land banking and, in fact, any acquisition of land for use in airport development is that of eminent domain. State and Federal condemnation statutes do not specifically authorize condemnation; they merely limit what under the doctrine of sovereignty is an inherent unlimited power. This leaves the power of the states to condemn land relatively unimpeded except for the limitations of the Fourteenth Amendment, which prevent any citizen from being deprived of his property without due process of law. Federal and state courts have held this due process requirement to mean that land can be condemned only for a public purpose. Some courts have reached the same public purpose requirement through different theories of law.

Most state courts also hold that the due process clause of the Fourteenth Amendment requires that land be condemned only when necessary. State courts have not agreed, however, on a determination of what constitutes "necessity" or whose determination of necessity is binding. The Fifth Amendment of the United States Constitution requires that court-determined "just compensation" be given by the governmental unit for the acquisition through condemnation proceedings.

Each political subdivision within a state has inherent in its grant of other powers the right to purchase land within its

boundaries to fulfill its legal obligations, but it does not have an inherent power of eminent domain and cannot condemn property without a specific grant of power to do so from the state. The state may also delegate its condemnation power to autonomous agencies within its boundaries.

STATE LAW

Enabling Statutes

A majority of states have authorized counties, municipalities, and various state agencies to acquire land for airports. Many others have authorized the formation of autonomous authorities to acquire land and manage airports. The methods of acquisition may include purchase, lease, grant, devise, and condemnation.

However, the ability to acquire land in advance of need is not automatic. A few states specifically authorize or prohibit land banking by airports, but more make no specific reference to it. The issue has not been dealt with in most courts. Where condemnation is involved, additional limitations may exist but the current trend suggests that airports will be given more freedom to bank land in the future, even in the absence of specific authorization.

Jurisdictional Limitations

Thirty states have statutes which can be interpreted as not allowing the acquisition of land outside the territorial limits of the authorized body. However, eight states allow some authorized bodies to acquire land not only outside their own territory, but also outside the territory of the state. A few states even allow authorized bodies to condemn land outside the state. Any extraterritorial condemnation is predicated on the permission and cooperation of the state that governs the land to be condemned.

Land Acquisition Method

In order to reduce costs, airports may seek to acquire less-than-fee simple interest in the land they wish to control. Most state statutes simply do not state what interest an authorized body can condemn, and courts' interpretations of their authority vary widely among the states.

Funding

Land banking requires large amounts of capital. The types of funds available for airports vary among the states. A majority of states authorize the use of state aid, private loans, and Federal funds. Of the forty states that authorize the use of bonds for land acquisition, most allow any type of bond to be used. A few states permit only revenue or general obligation bonds to be used.

Use and Disposal of Land

The body which acquires land may wish to reduce costs by renting or leasing it for private use during the interim period prior to public use. If plans for airport development change, it may ultimately wish to dispose of banked land. Most states authorize the sale or lease of land after acquisition and may allow the body acquiring the land to put it to any use it chooses. Many states do not specify how the land may be used. Although legal interpretations in these cases vary from state to state, the trend is clearly toward some freedom of use.

CONCLUSION

The issue of land banking for future airport development is not specifically addressed in most state enabling legislation for airports and courts have not as yet definitively resolved the issue. Land acquisition for airport use is clearly legal as is the use of condemnation proceedings where a clear public purpose exists. However, whether land can be acquired by condemnation proceeding in advance of actual need is still questionable. It can only be said that the present legal trend favors land banking.

CHAPTER VII

LAND BANKING: LAND ACQUISITION METHODS

Land acquisition methods can be divided into two primary categories: 1) acquisition of all of the interests or rights in the land or fee simple acquisition, and 2) acquisition of certain limited rights to the land. Both of these methods are considered in relation to land banking.

FEE SIMPLE ACQUISITION

Fee simple acquisition transfers all rights in the land (the title and risk of ownership) to the buyer, in exchange for the full purchase price. The use of this device in a land banking program has been criticized on two points: money and management. The total purchase price must be paid before transfer of title, thus tying up airport capital years before airport use. Furthermore, the jurisdiction may lose tax revenue. This depends on the laws in each state relative to the taxing of nonpublic uses. The management problem is that the airport may be required to act as landlord to residential, commercial, and agricultural tenants, requiring inhouse expertise or outside management agents. As landlord, the airport can be criticized for competing with private enterprise in nonaviation activities, particularly if the airport-as-landlord offers below-market rents to its lessees. On the other hand, if the airport removes the existing uses, allowing the land to remain vacant for years, it may be criticized for wasting resources.

LESS-THAN-FEE SIMPLE ACQUISITION

It may be possible to mitigate some of the alleged drawbacks of fee simple acquisition and still meet some or all of the objectives of the airport land bank through a less-than-fee simple acquisition, either alone or in combination with a deferred payment plan. In the following sections, development rights (or negative easement), remainder interest, and option will be considered in relation to airport development objectives, advantages over the fee simple, current legal status, and operational problems.

Development Rights

The newest method of property acquisition is the purchase or condemnation of a negative easement or development right. The acquisition of development rights is the purchase of the property owner's right to develop or change the use intensity of his land. For example, if a farm was worth X dollars as farm land and Y dollars if developable under the zoning or other regulation in effect, the airport would purchase or condemn the development right by paying Y-X dollars.

The development right purchase device prevents improvement which must later be acquired and removed. It could also prevent incompatible development in a "buffer" area. Development rights would only partially meet the objective of controlling rising land prices, since the price of the remaining interest may rise before it is ultimately acquired.

Acquisition of development rights mitigates several of the objections to the fee simple land banking. The airport's immediate capital outlay is reduced--significantly in areas of slow change where the value of the development rights would be low. The land remains productive and generates tax revenues. Management responsibility remains with the owner. The owner would also be able to sell his remaining property interest.

However, there are other potential difficulties with development rights. The development rights device loses its advantages over fee simple acquisition in areas of rapid development, as the value of the development right would virtually equal the cost of land. Secondly, in a condemnation suit, the court may have difficulty determining the value of the remaining interest in the fee. Third, should the airport decide to abandon its project, it is very unlikely that it could find a buyer for its development rights if the owner of the remaining interest is unwilling to repurchase them. Lastly, the newness of this device may be a factor inhibiting its implementation. Although easements for open space preservation can receive Federal subsidies, many owners prefer regulation through the more familiar zoning laws to compensation through the unfamiliar but fully-compensated development right.

Remainder Interest

Another method of less-than-fee acquisition is the purchase or condemnation of a remainder interest. The acquisition of a remainder interest gives the purchaser full title to the

land after a specified number of years. The cost of the remainder interest is determined by subtracting the value of the use of the land over the specified term of years from the present fair market value of the land. For example, an airport could purchase a remainder interest from a farmer whose land has a present fair market value of \$2500/acre. The airport would pay perhaps \$1500/acre and the farmer would have the ownership of the land for perhaps 10 years.

The present owner is given the choice of developing the land but the airport does not give compensation for any improvements and since the price has been fixed, the rising price of land does not affect the airport at the time the land is needed.

The remainder interest has fewer advantages over the fee simple than the development right. If the remainder interest is condemned, the total price must be paid at the time of condemnation, rather than after the term of years. Still, the capital outlay is reduced to some extent. As with the development right, the remainder interest leaves the management of the land in private hands, allows the land to remain productive, and maintains tax revenues.

As with the development right, the value of the remainder interest is sometimes difficult to determine. The value of a thirty-year term, for instance, may well approach or exceed the present fee simple value of the land. But in shorter terms of say ten to fifteen years, this method of acquisition could be very useful. Remainder interest, like the development right, suffers some lack of political acceptance due to its unfamiliarity.

Option

A third possible means of less-than-fee acquisition is the purchase or condemnation of an option. Using this device, an airport operator would pay a property owner the amount by which the option reduces the current value of the property. For example, if a parcel of land is valued at \$20,000 in 1974, the airport operator could purchase an option to buy the land for \$20,000 in 1985. The price of the option is essentially the estimated rise in land value over the ten-year period. The option purchase or condemnation saves the airport from paying for development on the land, although the owner would be free to develop the land as he saw fit. The option forces the airport to pay the increases in land value, but since the option price is an educated guess as to the rate of increase, the airport could make money if the rate is higher than expected or lose money if it is lower. If the rise in land is equal to 50% of the fee, it would be as economical to purchase the fee outright.

The prime advantage of the option over fee simple, remainder interest, and development rights (in rapidly developing areas) is that the minimum amount of capital is expended prior to actual airport use. As with remainder interests and development rights, the land remains productive and privately managed. While the land remains on the tax rolls, the appraised values should be lower to reflect the decreased value caused by the purchase of the option, provided its calculation of future value is reasonably accurate.

Installment Purchase

Installment purchase is a mechanism which distributes the payment for the land over a specified time period in exchange for an increased total price. The benefit to the airport is a significantly reduced initial capital outlay. With this ability, an airport operator could more easily take advantage of the land banking benefits--preventing development and eliminating the impact of rising land costs. Furthermore, installments can be used as a bargaining tool to lower the total price. Large landowners are often interested in the tax advantages of spreading out the payments. A major disadvantage of deferred payment is that in most cases it cannot legally be used for land acquired by condemnation.

A form of installment purchase known as contract purchase is used by the Louisville and Jefferson County (Kentucky) Air Board. The original landholder stays on the land, and, in effect, he exchanges interest he could have earned on the full price of his land for free rent. On the other side, the Air Board exchanges the rent it could have obtained on the open market for the cost of the capital needed to purchase the land all at once. From the perspective of the Louisville Air Board, the prime advantage lies in the lowered maintenance costs associated with having the original landholder stay on the land.

In summary, total outright acquisition in advance of need often demands a large capital outlay and may be accompanied by interim-use management problems. However, the various less-than-fee acquisition techniques which, in certain circumstances, can reduce the capital outlay and eliminate airport management responsibilities are legally more complex and generally unfamiliar.

SUMMARY

Fee simple acquisition of land in advance of need often demands a large capital outlay and may be accompanied by interim-use management problems. However, the various less-than-fee simple acquisition techniques which, in certain circumstances, can reduce the capital outlay and eliminate airport management responsibilities are legally more complex and generally unfamiliar.

Therefore, for purposes of this study, it was assumed that all land acquired to be banked would be purchased outright. However, since fee simple acquisition requires the highest initial outlay of capital, if land banking is economically viable based on this assumption, it would still be economically viable if another land acquisition method were used. The choice of land acquisition methods should be left to the individual airport operator in any airport land banking program.

CHAPTER VIII

ECONOMIC ANALYSIS OF LAND BANKING FOR EXISTING AIRPORTS

The basic economic objective in the timing of land acquisitions to meet airport needs is to purchase the land when the real cost of purchase, suitably discounted for the cost of capital, is at the minimum level prevailing during the time span available for the purchase. The real value of a property over time depends upon the rate of increase in land and improvement prices, the rate of transition from lower to higher uses of the property, the ratio of the values of higher to lower use, and the discount rate used.

Three different fundamental situations may result from various combinations of these factors. These three situations and the concomitant land acquisition decisions are described below and graphically depicted on the following page.

1. The rate of increase in land and improvement prices is greater than the discount rate. In this case, the discounted acquisition cost increases continuously over time, regardless of the rate of development, and the property should be purchased as soon as possible.
2. The rate of increase in the value of the property, taking account of both price increases and development of the property, is less than the discount rate. In this case, the discounted cost of purchase falls continuously over time and acquisition should be deferred as long as possible.
3. The rate of increase in the value of the property, taking account of both price escalation and development of the property, is greater than the discount rate, but the rate of increase in land and improvement prices alone after the property is developed is less than the discount rate. The former circumstance dictates early purchase while the latter dictates deferment of the acquisition. Taken together, the development of the property causes the discounted acquisition cost to rise until the parcel becomes largely developed, after which the discounted cost declines steadily. Thus, the optimum purchase time depends upon when the land is needed. If the land is needed before development peaks, or before sufficient cost savings have accumulated thereafter, it should be bought as soon as possible. If the

acquisition can be deferred long enough, however, the real cost of purchase will be lower than for early acquisition.

Any decision to defer land acquisition based on the second or third case may be offset by revenues that may be derived from the property if it is purchased early. If the present value of the income stream that may be expected between the time of purchase and the time when the land is needed for airport development is sufficient to compensate for a higher early acquisition cost, the land should be purchased sooner than would otherwise be concluded.

METHODOLOGY

A study was conducted to determine the applicability and operation of these economic factors with respect to future land requirements at the Nation's airports and thereby to estimate the economic feasibility and cost of land banking for airport development. The universe considered in this study consists of 158 air carrier hub airports, comprised of 31 large, 40 medium, and 87 small hub airports. From this universe, a sample of 26 airports, made up of eight large, ten medium, and eight small hubs, was selected. This sample is essentially a stratified random sample, with some minor modification to ensure adequate representation of the universe with respect to potential land requirements and the various economic factors affecting the timing of land acquisition.

It should be noted that an air traffic hub is not an airport. It is the city and SMSA requiring aviation services. Individual communities fall into four hub classifications, depending upon each community's percentage of total enplaned passengers on U. S. certificated route air carriers. Large hubs are those communities with 1.00% or more of total enplanements medium hubs enplane 0.25% to 0.99%, small hubs 0.05% to 0.25%, and nonhubs enplane fewer than 0.05%.

The airports selected for analysis in this study were limited to air carrier airports in large, medium, and small hubs. There were two reasons for this, neither associated with any assumption that land banking is not needed for airports serving only general aviation activity. The first reason was that problems associated with acquiring airport land are most acute at larger metropolitan areas or air traffic hubs. This is principally the result of rapid population growth around the larger cities in recent years, causing urban sprawl and rising land costs around their airports, together with the accompanying growth in demand for air transportation, both air carrier and general aviation, at these same locations resulting in a collision

between community growth and airport establishment and expansion. The second reason was that it was believed that air carrier airports had the highest total cost land needs, so that focusing on these airports would be the most efficient way to scope the entire problem within the time available.

It is recognized, however, that general aviation airports servicing metropolitan areas are facing the same constraints to establishment and physical expansion as are air carrier airports and will experience even greater activity growth as more general aviation operations shift away from air carrier airports as these major air carrier facilities become more congested. The result is that there will be a future need for greater capacity of both reliever and other general aviation airports as well as air carrier airports, especially in the larger metropolitan areas.

General aviation airports on the whole are less able to finance capital improvements than are air carrier airports. One FAA study* found that only those general aviation airports in metropolitan areas with a large commercial/industrial revenue base and generating over 100,000 annual operations earn sufficient revenues to meet operating expenses. And this, of course, says nothing about generating revenues for capital improvements. The pattern over the years of airport closures as the cities grow out toward them is another indication of their marginal financial status. It is reasonable to conclude that few local governments can afford to make large capital investments in long term future general aviation airport needs. If land banking is to occur at these airports, a program requiring little or no initial investment by the public airport operators will be required in the vast majority of cases.

If under the conditions considered in this study land banking is found to be desirable for air carrier airports, the conclusion would follow that land banking is also desirable under the same conditions for general aviation airports. The question is, since total national land banking needs are estimated in this study from a base of air carrier airports, by how much should this estimate be increased to account for general aviation airport needs?

A review of the most current National Airport System Plan (NASP) published by the FAA shows that at the 26 hubs comprising the sample in this study, the estimated cost of land needed within ten years for general aviation airports is approximately 15% of the cost of land needed for the air carrier airports at

* Economics of Airport Operation, April 1974

those locations during the same period. Any land requirements and costs determined in this study, based upon the sample of air carrier airports, were therefore increased by 15% to account for the associated needs of general aviation airports.

Visits were made to each of the 26 airport hubs in the sample to collect the necessary data on future airport land requirements; past, current, and projected uses and prices of the land needed; and revenues that may be derived from this land in the interim.

Estimated land requirements are based upon consultation with airport personnel, detailed examination of airport master plans, and the FAA's Terminal Area Forecast (TAF) of aviation activity. Also underlying these estimates of airport land requirements are assessments by the airport operators and planners and by the investigating staff of the most probable extent of the impact upon airport operations of technological developments such as implementation of the upgraded third generation air traffic control system (UG3RD), various possible low capital alternatives that may be implemented to relieve congestion, and other such factors that may affect the airport's operational needs.

Specific parcels of land needed for airport expansion were identified. Historical price data were collected for these and similar parcels and for improvements in the area. Projected values were estimated for these specific parcels, taking account of possible land-use changes and development, based upon the historical price data, examination of regional planning documents, and consultation with local planning agencies, assessors, appraisers, developers, and realty boards. Data on potential revenues from these properties were also collected through consultation with leaseholders and rental agents and examination of various lease agreements.

Thus, the projected uses of the land needed for airport expansion were combined with estimated future prices of land and improvements to estimate the total value of the required property at various times. Since projected changes in land use and the value of associated improvements as well as the land itself are taken into account, these valuations represent the total value of the tract under consideration in the state of development existing at the time. In order to compare the values prevailing at different times, all values were discounted to a common point in time (1980) using a discount rate of ten percent per year.

The sample data, classified by hub size, were thus compiled, analyzed, and evaluated. Then these sample data were used to estimate the relevant parameters of the universe by assuming that additional land requirements in the universe were proportionately the same as those in the sample and that the prices

and land-use distribution in the universe were equivalent to those in the sample. Thus, for example, if the sample data indicated that small hub airports would require ten percent more land in 1990 than they presently own, this percentage was applied to the total land owned by all 87 small hubs to estimate their additional land needs in that year. This amount of land was then valued, assuming the same land-use distribution and associated property values that prevailed in the sample for small hub airports in 1990.

ANALYSIS

The first step in the analysis was to estimate the amount of land required for future expansion at the 26 sampled airports and the time when this land would be required by the airports. The amount of additional land that would be required was estimated by analyzing current airport facilities, runway configurations, and capacities to determine the land that would be needed for the construction of additional runways and facilities to meet future operational demands. Projected demands upon airport facilities were based upon the TAF of aviation activity, extended from its usual ten-year span out to the year 2000, together with assessments of the probable effects of UG3RD implementation and the application of various low capital alternatives to relieve congestion. Generally it was found that the implementation, or nonimplementation, of anticipated UG3RD or low capital alternatives would affect the timing but not the amount of additional land requirements.

Table VIII.1 shows the total amount of land currently owned by the 26 sampled airports and the 158 airports in the universe studied, classified by hub size. This table also shows the estimated land required for airport development over the next twenty years at the sampled airports, in acres and as a percentage of current landholdings, and the estimated land requirements of the universe airports. These total land requirements were estimated by applying the required percentage increases in land for the sample to the universe land holdings.

This table indicates that 27,450 acres of additional land will be required by the year 2000 for expansion of the Nation's air carrier hub airports. The largest land requirements occur at the Nation's medium hub airports, where an increase of nearly 20 percent is required, reflecting the increase in aviation activity anticipated at this class of airports. The large hubs will require very little additional land, less than two percent of current holdings, primarily because the larger airports have already purchased most of the land they expect to use between now and the year 2000.

TABLE VIII.1

Current Landholdings
and Additional Land Required by Year 2000

<u>Sample</u>			
<u>Hub Classification</u>	<u>Current Land Holdings (acres)</u>	<u>Additional Land Required</u>	
		<u>Acres</u>	<u>Percent of Current Land</u>
8 large	35,460	550	1.6
10 medium	24,350	4,570	18.8
8 small	15,790	1,000	6.3
26 Total	75,600	6,120	8.1

<u>Universe*</u>			
<u>Hub Classification</u>	<u>Current Land Holdings (acres)</u>	<u>Additional Land Required</u>	
		<u>Acres</u>	<u>Percent of Current Land</u>
31 large	125,340	1,940	1.6
40 medium	92,670	17,390	18.8
87 small	128,210	8,120	6.3
158 Total	346,220	27,450	7.9

*Additional land required estimated by applying sample percentage requirements to universe land holdings for each hub classification.

It was estimated that virtually all of this additional acreage would be required by 1990, taking account of the time needed to actually effect purchase and a construction lead time of two to three years. The effect on land acquisition timing and costs of earlier and later requirement times were investigated, however, and is discussed later in this section.

As noted earlier, the estimate of 27,450 acres of additional land required is based upon a study of air carrier hub airports. To take account of the needs of general aviation airports, this amount is increased by 15 percent. Thus, it is projected that a total of about 32,000 acres of land will be required by the year 2000 for development of the Nation's existing airports.

Given this projection of land requirements, the next step was an analysis of land acquisition costs under a variety of different possible situations. A base case was developed and analyzed, along with ten variations from this base case. The base case used in the analysis reflected the following values for the principal variables affecting the discounted purchase cost of real property, net of any interim revenues that may be derived from advance acquisition.

1. Rate of increase of land and improvement prices, based on field survey data: estimated site-specific rates of price increases, which average about three percent per year between 1976 and 2000, though there is some variation among different locations and among different types of property. In most instances, the rapid increases of recent years are projected to continue until about 1980, but are expected to fall off to more normal levels thereafter. While three percent per year may seem low relative to the inflationary rates of recent years, this rate is comparable to long-term historical price trends. For example, during the twenty-year period between the post-war boom and the recent escalation of prices (1950-70), consumer prices and rents (indicative of real estate values) increased less than 2.5 percent per year and wholesale prices increased only 1.5 percent per year. Furthermore, it is the consensus of the assessors and appraisers contacted at the locations studied that the prices of land contiguous to airports are close to their peak levels now and will flatten out after 1980.
2. Rate and type of transition from lower to higher land use, based on field survey data: Estimated site-specific land-use changes and development.
3. Interim revenues:
 - a. Residential properties: Annual revenue equal to 8 percent of property value. Rental incomes on residential properties are generally about 12% of property value; a rate of 8% was used in this study to allow for lost tax revenue on the purchased property and the reduced revenue potential due to proximity to the airport and the short-term tenancy involved. Furthermore, several airports that own residential properties contiguous to the airport are receiving annual net revenues equal to about 8% of property value.

- b. Commercial and industrial properties: Annual revenue equal to 14 percent of land value, based on the assumption that the airport authority does not operate the commercial or industrial enterprises but only leases out the land for these enterprises.
- c. Vacant land: Annual farming lease values pertinent to the localities studied, ranging from \$15 to \$50 per acre in 1976.

4. Discount rate: 10 percent per year.

These values are considered to represent a reasonable and likely picture of the circumstances affecting land acquisition around the Nation's airports as the future unfolds. The different land acquisition situations examined were developed by changing each of these variables as follows:

- 1. Two higher rates of increase of land and improvements prices: 5 and 7 percent per year.
- 2. Two faster rates of transition from lower to higher land use, based on site-specific estimates of possible development.
- 3. Two lower rates of interim revenue: one-half of the base case revenues and zero revenue.
- 4. Two lower discount rates: 8 and 6 percent per year.
- 5. Two additional variants were also examined: the circumstances if the necessary land were required five years sooner or five years later than estimated.

The overall results of these variations are shown in Table VIII.2. These eleven different cases show savings from optimum purchase timing, as opposed to purchase only when needed, ranging from about \$113 million, or 15 percent, to about \$491 million, or 48 percent. The base case indicates savings of \$156 million, or 21 percent. These are savings that would be realized over the period of time between now and the year 2000 through optimum timing of land acquisitions.

It should be emphasized that these figures, as well as all others in this analysis, are not current dollars. In order to compare the values prevailing at different times, taking account of the cost of capital, all values were discounted to a common point

TABLE VIII.2

Net Costs of Acquiring Land Required at 158 Air Carrier Airports

Case	Variations of Determinants					Net Cost of Land Acquisition (millions of 1980 dollars)			Percent Savings from Optimum Purchase Timing
	Rate of Price Increase %/yr.	Rate of Land Use Transition	Interim Revenues	Discount Rate %/yr.	Year Land is Required	Optimum Purchase Timing	Purchase When Needed	Difference	
Base	3	Most Likely	Most Likely	10	Most Likely	571	727	156	21
1	3	Most Likely	Half	10	Most Likely	611	727	116	16
2	3	Faster	Most Likely	10	Most Likely	566	782	216	28
3	3	Fastest	Most Likely	10	Most Likely	592	1012	420	41
4	5	Most Likely	Most Likely	10	Most Likely	641	886	245	28
5	7	Most Likely	Most Likely	10	Most Likely	703	1137	434	38
6	3	Most Likely	Most Likely	8	Most Likely	566	861	294	34
7	3	Most Likely	Most Likely	6	Most Likely	533	1024	491	48
8	3	Most Likely	Most Likely	10	5 years sooner	988	1120	132	12
9	3	Most Likely	Most Likely	10	5 years later	409	565	157	28
10	3	Most Likely	None	10	Most Likely	614	727	113	15

Note: These data are for air carrier hub airports and do not include the 15 percent increase made to account for the needs of general aviation airports.

in time (1980) using a discount rate of ten percent per year (or, only for cases 6 and 7, 8% and 6%, respectively). Care must be taken, therefore, not to interpret these values as current values. For example, using a 10% discount rate, an expenditure of \$100 million in the year 2000 is equivalent to only \$15 million in 1980.

The changes in cost levels and optimum purchase savings resulting from the ten variations from base case conditions are all in a direction that would be intuitively expected. Lower interim revenues (cases 1 and 10) cause higher advance net purchase costs and, hence, lower savings from such advance purchases. Faster transitions of land from lower to higher uses (cases 2 and 3), faster increases in the prices of land and improvements (cases 4 and 5), and lower discount rates (cases 6 and 7) all raise the costs of land acquisitions made later when the land is needed and therefore increase the advantage of early acquisition.

If the airports require the land five years sooner than estimated (case 8), the shorter time span raises the net costs of both early and later acquisition, the former because there is less time to earn revenues and the latter because of the reduced discount period. The net result of these effects is a lower savings advantage available from early land purchases. If, on the other hand, the airports do not need the land until five years later than estimated (case 9), both early and later acquisition costs are reduced. The absolute level of savings from early acquisition hardly changes at all; however, the relative savings are greater.

In addition to the base case, which is the situation considered most likely to prevail, two of the alternative cases were selected for more detailed examination and exposition. Case five, with land and improvement prices increasing at seven percent per year, was selected as representative of a reasonable upper limit of land acquisition costs and savings through optimum purchase timing. Case ten, assuming that no revenues at all are derived from properties purchased in advance of need, was selected to represent a lower limit.

If a program is undertaken to acquire the necessary land at the most economically opportune time, some of the land will be purchased in advance of the time it is needed for airport development. Table VIII.3 depicts the proportion of required land that would be acquired in advance of need and "banked" under such a program, for each of the three cases studied in detail. Under base case conditions, about three-quarters of the required land would be purchased early. As would be expected, this proportion rises if prices increase more rapidly and falls if no revenues can be derived from the banked land.

TABLE VIII.3

Land Purchased in Advance of Need, as a Percentage of Total Additional Land Required, Under Optimum Purchase Timing

Hub Classification	Base Case	Case 5 (prices incr. at 7 %/yr.)	Case 10 (no interim revenues)
Large	17	72	0
Medium	86	93	62
Small	71	97	68
Total	77	92	58

One of the major factors contributing to the economic desirability of purchasing land in advance of the time when it is actually needed to meet airport operational demands is the transition of this land from lower to higher uses and the resulting higher costs of acquisition if it is not purchased until after such development has taken place. Table VIII.4 depicts the use distribution of the required land when it is purchased at the most economic time and at the time it is needed, under the three alternative cases. This table reflects the expected transition from vacant land to residential, commercial, and industrial uses in all cases, except at the large hubs where there is relatively little vacant land available. At the large hubs there is a small shift from residential to industrial use of land. These shifts in land use are even more sharply delineated for the land that should be purchased in advance of need, as shown in Table VIII.5.

TABLE VIII.4
Use Distribution of Required Land (%) ^{1/}

Land Use	A. Base Case							
	Large Hubs		Medium Hubs		Small Hubs		Total	
	Optimum Purchase Timing ^{2/}	Purchase When Needed	Optimum Purchase Timing	Purchase When Needed	Optimum Purchase Timing	Purchase When Needed	Optimum Purchase Timing	Purchase When Needed
Residential	38	36	24	29	2	8	22	26
Commercial	15	15	3	4	2	3	4	5
Industrial	19	21	4	6	6	11	6	8
Vacant	28	28	69	61	90	78	69	61
B. Case 5: Prices Increase at 7 %/year								
Residential	38	36	25	29	2	8	23	26
Commercial	15	15	3	4	1	3	4	5
Industrial	19	21	4	6	0	11	5	8
Vacant	28	28	68	61	97	78	69	61
C. Case 10: No Interim Revenues								
Residential	36	36	22	29	2	8	20	26
Commercial	15	15	3	4	2	3	4	5
Industrial	21	21	5	6	6	11	7	8
Vacant	28	28	69	61	90	78	69	61

^{1/} Table shows percentage distribution of land usage, by hub and by timing of purchase. For example, in the base case, if the land required at large hubs is purchased when needed, 21% of this land will be industrial at the time of purchase. If the required land is purchased at the most economically opportune time, 19% will be industrial.

^{2/} Some of the land purchased at the optimum time probably is purchased in advance and banked. For example, at large hubs in the base case, 17% of the required land is banked (see Table VIII.3).

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TABLE VIII.5

Use Distribution of Banked Land (%) ^{1/}

A. Base Case

Land Use	Large Hubs		Medium Hubs		Small Hubs		Total	
	When Banked	When Needed	When Banked	When Needed	When Banked	When Needed	When Banked	When Needed
Residential	100	87	28	34	4	11	26	32
Commercial	0	2	0	1	0	1	0	1
Industrial	0	11	0	2	0	8	0	3
Vacant	0	0	72	63	96	79	74	64

B. Case 5: Prices Increase at 7 %/year

Residential	53	50	26	31	3	8	24	29
Commercial	20	20	3	4	0	2	4	5
Industrial	27	30	4	6	0	11	5	9
Vacant	0	0	67	59	97	78	67	58

C. Case 10: No Interim Revenues

Residential	No	0	11	0	8	0	10
Commercial	Land	0	1	0	1	0	1
Industrial	Banked	0	1	0	8	0	2
Vacant		100	88	100	82	100	87

^{1/} Banked land is land purchased in advance of need.

Table VIII.6 indicates the proportion of each type of property for which there appears to be an economic advantage in being purchased early and banked, for each of the three cases. Between 83 and 89 percent of the vacant land that will eventually be needed for airport expansion would be purchased early and banked in any of these three cases, the percentage being slightly higher when prices are increasing rapidly. The advance purchase of vacant land is based primarily on acquisition prior to its development. The small proportion of vacant land for which land banking is not indicated is vacant land that is not expected to become developed in the interim, often due to its current use for such things as parks or cemeteries. Advance acquisition of residential properties appears to be desirable if a reasonable level of revenues can be anticipated from such properties. Only if prices are rising rapidly would commercial and industrial properties be purchased early and banked.

TABLE VIII.6

Proportion (%) of Land Use Types
Purchased in Advance of Need (Banked)

<u>Case</u>	<u>Residential</u>	<u>Commercial</u>	<u>Industrial</u>	<u>Vacant</u>
Base Case	91	2	0	83
5: Prices Increase at 7%/Year	100	93	100	89
10: No Interim Revenues	0	2	0	83

Table VIII.7 summarizes the anticipated costs of land acquisitions required for future development of existing airports and shows the time distribution of these costs under the circumstances of the three different cases studied. These results are based upon the universe of 158 air carrier airports considered in the analysis, with 15 percent added on to cover the land acquisition needs of general aviation airports as discussed above.

In each of three different cases, the 1980 present value cost of land acquisition is shown under two options. The first option is that land is purchased when needed (i.e., it is not land banked). The second option is that the land is purchased at the optimum economic time (i.e., it is either purchased and banked or purchase is deferred until needed). Again, it should be emphasized that costs shown are discounted to 1980 dollars. For example, the base case shows a cost of \$680 million during 1986-90 if land is purchased only when needed. The equivalent amount in current dollars during the five year future period is \$1,760 million.

TABLE VIII.7

Land Acquisition Funding Requirements
(millions of 1980 dollars)

A. Base Case

Land Acquisition Purchasing Options		Years			Total
		1978-80	1981-85	1986-90	
Purchase Only When Needed		-	155	680	835
Optimum Purchase Timing	Purchase & Bank	330	55	-	655
	Defer Purchase	-	150	120	

B. Case 5: Prices Increase at 7%/year

Land Acquisition Purchasing Options		Years			Total
		1978-80	1981-85	1986-90	
Purchase Only When Needed		-	225	1,080	1,305
Optimum Purchase Timing	Purchase & Bank	720	5	-	810
	Defer Purchase	-	20	65	

C. Case 10: No Interim Revenues

Land Acquisition Purchasing Options		Years			Total
		1978-80	1981-85	1986-90	
Purchase Only When Needed		-	155	680	835
Optimum Purchase Timing	Purchase & Bank	20	5	-	705
	Defer Purchase	-	150	530	

CONCLUSIONS

1. Between now and the year 2000, the Nation's existing airports will require 32,000 additional acres of land for the expansion and development necessary to meet their operational demands. Virtually all of this additional land will be required by 1990.
2. If this land is not purchased until it is actually needed, the total acquisition cost will be \$835 million (1980 dollars) in the most likely case, most of which must be expended between 1985 and 1990. If prices increase at the unusually high rate of 7 percent per year, this total cost will rise to about \$1.3 billion (1980 dollars).
3. If this same land is purchased at the most economically opportune time, the total cost in the most likely case will be \$655 million (1980 dollars), a saving of \$180 million, or over 20 percent, with the bulk of the land acquisition expenditures shifting from later to earlier years. If no revenues were derived from banked land, the savings would drop to \$130 million, or about 15 percent. If prices were to rise as fast as 7 percent per year, early acquisition costs would increase, but not as much as deferred acquisition costs; this results in savings close to half a billion dollars, or almost 40 percent.
4. Under a program of land acquisition at the most economically opportune time, three-fourths of the land required will be purchased in advance, with expenditure of sixty percent of the funds, and banked until it is actually needed for airport development. Purchase of the remaining quarter of the land required should be deferred until it is needed.
5. These conclusions with respect to land acquisition costs and expenditures in millions of 1980 dollars are summarized in the following table for the base case:

Land Acquisition, Purchasing Options		1978-80	1981-85	1986-90	Total
Purchase Only When Needed		-	155	680	835
Optimum Purchase Timing	Purchase & Bank	330	55	-	655
	Defer Purchase	-	150	120	

CHAPTER IX

LAND BANKING FOR FUTURE NEW AIRPORTS

In the previous chapter, future land needs and economic impacts of land banking were analyzed for the Nation's existing airports. Preliminary data collected for the Federal Aviation Administration's 1978 National Airport System Plan (NASP) indicates that approximately 450 new airports will be needed by 1988 to handle forecasted air carrier and general aviation activity. Of particular concern in this analysis are the land needs for possible major new airports, because of the very large tracts of land involved near large metropolitan centers which is precisely where encroachment pressures are being felt the most.

In addition to requiring a study of land banking, Section 26 of the 1976 Airport and Airway Development Act Amendments also called for a simultaneous study of new major airports. The findings of that study as contained in the final report* will be briefly assessed here with regard to land banking.

The major airport study found that from three to ten additional new air carrier airports may be needed by the year 2000 to serve large U.S. urban areas. This number is a function of what actually occurs within a range of future assumptions regarding aviation demand, airport capacity increases to be provided by the UG3RD, and capacity increases possible through implementation of administrative procedures such as spreading aircraft operations away from peak activity hours.

Of the estimated maximum of ten possible locations for new major airports, a few having already land banked substantial acreage for this purpose. The present cost of the land required for the remaining locations is estimated to total approximately \$350 million (1976 dollars). This estimate assumes that existing banked land for major airports and surplus military airfields which may become available are utilized to a maximum extent and that new air carrier airports will supplement, rather than replace, existing major airports.

An assessment of how many new smaller airports will be established and become part of the national system in the future may be obtained from examining the recent past. During the first five years of ADAP (1971-1975), 85 new national system airports

*Establishment of New Major Public Airports in the United States, Federal Aviation Administration, August 1977.

came into being with Federal assistance. Of these, three were air carrier airports and the remaining 82 were general aviation only. Ten new airports are currently receiving ADAP assistance under the fiscal year 1976 and transition quarter ADAP program. Of these ten, two are air carrier airports and eight are general aviation only. The air carrier airports, both in Alaska, received only about \$3,000 each for land acquisition, but one of the general aviation airports required \$1.4 million for land. This was a reliever airport serving a metropolitan area.

By far, the majority of needed new airports are for use by smaller general aviation aircraft. Airports for this class of aircraft vary considerably in size according to individual community needs, but a reasonable average size is 150 acres. If new airport construction continues as it has over the past six years, an average of approximately 15 new airports will enter the national system each year for a total of 360 new airports by the year 2000. This is a more realistic estimate of the number of new small airports that will actually be built than the 1978 NASP indicates will be needed.

The principal need for these airports is to replace small or substandard existing airports. For the most part, these smaller airports are established on undeveloped land near small communities. Field investigations of land values undertaken in conjunction with this study indicate that this type of land presently averages about \$700 per acre in value nationwide and is forecast to increase at an annual rate of less than 5 percent to approximately \$2,000 per acre by the year 2000. However, the 1978 NASP indicates that about ten percent of these new airports will be relievers serving larger metropolitan areas with considerably higher land acquisition costs. Typical of such reliever airports is the \$1.4 million required to purchase the land for the reliever airport built in 1976 and noted above. The expenditures necessary to construct 15 new small airports per year, 90 percent of which require 150 acres each, and 10 percent of which are larger relievers, given these land prices and a discount rate of 10 percent, result in a total investment of about \$75 million (1980 dollars). These expenditures would be distributed as follows, assuming that these airports are built at the steady rate of 15 per year: \$19 million between the present and 1980, \$19 million between 1980 and 1985, \$16 million between 1985 and 1990, \$12 million between 1990 and 1995, and \$9 million between 1995 and 2000.

The question is, should the land for new airports, large and small, be banked or acquired when it is needed? The economic instabilities of small airports discussed in Chapter X indicate it is very unlikely that developed land would be converted to small airport use. In other words, new smaller airports will continue to be established on largely undeveloped land.

The findings of the analysis of existing airports contained in Chapter VIII indicated that it is economically feasible to bank undeveloped land if it is expected that this land will be developed before it is required for airport use. Generally speaking, therefore, land for the construction of a new small airport should be purchased in advance and banked if it is expected that the selected site would likely be developed in the meantime were it not purchased and no reasonable alternative site would be available in the event of such development. If, on the other hand, no development of the land involved is expected, or alternative undeveloped sites are available, purchase of the site should be deferred until it is actually needed for construction of the airport.

As previously discussed, three to ten new major air carrier airports may be needed nationwide by the year 2000. Various factors such as social and political considerations and environmental impacts virtually dictate that any new major airport be constructed on undeveloped land beyond the urban fringe. The new major airport study indicates that the average price in 1976 of such land around the Nation's major hubs was about \$4,400 per acre.

Table IX.1 indicates the probable trend of prices for vacant land and residential properties in the vicinity of large hub airports, based on the above price of \$4,400 per acre and the field survey data referred to in Chapter VIII. The prices are presented in current dollars and discounted to 1980 using a 10 percent discount rate.

TABLE IX.1

Estimated Price Projections (\$1,000/Acre),
Vacant and Residential Properties Near Large Hub Airports

<u>Land Type</u>	<u>Dollars</u>	<u>1976</u>	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>
Residential	Current	109	126	150	171	192	216
	Discounted	160	126	93	66	46	32
Vacant	Current	4.4	6.3	8.0	11.2	13.4	16.1
	Discounted	6.4	6.3	5.0	4.3	3.2	2.4

Based upon an estimated 1976 land cost of \$350 million for all ten new major airports, assuming that this land is largely undeveloped, and using the increase in vacant land prices shown in Table IX.1, the cost of acquiring this land in 1980 will be

approximately \$500 million. The prices shown in the table also indicate, however, that the cost of purchasing the same land in 1995, discounted to 1980, is only about half of that amount; i.e., it costs twice as much (in 1980 dollars) to buy the land in 1980 as it does in 1995 if the land remains vacant.

It is reasonable to consider, however, that by 1995 this presently vacant land may be residentially developed. In that case, it would cost more than seven times the 1980 acquisition cost to purchase the same tracts of land in 1995 (from Table IX.1, $46/6.3 = 7.3$).

If an undeveloped site selected for a new major airport is not banked and converts to residential or other high-value use before the airport is established, it is probable that a new airport site farther out on undeveloped land would be selected. This leads to the conclusion that the principal advantage of banking land for new major airports is not the potential saving in land acquisition costs but the preservation of a site closer in to the central business district. This is especially critical, of course, if there is no suitable alternative site within any practicable distance of the metropolitan center.

In the event, therefore, that a new major airport is committed to a specific site that may reasonably be expected to become developed before it is needed by the airport, it would be economically advisable to purchase and bank this site. To defer purchase would cost about seven times as much if the site were in fact developed in the meantime, while the current acquisition cost would only be about twice the later cost if the land were not developed. In other words, in such a case the potential saving far exceeds the possible additional cost of early acquisition.

In stating that the major benefit of land banking sites for new airports is to insure closer-in airport facilities, it is recognized that user costs are associated with locating airports farther from community centers. Especially in the case of large communities served by systems of airports, however, travel patterns become very complex and these costs are extremely difficult to quantify. No attempt to do so was made in this study.

In conclusion, land banking for new airports, large or small, must be determined on a site-specific basis. The distribution of the \$75 million expenditure for new small airports to purchase the necessary land as it is required is based on the assumption that these airports are built at the steady rate of 15 per year. Any advance purchases for small airports would probably be distributed in about the same way, rather than being concentrated at the beginning of this period, and thus would not

alter the distribution of expenditures significantly. For the new major airports to be operating towards the end of the century, the required land would cost about half the 1980 acquisition cost if these purchases can practicably be deferred until the land is actually needed; the sooner the land is needed, the higher the acquisition cost (discounted to 1980). However, if it appears probable that the land will be developed and there are no suitable alternative sites, to defer acquisition may raise the cost significantly and, therefore, advance acquisition may be warranted.

CHAPTER X

CAPITAL FINANCING FOR AIRPORT LAND BANKING 1/

Airport capital improvements are generally financed either by general obligation or by revenue bonds. Bank loans and risk capital, to a more limited degree, are also used to finance development projects. General obligation bonds and revenue bonds are discussed below.

GENERAL OBLIGATION BONDS

The traditional way of financing local public works projects is by general obligation bonds, which carry the full faith and credit of the issuer. Revenues to secure the general obligation bond issue come from all the taxes and income of the local government. This results in lower interest rates than for a nonguaranteed revenue bond.

General obligation bonds become part of the outstanding debt of the local community and this has several ramifications. First, there is usually a statutory debt limit which the local Government cannot exceed. A common limitation is that debt cannot exceed a given percentage, say 2, 5, or 10 percent, of the valuation of taxable property in the community.

If statutory limits have been reached, or governments desire to reserve any remaining margin for other local public works, general obligation bond financing of airport projects is precluded. If the debt ceiling is raised to accommodate additional airport bond issues, the credit rating of the government may be affected, resulting in higher interest costs. Because fiscal pressures on local governments for all types of activities have been increasing, debt ceilings and priorities of other public work projects probably constitute the most significant problem for general obligation bond financing. However, there are also several forms of psychological limitations such as adverse

1/ Material in this chapter is taken from:
William R. Fromme, The Airport Passenger Head Tax
(Washington, D.C., U. S. DOT, Federal Aviation Administration,
July 1974)

taxpayer reaction to "more public debt" and active campaigning against bond issues by those opposed to airport development. (Elections are required in many states to authorize general obligation bonds.) When general obligation bonds became less popular the concept of revenue bonds was developed.

REVENUE BONDS

Revenue bonds for airport development do not constitute a debt of the local government. They are sold to the private capital market on the premise that revenues from the airport, group of airports, port authority facilities, or special airport facility such as hangar or terminal building will be sufficient to cover interest and capital repayment of the bond over the period of the loan. Because they do not require a pledge of the faith and credit of the state or municipality, revenue bonds do not normally impinge on local statutory debt limitations. Generally, the only limitations are economic ones, i.e., how large a debt will revenues support? Moreover, many states permit the issue of revenue bonds without general election or, at most, require specific public action to petition for a referendum.

Revenue and general obligation bonds have a number of common characteristics. Both are exempt from Federal income taxes and sometimes from state and local income taxes. Municipalities frequently have a choice between issuing general obligation bonds or revenue bonds, depending on the purpose of the bond issue. Either type may be issued for terminal construction or other income-related projects. However, only general obligation bonds would be available for nonrevenue public projects, such as, for example, acquisition of crash and fire rescue vehicles.

PROBLEMS OF CAPITAL FINANCING

The problems of capital financing for airport development are usually more difficult for the Nation's smaller airports than for the larger ones. Many larger airports have an established history of earnings and payment of existing debt. These airports often are able to issue revenue bonds without voter approval. Furthermore, with both earnings and capital financing available, many larger airports have ready access to matching funds for Federal or state grants.

Smaller airports, those in the small and non-hub categories, are not as fortunate as their larger counterparts. Many cannot meet all their operating expenses. Analysis of financial reports of 47 airports by the FAA Office of Aviation Policy for The Airport Passenger Head Tax Study found that airports did not consistently "break even" on operating expenses until enplanements exceeded approximately 97,000 annually. Not until annual enplanement reached 275,000 were airports generally able to meet their debt service requirements without local contributions, head taxes or other extraordinary income. Airports without surplus funds for capital improvement projects are, of course, unable to take advantage of matching state or Federal grants.

At some of the larger airports, airlines, through negotiable landing fee rates, guarantee meeting airport operating expenses and debt service requirements. These negotiable landing fees are contained in revenue bond provisions to insure their sale. At most of the smaller airports, however, airlines generally do not enter into such agreement because of low utilization of airfield and terminal facilities. Without airline backing, bonds are considerably more difficult to sell.

In an attempt to overcome some of the problems of capital financing, many of the airports in the FAA survey for the head tax study had been established as airport authorities by local or state legislation. A potential advantage of the airport authority is that it can draw support from more than one local government, effectively expanding the tax base and legal jurisdiction of the airport. Under this form of ownership, for example, one airport met its financial obligations with a combination of grants from nine cities and towns, state aid, grants from six private firms, and a Federal emergency employment act grant.

However, it was concluded in the head tax study that the problem of airport capital financing cannot be solved by a change in the form of airport ownership.

EVALUATION OF FINANCIAL CAPABILITY

The Airport Passenger Head Tax study evaluated the economic viability of 47 airports. An initial analysis was conducted of each airport's ability to meet its reported operating expenses, debt service and capital improvement costs without head tax revenues, local government contributions or extraordinary income resulting from sale of airport equipment or

land. The results of this analysis are shown in Table XI.1 for each of five annual enplanement groups.

For purposes of the head tax study five airport categories were defined:

<u>Category</u>	<u>Annual Passenger Enplanements</u>
Hub Size A	500,000 - Two Million
Hub Size B	250,000 - 500,000
Hub Size C	125,000 - 250,000
Hub Size D	50,000 - 125,000
Hub Size E	Under - 50,000

The analysis showed that all hub airports in the two largest categories ("A" and "B") and twelve of thirteen hubs in the next largest group (Category "C") were able to meet their operating expenses. Only six of eight airports in the 50,000-125,000 annual enplanement Category ("D") and two of the smallest airports (Category "E") were able to meet operating expenses.

With respect to the ability of airports to finance capital improvements, two of six largest airports and three of seven Category B airports generated sufficient revenues to meet debt service requirements and support capital improvement costs. Only two of thirteen Category C airports generated sufficient revenues to support capital improvements from earnings. None of the airports in the two smallest categories generated sufficient income to support capital improvement.

The lack of adequate financial resources for the development of landing areas, terminals and other projects was evident at almost all of the airports surveyed. Faced with uncertainties of capital availability, many airports have found it difficult to implement a planning program; several have deferred most or all of their development projects.

The financial analysis also indicated that the condition of several airports would substantially change in the near future. Of the six airports shown to be able to meet operating expenses, debt service costs, and capital improvement costs, one presently has no debt and is without adequate retained earnings to finance major long-term capital improvements which it may require. Another is in the midst of a major development program with the first principal payment due in 1977. This principal payment is in excess of its current operating profit, although payment of this debt is guaranteed by airline revenue bond covenants. Three other airports are also in the midst of major development programs substantially adding to their debt. At one of these,

Table x .1 AIRPORT FINANCIAL CAPABILITIES

CAPABILITY OF AIRPORTS TO MEET CURRENT OPERATING EXPENSES, DEBT SERVICE
AND/OR CAPITAL IMPROVEMENT COSTS WITH OPERATING REVENUES, HEAD TAX REVENUES,
LOCAL GOVERNMENT CONTRIBUTIONS, OR EXTRAORDINARY INCOME NOT INCLUDED.

Y = YES, AIRPORT CAN MEET ALL EXPENSES WITH OPERATING REVENUES,
N = NO, AIRPORT CANNOT MEET ALL EXPENSES WITH OPERATING REVENUES.

ANNUAL ENPLANEMENT GROUP & AIRPORT	ENPLANED PASSENGERS	OPERATING EXPENSES	REVENUE BOND		G.O. BONDS/LOANS		CAPITAL IMPROVEMENTS
			INTEREST	PRINCIPAL	INTEREST	PRINCIPAL	
HUB SIZE A (\$500,000 - 2 million)							
Indianapolis, Ind.	1,044,991	Y	Y	Y	Y	Y	N
Rochester, N.Y.	796,799	Y			N	N	N
Jacksonville, Fla.	796,511	Y	Y	Y	Y	Y	N
Norfolk, Va.	666,724	Y	Y	Y			Y
Raleigh-Durham, N.C.	577,301	Y	Y	Y			Y
Tucson, Arizona	570,737	Y	Y	Y			N
HUB SIZE B (250,000 - 500,000)							
Des Moines, Iowa	486,301	Y			Y	N	N
Spokane, Wash.	465,236	Y	Y	N	Y	Y	Y
Cedar Rapids, Iowa	421,283	Y			Y	Y	Y
Richmond, Va.	413,401	Y			Y	N	N
Rosnoke, Va.	332,329	Y			Y	Y	Y
Jackson, Miss.	322,428	Y			Y	Y	Y
Sarasota, Fla.	275,356	Y	Y	Y	Y	Y	N
HUB SIZE C (125,000 - 250,000)							
Madison, Wisc.	241,042	N			N	N	N
Huntsville, Ala.	230,780	Y	N	N			N
Greenbay, Wisc.	227,281	Y			N	N	N
Chattanooga, Tenn.	225,362	Y			N	N	N
Allentown, Pa.	206,877	Y			N	N	N
Newport News, Va.	204,242	Y			Y	N	N
Midland, Tex.	199,010	Y	Y	Y			Y
Pensacola, Fla.	195,459	Y			Y	Y	Y
Fort Wayne, Ind.	194,523	Y					Y
Evansville, Ind.	188,784	Y			N	N	N
Fort Myers, Fla.	181,918	Y					N
Fayetteville, N.C.	155,000	Y			N	N	N
Youngstown, Ohio	135,479	Y			N	N	N
Rochester, Minn.	134,500	Y			N	N	N
HUB SIZE D (\$50,000 - 125,000)							
Melbourne, Fla.	123,901	Y	Y	Y			N
Eugene, Oregon	107,395	N			N	N	N
Kalamazoo, Mich.	96,195	N			N	N	N
Duluth, Minn.	92,413	Y			N	N	N
Springfield, Mo.	86,247	Y			N	N	N
Medford, Oregon	85,785	Y			N	N	N
Lafayette, La.	65,000	Y			N	N	N
Traverse City, Mich.	50,327	Y			N	N	N
HUB SIZE E (Under 50,000)							
La Crosse, Wisc.	46,978	Y			N	N	N
Williamsport, Pa.	42,254	N	N	N			N
Manchester, N.H.	35,994	N			N	N	N
Lake Tahoe, Cal.	35,204	N					N
Staunton, Va.	27,876	N			N	N	N
Bradford, Pa.	24,661	N					N
Lebanon, N.H.	20,491	N			N	N	N
Int. Falls, Minn.	18,000	N					N
North Platte, Neb.	15,421	N	N	N			N
Keene, N.H.	12,383	N			N	N	N
Laconia, N.H.	3,775	N					N
Berlin, N.H.	1,500	N					N

debt increased from \$460,000 to over \$4 million, another from \$490,000 to \$3.3 million. An evaluation of current and projected resources of these airports indicates they will be unable to meet all future debt service requirements. Much of this responsibility will revert to local taxpayers.

Large increases in debt are also evident at airports already receiving substantial community subsidization. At one such airport, debt recently increased from \$2 million to \$12.5 million. Starting in 1976, the airport will have to meet over \$712,000 in interest and principal payments, an amount which exceeds its current operating profit by a factor of eight.

CHAPTER XI

ALTERNATIVE FEDERAL ACTIONS

Chapters VIII and IX indicate that land banking shows positive but not overwhelming economic advantage when examined over a fairly wide range of future projections of land values, interest rates and development pressures.

Non-economic advantages of land banking were also identified in this study. Perhaps one of the most outstanding potential advantages of land banking is that it could provide a mechanism for performing in advance environmental assessments, public forums, relocation programs and related social processes that often impose significant delays on airport expansion projects. The transition from propeller-driven to turbojet aircraft during the 1960's carried three significant changes at the larger airports: noise levels from aircraft operations increased substantially, runways had to be extended requiring additional land, and the number of runways and size of terminal areas needed to expand to accommodate the rapid public acceptance of jet travel. The result of this was that airports gained a reputation for being poor neighbors who could be expected to bring more and more noise closer and closer to surrounding communities without regard for community impacts. Opposition to further expansion became vocal and well-organized, resulting in creation of new legislation, regulations, and procedures designed to protect the environment and community interests. These protections are beneficial, but in some cases they have considerably extended the time required to bring about airport development. It appears that these protections will become more rather than less numerous in the future, leading to the conclusion that perhaps it should be recognized that the planning phase of airport projects should and has become much more significant than in the past. Planning should look further into the future with more detail, perhaps even defining precisely in terms of land need the ultimate extent of the larger airports.

If this were done, land banking would allow the land acquisition process to be initiated years in advance of need, providing ample time for preparation of required environmental impact statements, carrying out community consultation, etc. To some extent, land could be banked slowly as it came on the market in the normal process, thereby ameliorating adverse community impact with its inevitable resistance. Banked land could be leased to its original owners or others for non airport use during the interim period before it is needed for airport purposes, thus preserving the community and producing revenue which would offset acquisition costs to some extent as investigated in Chapter VIII.

One of the most frequently cited possible advantages of land banking is that it helps insure future land availability for airport expansion. The belief is that available land around airports is rapidly disappearing and that zoning and land use regulations are not in themselves sufficient to maintain the continuing availability of needed land.

A somewhat surprising finding of this study is that by and large this is not an urgent problem. Acquisition costs for future land needed on a national basis will be about 20% more if not acquired until needed. While high, this is not prohibitive and supports the general observation during the field analysis that most airports are not experiencing serious encroachment problems. In some cases this could be attributed to their having had the foresight to bank needed land previously. As shown in Chapter VIII, most future land is needed by the medium hub airports and there is still considerable amount of land that will continue to be available at those locations. No doubt there are, however, some exceptions at specific airports to this general conclusion.

Only two significant potential disadvantages to land banking were identified during the course of this study. One was that removal of land from the tax rolls may form the basis of potential opposition. The field investigations, however, did not find reason for substantial concern on this point. The acreage involved was usually an insignificant portion of the total taxable land in a city or county. Because it was often vacant or agricultural as opposed to other built-up sections of the jurisdictions, it was an even less significant portion of the total source of property tax revenues.

The second disadvantage related to financing. This was an extension of normal airport financing problems. The capability of airport operators to finance capital improvements is discussed in Chapter X. The findings is that capital funding is in short supply except at the largest airports and that long range needs cannot effectively compete with short-range needs.

If it were decided to establish a Federal airport land banking program, funding needs and alternative programs are as follows:

FUNDING NEEDS FOR LAND BANKING

Based on the analysis contained in Chapters VIII and IX, total costs for additional airport land through the year 2000 may be \$1081 million (1980 dollars), assuming the maximum of ten new major airports and that the land is purchased at the optimum time to minimize acquisition costs, discounted to 1980. This total consists of \$655 million to expand existing airports, \$351 million to construct the ten new major airports, and \$75 million to build 360 new small airports. Of this amount,

\$385 million was found economical to invest in land banking during the years 1978-1985. The remainder should be invested in land that is not acquired until it is needed, though there are circumstances under which some of this land should be purchased in advance and banked for new airports.

An investment program averaging \$48 million per year in 1980 dollars during the period 1978-1985 would cover this cost. By way of illustration, the following chart shows equivalent amounts in current dollars required to match a uniform \$48 million annual investment in 1980 dollars. The table is based on a 10% discount rate.

TABLE XI.1 Annual Funding Needs for Land Acquisition in 1980 and Current Dollars

Amounts Shown in Millions									
	1978	1979	1980	1981	1982	1983	1984	1985	Total
1980	48	48	48	48	48	48	48	48	385
Current Dollars	39.8	43.8	48.1	52.9	58.2	64.1	70.5	77.5	454.9

ALTERNATIVE TYPES OF PROGRAMS

There are several different approaches that could be used to provide the funds needed for a Federal airport land banking program. These include funding through the existing airport development aid program (ADAP), a direct loan program, a loan guarantee or assistance program, and a combination grant/loan program. Each of these options is discussed below.

GRANT PROGRAM FOR LAND BANKING

The FAA could provide funding assistance through the existing Airport Development Aid Program (ADAP). While the ADAP already allows land acquisition for future airport development as an eligible item for funding, such acquisition is forced to compete directly with more immediate development needs. Long range needs (such as land banking) often experience difficulty competing in this fashion with more urgent, short range needs. However, this problem could be overcome to some extent by legislatively earmarking a portion of ADAP funds specifically for land banking.

Under conventional ADAP, sponsors would be required to raise their share of land acquisition costs at the time of land purchase. This could still result in some competition between long-range and short-range airport needs for sponsor funds, even if Federal funds were earmarked for land banking only.

LOAN PROGRAM

Loans could be provided directly by the Federal Government to the airport sponsor. The interest rate for such loans could be set at a constant rate or it could be varied with prevailing rates. It could be the same as the market interest rate or pegged somewhat below that rate. These loans could cover part or all of the land banking project costs and the form of repayment could vary. Some payment alternatives are an annual payment over the term of the land banking projects, an annual payment over the term of the whole development project, or a lump sum due when the development project is begun.

A Federal loan program would involve an initial expenditure comparable to a grant program but the money would eventually be repaid in most cases. From the sponsor's point of view, if a loan was made for the entire cost of the program, no initial capital outlay would be necessary and if repayment of the loan were delayed until the land was actually put into use, he would be in a better position financially to make any payments. A disadvantage to this approach is that smaller airports may experience difficulty repaying loans and these are the airports most in need of a land banking program.

LOAN GUARANTEE OR ASSISTANCE

The Federal Government could either guarantee repayment of a commercial loan or bond or pay the interest on such a loan. In both cases, actual expenditures by the Federal Government would be minimal. For a guarantee program, the only expenditure would be if the airport sponsor defaulted. For an assistance program, the only expenditure would be the interest payments.

While the sponsor would have to compete in the market for the loan, he would have an advantage similar to that experienced when selling general obligation bonds; that is, lower interest rates may be available due to the Federal guarantee. However, bond payments would begin immediately before the land generated any revenues.

GRANT/LOAN PROGRAM

This is essentially a combination of the loan and grant methods. This type of approach has a precedent in the Federal Highway Administration's advance right-of-way land acquisition program discussed in Chapter V. This type of program could be adapted for airport land banking as described in this section.

Land banking funds would be allocated annually, by Congress from the Airport and Airway Trust Fund and placed in a revolving account. Airport land banking program projects would be selected on the basis of eligibility, justification, ranking criteria, and, possibly, an apportionment system.

The FAA would make a loan to a sponsor from the revolving land banking account. This loan would not go immediately to the sponsor but would be placed in a separate account on which the sponsor could draw on the funds as needed. Funds could be withdrawn by the sponsor from this account in increments so that money would be on hand to pay for parcels of land as they became available. Up to 100% of total land costs could be loaned.

The loan remain in effect at low interest or no interest until the land is actually needed for airport purposes. At that point the sponsor would apply for the land to be financed under ADAP. Upon approval, the sponsor would repay a part of the loan as his share of the ADAP project, and the Federal Government would convert the remaining loan to an ADAP grant. Loan repayments from both the sponsor and Federal Government could then again become available for additional land banking loans.

FEDERAL ADMINISTRATIVE COSTS

Analyses of alternative land banking programs in this chapter and the estimation of potential savings of land banking identified in Chapter VIII do not take into account the cost of administering a Federal program, if such a program were initiated. Depending on the program adopted, annual Federal costs in current dollars are estimated to range from virtually nothing in the event ADAP funds are merely shifted from later to earlier years to a maximum of approximately \$300,000 if a loan/grant program is implemented. If these annual costs occur over the eight years 1978-1985, the total Federal cost discounted to 1980 dollars of administering a land banking program would fall somewhere between zero and \$2 million.

IMPACT OF NO FEDERAL ACTION

If there is no change in the existing authority under ADAP, it is unlikely that a significant amount of ADAP advance land acquisition will occur since little has taken place under the existing program since 1970. As a result of program fund limitations, only projects which are needed within five years are normally programmed. Moreover, for one reason or another, airport operators have not applied for ADAP funds for advance land acquisition. Some large airport sponsors have banked land without Federal assistance, but for the most part the medium sized communities cannot afford to do so and these are the locations where banking is most needed.

However, despite the fact that little land will be banked without Federal action, land will still be needed for future airport development and if purchase is deferred until needed, it will cost about \$180 million (1980 dollars) more than if banked. If it is assumed that the Federal Government will provide grant

funds for this land acquisition and that the Federal share will be 80%, the cost to the Federal Government will be \$144 million (1980 dollars) more than if the land were banked. Further, the major portion of the land will be needed in the 1986-1990 period; as a result, a substantial part of the total ADAP program in that time period would have to be devoted to land acquisition.

The \$180 million saving discussed above is primarily attributable to the early purchase of land that is not now developed but which will probably be developed before it is needed for airport purposes. In the economic analysis, it was assumed that if land is not banked and develops for non-airport use, it may be purchased later for airport purposes at market value. Experience has shown, however, that once property has developed, particularly as a residential area, it may be very difficult and sometimes even impossible as a practical matter, to purchase for airport use.

CHAPTER XII

CONCLUSIONS

The principal findings and conclusions of this study of the feasibility, practicability, cost and other issues associated with airport land banking are as follows:

1. Airport land banking could result in a potential saving of \$180 million (1980 dollars) in land acquisition costs at existing airports through the year 2000 based upon conservative but reasonable estimates of future land prices and other forecasts. This amounts to a 22% saving over delaying land acquisition until it is needed and it is not clear that this magnitude of saving is sufficient, in and of itself, to justify a specific Federal program. If land prices increase beyond 1980 at the high rates experienced during the last five years, however, greater savings would be realized. For example, at the unusually high long-term land price increase rate of 7%, savings would approach \$500 million or close to a 40% saving over delaying land acquisition until it is needed.
2. Land banking shows greatest promise in acquiring presently undeveloped land that is likely to become developed for non-airport use before it is needed for airport facilities. Generally, vacant land that will eventually be required by an airport should be purchased early and banked. Residential properties should also be purchased in advance if a reasonable level of revenue can be anticipated. Only in relatively few cases should commercial or industrial properties be acquired before they are actually needed for airport purposes.
3. Land banking is not new; it has been used in this country to secure land for future use by schools, parks, highways, and airports. While there continues to be some legal uncertainty concerning the concept, primarily because advance acquisition of land is not specifically addressed in state enabling statutes, it appears that present trends in the courts favor it. Therefore, it can be concluded that land banking is a feasible solution to the problem of securing land for future airport development.
4. Zoning and other land-use controls have not been an effective means of ensuring the future availability of land for airport expansion or new airport development. The economic incentives operating in an urban area have been strong enough to overcome local regulatory devices in the past and this situation is expected to continue.

5. Depending upon future aviation demand, purchase timing, and other variables, between \$0.5 and \$1.3 billion (in 1980 dollars) in additional land may need to be acquired for existing air carrier and general aviation airports through the year 2000. These estimates represent an equivalent annual investment in current dollars averaging between \$40 and \$110 million.
6. Under conditions considered most likely to occur, 32,000 acres of additional land will be needed by the year 2000 to expand the Nation's existing airports. The cost of this land will be approximately \$835 million if it is not purchased until needed but could be reduced to approximately \$655 million if \$385 million of the total is purchased early and land banked. For direct comparison of purchases between the years 1978 and 2000, these figures are 1980 dollars calculated at a 10% discount rate. These findings are summarized in Table XIII.1. For illustration purposes, the table also includes estimated land costs for new airports.
7. The economic viability of land banking sites for new airports depends on the future availability of undeveloped sites. Where adequate, undeveloped sites will be available in the future, land banking is not economically justified. If a community is committed to a specific site, however, it may cost much more to delay acquiring land until it is needed than to land bank it up to 15 years early. In terms of risks, land banking when other undeveloped sites are not available in the future may multiply ultimate land costs seven times.
8. Airport land banking could provide a mechanism for advance completion of environmental assessments, community consultation, relocation programs, and related social processes that in recent years have more and more often imposed long delays on many airport expansion projects.
9. Only the largest airports enplaning 250,000 or more passengers annually have the financial capability to finance moderate capital improvements from airport revenues. With annual enplanements of less than 100,000 annually, an airport usually relies on outside support just to meet operating expenses.
10. If some type of Federal support were to be provided for airport land banking, it could take the form of an extension to the existing Airport Development Aid Program (ADAP), either within authorized funding levels or as an add-on, or it could operate as a loan program, a loan guarantee program, or a combination grant/loan program. To achieve maximum economic effectiveness, any such land banking program should begin soon. Under study assumptions, such a program would be extremely active during the period 1978-1985. If an

extension of the existing ADAP were used over this time period, the Federal share would amount to approximately \$308 million in 1980 dollars or approximately \$45 million per year on an annual basis in current dollars. This compares to a total \$610 million 1980 ADAP under existing legislation.

TABLE XII.1

Land Acquisition Funding Requirements
(millions of 1980 dollars)

Purchasing Options & Airport Types		1978-80	1981-85	1986-90	1991-95	1996-00	Total	
Purchase Only When Needed	Existing Airports	-	155	680	-	-	835	
	New Small Airports (360)	19	19	16	12	9	75	
	New Major Airports (10)	-	192	108	51	-	351	
	Total	19	366	804	63	9	1261	
Optimum Purchase Timing	Purchase & Bank (Existing)		330	55	-	-	-	385
	Defer Purchase	Existing Airports	-	150	120	-	-	270
		New Small Airports (360) ^{1/}	19	19	16	12	9	75
		New Major Airports (10) ^{2/}	-	192	108	51	-	351
	Total		349	416	244	63	9	1081

^{1/} Some of these expenditures may be for advance purchases, distributed over the time periods shown.

^{2/} If the purchases shown beyond 1985 cannot be deferred until that time, advance purchase would require expenditures of about \$500 million in 1980-85.