

FINANCING RELIEVER AIRPORTS
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Summary

The financial feasibility sections of most airport development studies prepared to date suggest that general aviation airports do not generate sufficient operating revenues to cover operating expenses and annual debt service and must, therefore be subsidized through other revenue sources. This information, if presented in a public forum, can lead to insurmountable opposition from the public for any proposed development.

However, when development is to be funded through the issuance of general obligation bonds (as is the case with most small, publicly owned airports), the approach used in previously prepared financial studies may have been inappropriate. When general obligation bonds are used as the financing mechanism, revenue projections should include not only operating revenues derived from the proposed project, but also property and sales taxes generated as a result of the project. This total should serve as the basis of determining whether and when, total annual airport related revenues exceed airport expenses and debt service.

Reliever Airports

The concept of a reliever airport system serving an urban area generally focuses around a major commercial hub airport with one or two primary hub-reliever airports, a number of secondary relievers, and several small utility relievers. In theory, the airport system is financed by a combination of Airport Development Aid Program (ADAP) grants and local debt financing. The local financing, in turn, is backed by the revenue-generating capacity of the airports involved. The key to effective airport revenue generation as well as proper segregation of demand among the airports in the system is differential pricing for users of various categories of airfields within the system.

In contrasting theory with reality, the airport system serving the Houston area was used as an example. Fifteen airports serve the area, nine of which are privately owned. The Houston example indicates several important variations between a theoretical reliever airport system and reality. There is no apparent significant variation between the airfield user charges at airports in the different reliever categories. While there is limited segregation of demand among the various types of airports, it is not based on user cost differentials. There is only limited eligibility for ADAP funding among the airports and, of those eligible, few have used ADAP construction grants. Finally, the capital costs associated with developing airport facilities within the region are more reflective of when they were built than the type of service they can provide.

A systemwide schedule of mandatory airfield user charges is recommended to generate the revenue base and provide proper demand segregation among the airports. User charges based on the level of service offered by the airfield should be established as opposed to fee levels based on either airfield costs or aircraft needs. A mandatory airfield user fee schedule will provide the controlling economic force needed to properly develop and maintain a reliever airport system and still preserve a freedom of operation and expansion for the individual airport operations in the system.

Reliever Airports - The Theory

The concept of reliever airports stems from recognition that various types of aviation traffic require different airport facilities. Large commercial jetliners may require high-strength runways up to 10,000 feet long and 150 feet wide, while small general aviation aircraft need only small, lightly paved strips 3,000 feet long and 50 feet wide. Yet when an aircraft of any size is on final approach into an airport, the plane commands all the capacity of the runway until it has landed and taxied off whether or not it needs all the facilities.

As major commercial airports became more constrained due to lack of adequate airfield capacity, the concept of reliever airports became popular. Reliever airports can theoretically reduce congestion at major commercial airports by providing an attractive alternative to that portion of an airport's demand which can be as well served by smaller, less expensive airfield facilities. In this manner, more capacity is freed up at larger hub airports to meet the growing needs of the commercial airliners these airports are designed to serve.

The Reliever Airport System

The concept of reliever airports can be expanded to a tiered system of several airport types, each designed to meet the needs of a specific segment of regional aviation demand. The system may focus around a major commercial hub airport serving a large urban region. The hub airport's airfield is equipped to serve heavy commercial jets operating at or near their maximum weights as well as that very small segment of general aviation using larger-airline-type aircraft.

Conceptually, the reliever airport system also has one or more primary hub-reliever type airports. Their purpose is to relieve the commercial hub airport of most of its general aviation traffic volumes. The hub-reliever airport has one or more runways up to about 8,000 feet long and 100 feet wide, capable of supporting aircraft weights up to 100,000 pounds.

The next echelon in the system consists of a number of reliever airports designed to offer capacity relief to the hub-reliever. The secondary reliever airports are designed to attract smaller piston-powered aircraft. A secondary reliever airport generally has at least one runway over 4,500 feet long and 75 feet wide, accommodating aircraft weights up to about 10,000 pounds.

At the bottom of the system hierarchy are the small utility airports used primarily for small sport and training aircraft. These airports have relatively inexpensive airfield facilities consisting of a 3,000-foot by 50-foot runway only lightly paved and not lighted. (Table 1)

Airport Financing

Financing the reliever airport system, in theory, becomes a rather straightforward process consisting of four primary elements.

A key to this financing program has been the Airport Development Aid Program. ADAP grants are often the cornerstone for financing airfield development projects. A multi-billion dollar trust fund is available to provide project grants, varying from 75 percent to 90 percent of total airfield development costs. These grants can solve a major part of the total financing problem at the start.

Table 1. Typical airfield facilities reliever airport system.

	<u>Major Commercial Hub</u>	<u>Primary Hub- Reliever</u>	<u>Secondary Reliever</u>	<u>Utility Reliever</u>
Land Required	750 acres	500 acres	110 acres	60 acres
Runway				
Length	10,000 ft.	8,000 ft.	5,000 ft.	3,000 ft.
Width	150 ft.	100 ft.	75 ft.	50 ft.
Strength	800,000 lbs.	100,000 lbs.	10,000 lbs.	5,000 lbs.
Taxiways				
Number	2 parallel	2 parallel	1 parallel	1 stub
Length	10,000 ft.	8,000 ft.	5,000 ft.	100 ft.
Width	75 ft.	50 ft.	40 ft.	30 ft.
Turn-offs	6 high speed 6 crossovers	2 high speed 4 crossovers	2 crossovers	—
Lighting	Touchdown Centerline High Intensity Edge REIL 36-in. Beacon	High Intensity Edge REIL 36-in. Beacon	Med. Intensity Edge REIL 10-in. Beacon	None
Nav Aids	CAT II ILS VASI-4 NDB	CAT I ILS VASI-4 NDB	Localizer VASI-4 NDB	None

Next comes the revenue-generating capability of the airport system itself. Fortunately, those airport users requiring the most costly airfield facilities also have the greatest ability to pay for those facilities. For example, while a large commercial jetliner may require a single-runway airfield costing over \$120 million at today's prices, each commercial aircraft carries many passengers. Assuming a single runway at a major commercial hub airport can accommodate 85,000 landings per year deplaning an average of 70 passengers per landing, annual costs of capital for development of the airfield approximate \$200 per landing, or \$3 per deplaned passenger. On the other hand, the small training aircraft may be carrying only a single passenger on a short practice flight. If this student uses a small utility airfield, costing just over a million dollars to develop and accommodate about 45,000 annual landings, the cost per person landed is about the same as for the \$122 million airfield.

Users of primary hub-relievers and secondary relievers must pay significantly more per passenger landed than those using the largest and smallest airports in the system (see Table 3). However, in a properly segregated system, these type airports attract primarily twin-engine and larger single-engine aircraft whose users generally pay more for all components of their aircraft trip, presumably receiving the extra value of service to warrant this higher cost.

In each case, the key to proper costing and revenue generation is segregating aviation traffic

to the airport specifically designed to meet its needs. The most obvious and effective way of achieving such segregation is through differential pricing. Theoretically, a properly designed pricing structure prices airport usage throughout the system in relationship to value received and thereby generates airport revenue in relationship to the cost of developing the facilities provided.

However, not even a theoretical system can be expected to achieve perfect equilibrium between capital costs and revenue production. Variations in demand levels of the various user groups may prohibit all airports from operating at the same level of capacity. Airfield components, such as runways, come in large productive units that are not fully productive during the early years of their productive lives. In addition, facilities built during different time periods vary significantly from the constant dollar costs illustrated in Table 2. Thus, a third element for consideration in financing a reliever airport system is cross-subsidy between airports in the system.

The concept of cross-subsidy permits excess revenues from an established airport, developed some years ago with higher valued dollars and now operating at full capacity, to be used in the initial financing of a new airport in the system. This subsidy is justified by the fact that the new airport is designed to relieve capacity at the older airport by diverting those segments of demand requiring less extensive airfield facilities. Such a concept, of course, presupposes that the airports in the system are financed as a single enterprise or through some joint enterprise agreement.

Table 2. Typical airfield development costs - single runway (Thousands 1981 Valued Dollars).

	<u>Major Commercial Hub</u>	<u>Primary Hub- Reliever</u>	<u>Secondary Reliever</u>	<u>Utility Reliever</u>
Land Purchase	\$ 11,250	\$ 7,500	\$1,650	\$ 450
Site Preparation	11,250	5,000	850	180
Paving	80,000	12,000	2,000	230
Other	<u>20,000</u>	<u>6,800</u>	<u>2,400</u>	<u>200</u>
Total	\$122,500	\$31,300	\$6,900	\$1,060

Table 3. Typical annual capital costs (1981 Valued Dollars).

	<u>Major Commercial Hub</u>	<u>Primary Hub- Reliever</u>	<u>Secondary Reliever</u>	<u>Utility Reliever</u>
Annual Cost of Capital (Thousands)*	\$17,760	\$4,540	\$1,000	\$155
Annual Aircraft Landings	85,000	85,000	65,000	45,000
Cost per Landing	<u>\$204</u>	<u>\$53</u>	<u>\$15</u>	<u>\$3</u>
Persons per Aircraft	70	4	2	1
Cost per Person	<u>\$3.00</u>	<u>\$13.25</u>	<u>\$7.50</u>	<u>\$3.00</u>

*Amortized at 15 percent semi-annually over 30 years.

A variation of the concept of cross-subsidy between airports within the system is the subsidizing of needed airport financing requirements with tax revenues. The concept of tax revenue subsidization of airport development is quite simple. To the extent that an airport benefits the "general public" by promoting local development and economic expansion, thereby increasing land values and employment opportunities, some application of tax revenues is warranted.

Reliever Airports - The Reality

In reality, reliever airports, either individually or as a system, exist primarily as a result of

historical happenstance or dedicated special interest efforts rather than from some well-conceived plan. Drawing on information and opinion from the recently published Regional Airport - Airspace System Plan (1) of the Houston-Galveston Area Council (H-GAC), the Houston area provides an example of how an airport system actually functions, emphasizing the reliever airport aspects of the system and some typical financial problems.

The Houston Airport System

While the H-GAC study included a thirteen-county area, for purposes of this analysis the Houston airport system was defined as the airports located

within the five-county area shown on Figure 1. Fifteen public-system airports service a 5,500 square mile area centered around Houston Intercontinental Airport, the area's major commercial hub airport. The area ranks twelfth in the nation in terms of total airline passenger traffic and, according to a recent statement by the National Business Aircraft Association, first in terms of based corporate-owned general aviation aircraft. (2) Nine of the fifteen system airports serving the area are privately owned, most by a single individual or family.

A brief description of the fifteen airports in the system, by airport category, follows. (Table 4 and Table 5)

Major Commercial Hub - Houston Intercontinental Airport was built by the City of Houston and opened in 1969, replacing William P. Hobby Airport as Houston's commercial airport.

Two primary runways serve all commercial operations. Two of the four dual-taxiways are also designated as "STOL runways" and serve small, feeder-type aircraft flown by third-level airlines. Increasing commercial aircraft demand now requires these STOL runways be closed and devoted exclusively to aircraft taxiing operations.

A new 6,000 foot-long runway was recently added at Intercontinental. Designed exclusively for general aviation operations, this runway can later be strengthened, lengthened, and made suitable for commercial aircraft activity. Several major industrial corporations located in the Houston area have built or are building corporate aircraft facilities at the airport. Two fixed base operators (FBOs) also serve the airport's general aviation demand. General aviation, excluding airline feeder services, currently accounts for about 25 percent of the total aircraft operations at the airport,

Figure 1. Houston Airport System.

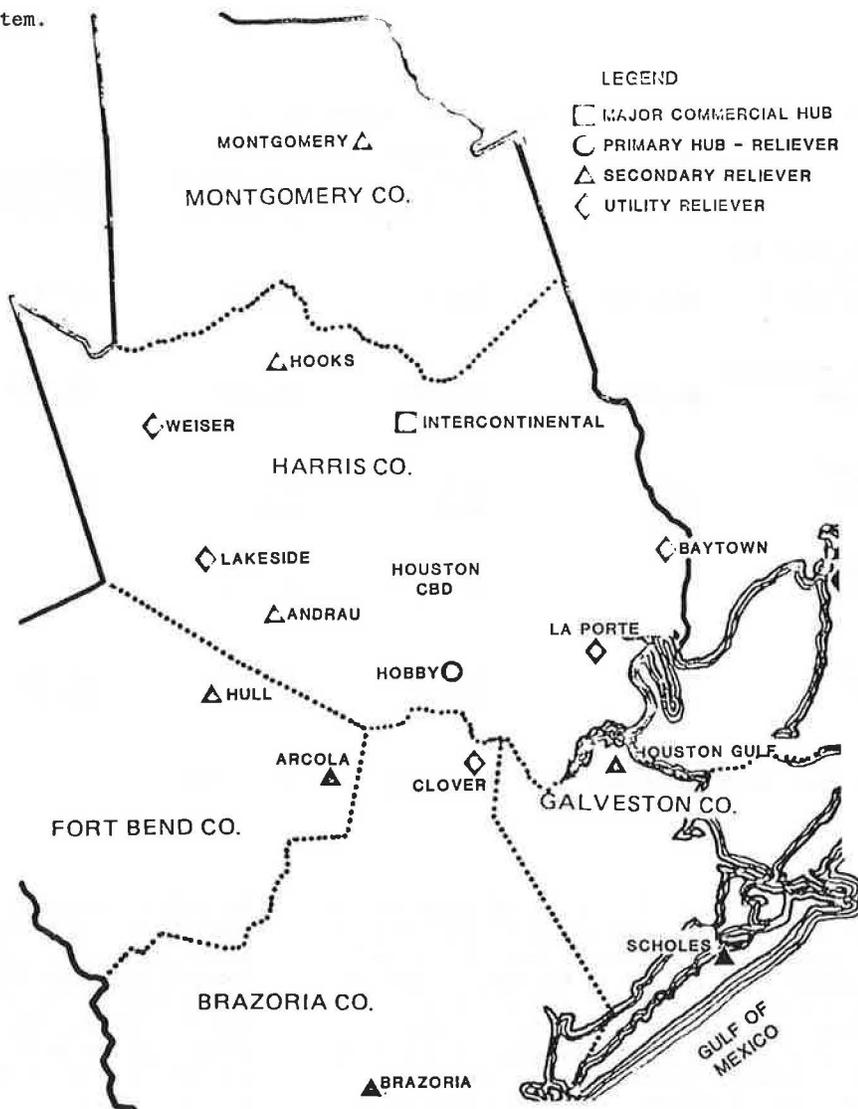


Table 4. Houston Airport System service area - 1980.

Land Area	5,504 square miles
Population	3,034,000
System Airports	15
Aircraft Operations	
General Aviation	1,827,700
Commercial	301,500
Airline Passengers	13,970,000
Based Aircraft	2,836

Source: Regional Airport - Airspace System Plan - H-GAC.

Table 5. Houston System airports - future aviation activity.

	<u>One Major Commercial Hub Airport</u>	<u>One Primary Hub-Reliever Airport</u>	<u>Eight Secondary Reliever Airports</u>	<u>Five Utility Reliever Airports</u>
Passengers (Thousands)				
1980	10,700	3,270	--	--
1990	26,400	7,070	--	--
2000	52,700	8,000	--	--
Aircraft Operations				
1980	289,300	347,547	833,593	357,260
1990	482,000	416,000	1,235,100	652,300
2000	784,000	423,000	1,468,400	959,400
Based Aircraft				
1980	62	540	1,570	664
1990	86	545	2,096	1,099
2000	90	549	2,569	1,574

Source: Regional Airport - Airspace System Plan - H-GAC.

about the same percentage as 1970, the airport's first full year of operation.

Airlines servicing Intercontinental have expressed an immediate need for another commercial aircraft runway, at least 10,000 feet long and designed for independent IFR operations. A new passenger terminal building was recently opened, doubling the total terminal area at the airport. Another terminal 1-1/2 times this size is scheduled to begin construction in early 1982.

Primary Hub-Reliever - When commercial activity was moved to Intercontinental in 1969, Houston's William P. Hobby Airport (which had previously been designated "Houston International") became exclusively a general aviation airport. In 1970, Hobby served about 240,000 annual general aviation aircraft operations, about 30 percent more than the total aircraft activity at Intercontinental that year.

In late 1971, Southwest Airlines moved its then infant airline schedule from Intercontinental back to Hobby. The spectacular growth of that airline service is reflected by the growth in commercial operations at Hobby since 1972. In 1980, 14 percent of the aircraft operations at Hobby represented commercial airline activity, excluding some 8,000 small, commuter aircraft operations. Since 1970, total operations at Hobby have grown by 42 percent while general aviation activity (excluding air taxi) has increased by only 15 percent. Preliminary data for 1981 indicate a 2 percent growth in general aviation activity and a 36 percent increase in commercial operations, bringing commercial operations up to 18 percent of the total.

The primary runway system at Hobby is a "closed V" similar to Intercontinental. The longest runway is 7,600 feet. Also like Intercontinental, a new close-in parallel runway has recently been built at Hobby in an effort to provide some separation

between commercial and general aviation activity. The runway forming the other leg of the "V" is scheduled to be lengthened from 4,500 feet to 6,000 feet, allowing it to accommodate commercial operations. Unlike Intercontinental, Hobby also has a major cross-wind runway; however, because it intersects the other primary runway forming an "X" configuration, the cross-wind runway adds little to the overall capacity of the airport.

The old passenger terminal facilities at Hobby are in the process of being expanded and modernized. A 3,700-car parking structure is also being added. The latest master plan of the airport calls for additional terminal expansion to an ultimate capacity of 8 million annual passengers. (3) Traffic projections indicate this total will be reached by the mid-1990's; however, current growth trends extrapolate to a much earlier date. Preliminary 1981 data show a 20 percent increase in airline passenger traffic over 1980.

Secondary Relievers - With the two City of Houston airports attracting such large growth in commercial activity, a group of secondary reliever airports are being called upon more and more to serve much of the area's general aviation needs. Eight airports in the Houston area are herein designated as secondary relievers. Each has at least one lighted runway over 4,500 feet long and at least one published instrument approach. One of these airports is currently served with a precision instrument landing system (Scholes) and one has a FAA-operated control tower (Hooks). Perhaps most significant, only three of these eight airports are publicly owned; and these three (Montgomery, Scholes, and Brazoria) are the farthest from the Houston demand center (see Figure 1).

Brazoria and Arcola are the only two of these eight airports that have been added to the system in the last 30 years. Brazoria was built in the late 1970's by Brazoria County with the help of \$3.3 million in ADAP grants and a very significant donation by a major corporation located in the area. Brazoria, apparently, is the only airport in this group for which ADAP funds were spent for airport construction. The Arcola Airport was financed and built by a private syndicate in the mid-1970's and is operated as a private enterprise with restricted availability for public use. The remaining six are long-established airports, with the four privately owned airports built on what was then inexpensive rural property and both of the public airports developed or significantly expanded as military airports during World War II. Scholes and Brazoria airports also serve Metro Airlines, the third-level feeder airline serving Intercontinental Airport. Scholes is also a major base for helicopters serving the off-shore petroleum industry.

Utility Relievers - The final category of airports in the system is the utility relievers which serve primarily smaller general aviation aircraft. Five airports in the Houston area are herein designated as utility relievers. These airports have runways less than 4,500 feet long. All but one (Weiser) have a paved runway and at least one published instrument approach. Only one is publicly owned, the Municipal Airport owned by the City of La Porte. With the exception of Clover, each of these airports is surrounded by various land uses that make it impossible to impractical to expand the airfield or upgrade the airport to the secondary reliever class. Even at Clover, opportunities for expansion are limited and the current owner has indicated no intention of expanding.

Financing the Houston System

Facility requirements at the fifteen existing airports in the Houston system are estimated to cost in excess of \$1.8 billion between now and 2000. About 90 percent of these costs is for expansion at Houston Intercontinental. In addition, \$93 million are considered necessary to build two new primary hub relievers, including \$27 million to upgrade and expand the present Ellington Air Force Base into a new hub-reliever airport. An additional \$19 million has been estimated for building two new secondary-reliever airports in the system by 2000. (Table 6 and Table 7)

Financing these improvements will be a very difficult, if not impossible, task. However, examination of these totals by airport and type of facility can provide some insight as to how a large portion of the financing might take place.

Major Commercial Hub - Over 75 percent of the total planned facility expense at Intercontinental between now and 2000 is for terminals, parking, roads, and related landside facilities. While the financing of these facilities will be a challenging and complex process, it should have no direct bearing on financing the area's reliever airport system.

However, about \$400 million of the planned improvements at Intercontinental are for airfield-related facilities. In addition to serving an estimated 579,000 annual commercial operations by 2000, these airfield facilities are projected to serve over 200,000 annual general aviation operations by that year, a total about equal to the commercial operations at the airport today. (4)

The local share of airfield development costs at Intercontinental is financed with revenues derived from aircraft landing fees. Airlines pay landing fees specifically calculated to pay for the City's costs of owning and operating the airfield. These fees were set at 31 cents per one thousand pounds of aircraft landing weight in 1980 and generated about \$3.9 million in airport revenue. The fee was increased to 45 cents in 1981 and could be almost double that in 1982. General aviation's share of the airfield costs is collected as a fuel-flowage fee imposed on all nonairline fuel sold at the airport. This fee has been set at 5 cents per gallon for the last five years and generated about \$470,000 in revenue in 1980. Fuel-flowage fee revenue, which comprised about 11 percent of the total airfield revenue in 1980, is used to offset the airlines' share of the total airfield costs, thereby reducing airline landing fees. The amount of general aviation fuel-flowage fee revenue does not affect the total revenue received by the City for owning and operating the airfield.

Primary Hub-Relievers - About 30 percent of the \$108 million planned for future development at Hobby is for airfield-related development. Like Intercontinental, the City's share of airfield development costs are used to calculate airlines' landing fees. However, unlike Intercontinental, airline landing fees at Hobby are not established to assure the City's compensation for all its airfield costs but rather only that portion of those costs attributable to airline operations. In 1980, about half of the total airfield costs were attributable to general aviation, or about \$800,000. The general aviation fuel-flowage fee at Hobby, which, by City policy, has been set at the same 5 cents per gallon rate as at Intercontinental, generated \$850,000. By 1982, even though general aviation's portion to the total airfield costs are

Table 6. Existing Houston system airports facility development costs - 1982-2000 (in thousands of 1981 valued dollars).

Major Commercial Hub	\$1,656,400
Primary Hub-Reliever	107,700
Secondary Reliever	55,455
Utility Reliever	<u>18,415</u>
Total	\$1,837,970

Source: Regional Airport - Airspace System Plan - H-GAC.

Table 7. New Houston system airports facility development costs - 1982-2000 (in thousands of 1981 valued dollars).

Primary Hub-Relievers	\$ 93,600*
Secondary Reliever	<u>18,915</u>
Total	\$112,515

*Includes civil acquisition and expansion of Ellington Air Force Base.

Source: Regional Airport - Airspace System Plan - H-GAC.

calculated to reduce the 33 percent of the total, total airfield costs are expected to increase to the point that general aviation's share will approximately double its 1980 cost allocation. General aviation operations at Hobby in 1982 are expected to be about 5 percent greater than the 1980 level.

The City of Houston has also had estimates made of future funding required to finance the development of Ellington AFB into a primary hub-reliever and the building of a third hub-reliever type airport west of the city. (5) In order for the airfield portions of these two development projects to be financed with fuel-flowage fees, required fees ranging between 12 cents and 20 cents per gallon have been estimated. The range depends on the level of available ADAP funding assumed and a number of other financing assumptions considered. In any case, fuel-flowage fees considerably higher than the 5 cents per gallon level currently charged by the city are considered necessary.

Secondary Relievers - About 60 percent of the \$55 million needed for future development at the eight secondary reliever airports is for airfield-related development. About 65 percent of this total, or \$21 million, is for airfield development at the five privately owned airports. The remaining \$12 million related to development at the three publicly owned airports and is, therefore, theoretically eligible for future ADAP participation.

The airfield development projects currently underway at these airports are all at the privately owned facilities. While there are some significant projects planned for near-term construction at one of the publicly owned airports, they are awaiting the availability of ADAP funding.

Competition among these airports and between this group and Hobby appears to be the primary force driving the expansion and improvement of airfield facilities at the privately owned airports. Runway lengthening and new taxiway development at both Hooks and Hull are being undertaken. Both are trying to expand their overall airport operational capacity, and Hull, in particular, is also trying to appeal to more corporate aircraft owners, recognizing that this segment of the market spends considerably more money per aircraft operation on both fuel and ground facilities. Hooks and Arcola airports sell airfield-accessible land as a major revenue source. Both airports are also experimenting with various forms of user charges for these land purchasers to use the airfield facilities. Andrau, on the other hand, is doing little or nothing in airfield development. This airport enjoys the prime location of the group with its proximity to the Houston urban center (see Figure 1) and, therefore, apparently has all of the business its owners want or need. The airport reportedly has a long waiting list for aircraft basing space.

The owners of these airports generally agree, however, that their primary competition comes from the two City of Houston airports. This competition is not merely for a larger share of total demand but for that higher revenue-producing segment of the demand total represented primarily by corporate aircraft owners. Larger runways, full instrumentation, and traffic control facilities available at Intercontinental and Hobby are hard to compete with when trying to convince a corporate executive he should fly in and out of their airports. At various times during the last few years, at least two privately owned airports have explored the possibility of selling their airports to the City of Houston or some other local government entity.

In addition to the existing airports, the regional plan concludes that at least two new secondary-reliever airports are also needed to meet future demand in the area, even if the eight existing airports are expanded to their practical limits.

One of these new airports, located about 50 miles west of Houston, is in the final planning stage. While the proposed airport is being sponsored by the local municipality (Sealy), the impetus and most, if not all, of the local financing for this airport will come from a major industrial firm located in the area. ADAP participation is also being sought. The industrial sponsor is also responsible for the airport's planned location far from the primary demand area.

The second new airport is proposed at some general location about 30 miles northwest of Houston. Local interest in this development is barely in the talking stages.

Utility Relievers - About 55 percent of the \$18 million needed for future development of the five utility relievers is for airfield-related development. Only about 15 percent of this total, or \$1.5 million, is for airfield development at the one publicly owned utility reliever airport. Almost half of the total is assigned to Clover, the only one that has any capability for significant airfield expansion. In fact, the H-GAC report recommended the Weiser Airport be abandoned and replaced by another airport farther west. The \$4.115 million estimated to develop the replacement site has been included in the utility reliever total.

At least one of the privately owned utility relievers is operating at a financial loss. It is quite likely that all are experiencing financial losses if any reasonable return to land investment is considered. Under these conditions, the temptation of continually increasing land values for various types of urban development make the long-term viability of any of these privately owned sites continuing to operate as an airport very questionable at best. At the same time, their restricted expansion potential makes them generally unacceptable for public acquisition even if a local municipality could be persuaded to own and operate a small utility airport. Most municipalities in the Houston area that show an interest in airport ownership at all view airports as potential locations for corporate aircraft owners who might locate at or near their cities.

Yet if these five airports were to close by 1990, they would leave an estimated 650,000 annual small aircraft operations to find a new airport location (see Table 5). This would take the form of additional and mostly unwanted demand placed on the largely overcrowded secondary-reliever airports in the area.

Variations Between Theory and Reality

The Houston example indicates several important variations between the theoretical reliever-airport system and reality, at least in the Houston area.

No Meaningful User Charge Differential

While the need for more investigation in this area must be recognized, no evidence of any meaningful general aviation user charge differential between the various categories of airports was found during the preparations of this paper. None charge a landing fee to general aviation users, although the City of Houston once tried this approach at Intercontinental and soon abandoned it

as "more trouble than it was worth." Where a discernible fuel-flowage fee was found, it appeared to have only limited relationship to the cost of the service and virtually no relationship to the value of the service offered. Competition appeared to create what fuel price differential there was at the various airports.

Limited Segregation of Demand

There was some significant degree of segregation of the various categories of general aviation demand among reliever airport types. Most larger corporate aircraft used either Intercontinental or Hobby because of the facilities available. Smaller aircraft were discouraged from flying in and out of Intercontinental, partly because of the potential danger, real or imagined, of intermixing with larger aircraft; partly because of pilot sophistication required in the traffic patterns; and partly because local FBO's do not generally cater to small aircraft traffic.

Small aircraft use limitations also existed to a limited extent at Hobby. This appeared primarily as the result of traffic congestion, lack of ground facility capacity, and a general requirement for greater pilot sophistication. It did not appear to be a result of any user charge differentiation.

Throughout the remainder of the system, what little traffic segregation existed appeared to be a result of capacity limitations and facility requirements.

Limited ADAP Eligibility

Without dwelling on the general unavailability of ADAP funds, most of the airports in the Houston system are privately owned and not eligible for ADAP funding under any currently proposed program. While some consideration has been given to ADAP funding for privately owned airports, no such plan appears forthcoming in the foreseeable future.

Even among those airports eligible for ADAP funding in Houston, grants have been limited to only three of the six publicly owned airports in the system. The reason for this appears more due to the lack of local response than FAA funding availability, although closer examination may also reveal that in the Houston area at least two of these three airports have had no real development requirements until very recently.

Competition Instead of Cross-Subsidy

In the Houston area, cross-subsidy is currently practical only between the two city-owned airports. The City of Houston operates its two airports as a single enterprise and, while operating costs and compensatory charges are accounted for separately, capital financing is undertaken by the enterprise. If Ellington AFB and a fourth primary hub-reliever are added to the City of Houston's enterprise, this capability for cross-subsidy will be expanded.

Costs Reflected Inflation Rather Than Utility

Perhaps the greatest variation between theory and reality is the relationship between a facility's costs and its service levels. For example, in 1965 a tee hangar could be built at a Houston airport for \$3,000, including the cost of land and structure. If financed over a 25-year life and the then-prevailing interest rate of 5 percent, the rental rate required to amortize the debt would be about \$15 per month. Today, that same hangar costs about \$15,000, including land, and requires a 15 percent interest rate to finance (with municipal bonds).

The rental required to amortize the facility over 25 years would be about \$190 per month, or an increase of over 12 times the rate for the older building, yet the utility of the newer building is very little greater than the older one.

This compounding effect of inflation and higher interest rates has a varying but substantial effect on all airport facilities, and the amortization of development costs is a major portion of the total costs of operating an airport. Therefore, newly developed airport facilities must charge much more to break even than do older facilities built and financed at pre-inflation prices. User charges based on facility costs therefore may reflect the age of the facilities much more than they reflect the level of service the facilities can provide. A new reliever airport may cost more than the larger yet older airport it is intended to relieve. Its justification is that the new reliever facility costs significantly less than the cost of developing additional capacity at the larger airport. This concept becomes financially viable only if both facilities are priced on the basis of their service-ability rather than their cost.

A Recommendation

The elements required to bring those essential components of reliever airport financing theory to an airport system, such as that existing in the Houston area, are twofold. First, a systemwide schedule of airfield user charges must be established which will encourage segregation of airport users to those facilities best suited to meet their needs and also will generate the revenue base needed to finance future development at the various airports in the system. Second, these user charges must be installed at all airports operating within the system in a manner that will preserve operating freedom for the diverse group of owners and operators at the individual airports within the system. These objectives could be achieved by imposing a mandatory systemwide schedule of airfield user charges that will function as a controlling economic force throughout the system. This charge would be applicable only to airfield usage; other components of the airport would continue to have separate and independently imposed rates and charges.

User Charges Based on Airfield Service Availability

Differential user charges should be enforced at each airport in the system which reflect the benefit or level of service that airfield has available. It should be emphasized that these charges would be based on the level of service available at the airfield, not merely on those service components that a particular user or user group might require. When an aircraft arrives or departs a runway, it is essentially using all of the components of that runway whether it needs them or not. This concept recognizes that a fee differential may be warranted under specific circumstances for using different runways within a given airfield complex. Granting this, however, charges should be the same for all types of aircraft that use a given airfield facility.

Insofar as possible, the user fees should be imposed on the basis of aircraft operations as opposed to fuel purchased or some other surrogate measure of aircraft activity. Not only are numbers of operations the most accurate measure of aircraft activity but they permit a uniform charge to all aircraft types, an essential component of this plan.

Distribution of Revenues

A primary objective of this systemwide airfield user charge schedule is to generate a revenue base by which to finance future airport development. Therefore, the distribution of revenues generated by the user rates is also an important consideration. First, it is essential that all of the revenues generated from these charges be used for airport development within the system. Second, each individual airport owner or operator should be given as much freedom as possible to choose how to use his own revenue allocation. Third, for the most part, revenues should be allocated back to the individual airports in the same proportions as they are collected.

The revenue allocation can provide for some degree of cross-subsidy. A small portion of the total could be set aside for assisting individual airports in financing larger specific projects. This assistance could be in the form of loans or advances on future revenue shares to be repaid to the system later. The danger with this part of the proposal is that along with subsidy comes increased system control over individual airports and a system bureaucracy that may divert unwarranted amounts of revenue from their primary goal. Cross-subsidy should be kept small if it is to be used at all.

Setting Rates

The heart of this proposal lies in the proper setting of user charges at various airports in the system. Some experimentation may be required to establish the price elasticities necessary to obtain the proper segregation of users between the various airports in the system. A proper fee schedule should not necessarily reduce competition between the airports in the system but rather reorient the focus of the competition from price to service. Traditional concepts of charging airfield users based on facility costs or user needs will be difficult to avoid. Rate adjustments will also be needed at individual airports to reflect improvements in facilities that increase the airport's utility.

Advantages of Mandatory Systemwide Charges

Some of the primary advantages of this proposed schedule of mandatory airfield charges are summarized as follows.

User segregation - A primary goal of the proposed plan is to use the pricing mechanism to achieve the airport user segregation among various categories of airports that is essential to the reliever airport concept. While the pricing mechanism does not assure users will use only those facilities they need, it requires that they pay a significant penalty for the privilege of using facilities they do not need.

Revenue for development financing - Not only will the proposed plan give each airport in the system a measure of equity in generating airfield revenue, there would be an element of long-term dependability in this revenue generation that is essential if it is to be used as a financing base. This does not mean that noncompetitive airports would be tolerated very long. By allocating revenues back to the individual airports on the basis of their activity, the proposed plan required that each airport operator provide a competitive level of service to his user category in order to maintain his revenue share.

Replacement for ADAP - In the broadest terms, the concept might be considered replacement for ADAP at the local level. If ADAP remains intact,

this proposed plan also could be viewed as a logical and compatible supplement to the federal program. The proposed plan would have several advantages or improvements over the historical ADAP plan:

- Flexibility to meet specific local needs.
- Encourages competition.
- Includes privately-owned airports.
- Generates ongoing revenue as a financing base.
- Returns most revenue to the airport from which it is collected.

It should be noted, however, that this concept is not conceived specifically to replace or supplement ADAP. While it has some of ADAP's characteristics, its purpose is aimed at assisting airport revenue generation capacity, not at providing development grants.

Problems of Implementation

Implementing a program of mandatory airfield user charges obviously involves many difficulties and unresolved questions. There are also some significant potential disadvantages to the plan which should be recognized.

Legal constraints - Work with local government policy and financing has taught the author that almost every proposal has some form of legal constraints. Certainly there are a myriad of potential legal problems involved in establishing mandatory user fees at the local level, particularly if they involve a geographical area over which there is no single political jurisdiction. Such problems and potential solutions would need to be examined on a state-by-state basis.

Collection of fees - Experience has also shown that a major drawback to the airfield user fees for general aviation is the difficulty of administration and collection. This is why the fuel-flowage fee is used. However, a charge based on aircraft operations is sufficiently important to this overall concept that renewed attention and effect should be placed on this problem.

Revenue allocation - It is important from both conceptual and practical standpoints that these mandatory user charges not be viewed as a tax. Yet any reallocation of revenue in variation to the amounts collected from each specific airport in the system constitute a tax-like characteristic to the charge. It must, therefore, be reemphasized that reallocation of revenues is not an objective of this proposal.

New level of government - Insofar as the local airport system does not operate within an existing governmental jurisdiction, some new local governmental hierarchy may be required. This is not only usually very unpopular with local citizens but also, realistically, is conducive to the development of a bureaucratic formation that ends up creating more administrative costs and controls than are justified. If at all possible, and even at the cost of defining the boundaries of the airport system something less than optimum, the concept should be carried out under an existing government entity. Specific ways of accomplishing this must also be considered on a state-by-state basis.

Despite these potential problems and difficulties, many state and local airport development authorities could devise a program of mandatory airport user charges that will provide the operational and financial framework from which an effective reliever airport system can be developed.

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