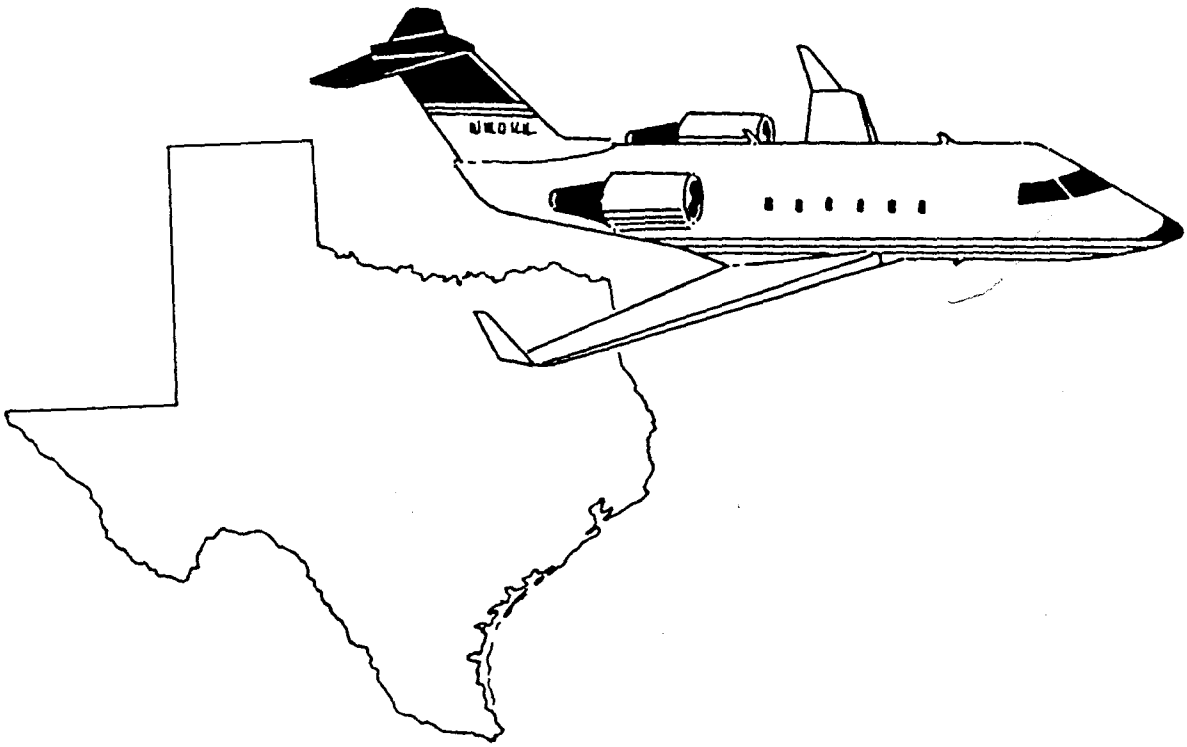
TEXAS AERONAUTICAL FACILITIES PLAN



Texas Aviation Activity to the Year 2000

September, 1984

TEXAS AERONAUTICAL FACILITY PLAN
TEXAS AVIATION ACTIVITY
TO THE YEAR 2000

A Compilation of Two Studies

SHARE-OF-MARKET FORECASTS OF PASSENGER ENPLANEMENTS FOR TEXAS AND TEXAS HUBS

by
George B. Dresser
Texas Transportation Institute
Texas A&M University

TEXAS GENERAL AVIATION FORECASTS

by
Dana L. Ryan
Texas Aeronautics Commission

September 1984

This material was prepared under an Airport System Planning Grant provided by FAA/DOT as authorized by the Airport and Airways Development Act of 1982.

SUMMARY

Realistic demand estimates are the basic requirement for systematic airport development. Identified demand patterns allow assessment of future system performance. Options to satisfy demand can then be formulated and programs developed consistent with objectives and policies of the implementing agency.

Aviation activity forecasts are the principal means of establishing demand. Forecasts determine the need for physical facilities and enhance the decision making process by reducing uncertainty of demand variables.

PURPOSE

This report was prepared in support of the Texas Aeronautical Facilities Plan - the official document for planning and developing the Texas airport system.

Presented herein are two studies that forecast commercial airline and general aviation activity for the State of Texas.

- "Share-of-Market Forecasts of Passenger Enplanements for Texas and Texas Hubs": prepared by the Texas Transportation Institute

- "Texas General Aviation Forecasts": prepared by the Texas Aeronautics Commission

The forecasts are based upon and reflect national forecasts offered in the Federal Aviation Administration publication FAA Aviation Forecasts - Fiscal Years 1984-1995.

FORECAST SUMMARY

Projected growth of aviation activity in Texas through the year 2000 is substantial. A summary of demand forecasts is present in Table 1. Activity measures - such as passenger enplanements, registered aircraft and others - will experience significant increases largely fueled by extensive population growth and industrial diversification and expansion. Overall, growth of aviation in Texas will continue to be much stronger than for other states.

Table 1 - AVIATION FORECASTS

	1982	1985	1990	1995	2000
Passenger Enplanements (x 1000)	31,154	37,136	53,116	72,901	95,796
General Aviation					
- registered aircraft	22,461	24,310	28,900	34,300	40,700
- hours flown (x 1000)	3,266	3,524	4,806	5,880	7,028
- operations (x 1000)	10,204	10,918	14,850	18,176	21,811
Pilots	59,851	59,000	70,000	81,000	93,000
Fuel Consumption (gallons x 1000)	1,334,948	1,540,500	1,720,200	1,916,400	2,107,600

ECONOMIC AND AVIATION TRENDS

Texas has enjoyed a healthy and vigorous economy. The state's economic environment serves as a magnet for new business and industry, and as a catalyst for expanding existing companies. New industries create jobs and jobs attract people. Population growth in response to economic opportunities has been phenomenal. By the year 2000 more than 21 million people are expected to live in Texas. Through the 1980's, major trends that will influence the Texas economy, and hence aviation, include:

- economic durability spurred by growth in high-tech industry
- moderate inflation
- stable fuel price increases (relative to inflation)
- moderate to high interest rates
- continued shift toward diversified manufacturing with an emphasis on durable goods
- moderate to high population growth

Generally, the Texas economy is expected to be stronger than the United States economy, a continuation of the most significant trend for Texas.

The key word for aviation in the 1980's is change. In Texas the aviation industry is undergoing a dynamic transition as a result of the extensive population and economic growth occurring in our state.

The Texas airport system is one of the more active state systems in the nation. In 1983 Texas had more than 30 domestic airlines, serving 30 airports, enplaning over 30 million passengers annually. There are more than 22,000 aircraft based in Texas that are being flown by a resident pilot population of nearly sixty-thousand.

The 1978 Airline Deregulation Act continues to foster major changes in the commercial air carrier industry. The predominant trend nationwide has been rationalization of airline route structures. In Texas the primary impact has been the ease of market entry and exit, particularly by new, low cost airlines. Market competition from these new carriers has greatly benefitted the Texas passenger in the form of high-frequency, low-fare service. All indications are that Texas can expect continued increases in the number of airlines serving the state and expansion of city-pair markets for some time into the future.

The Texas commuter airline industry was essentially deregulated by the state in the early 1970's. By the time national deregulation was enacted mature commuter markets had already been established in Texas. In the future, established commuter carriers will continue to increase equipment size and, thus, outgrow some markets. In most cases, they will be replaced by new, smaller commuters and there will be new routes as we continue to grow toward the 21 million people expected to be living in Texas by the year 2000.

Major changes are occurring in general aviation as a result of the overall economy. Two diverging trends have become observed:

- the market for new, light single and twin-engine piston aircraft is extremely soft and growth very sluggish

- a robust demand by businesses and corporations has made high-performance, turbine aircraft the growth center of general aviation

Over the past decade general aviation has become an increasingly important means of transportation for business and industry, especially in Texas. Centralized management, dispersed manufacturing plants, tax advantages, and changing airline routes have made general aviation a highly competitive mode of transportation. Demand for corporate and business flying has greatly expanded the Texas business aircraft fleet. Today nearly one of every six business-jets in the nation is registered in Texas.

Overall, the future of Texas aviation is bright. Aviation will continue to dominate all modes of commercial transportation in the intercity passenger markets. The state's aviation growth rate will continue to exceed that of other states.

TEXAS AERONAUTICAL FACILITY PLAN

SHARE-OF-MARKET FORECASTS OF PASSENGER ENPLANEMENTS FOR TEXAS AND TEXAS HUBS

by

George B. Dresser

Texas Transportation Institute
Texas A&M University
College Station, Texas

September 1984

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Texas Enplanement Forecasts

This study projects domestic and international scheduled air passenger enplanements at Texas airports through 2000. Forecasts of passenger enplanements for Texas and for Texas airports having scheduled air passenger service are shown in Table 1. This table includes enplanements by air carrier and commuter carriers. These forecasts were derived by forecasting separately the enplanements by air carrier and commuter carriers and summing the results by location. Due to the different data bases utilized in the development of the forecasts, this procedure was employed.

Air Carrier Domestic Enplanement Forecasts

The United States forecasts were taken from FAA Aviation Forecasts - Fiscal Years 1984-1995 released in February 1984. Air carrier domestic enplanements increased by 6.4 percent in 1983 to 290.3 million, surpassing the previous high for enplanements which was set in 1979. Enplanements are projected to increase 7.7 percent in 1984, 5.5 percent in 1985, and 4.3 percent in 1986. For the 1984-1995 forecast period domestic enplanements are expected to increase at an average annual rate of 4.6 percent to 497.8 million passengers in 1995. The FAA forecast was projected to 2000 using a least squares regression line fitted to the 1986-1995 forecast values. The FAA forecasts projected through 2000 are shown in Table 2.

Table 3 shows the forecasts of air carrier domestic enplanements for the United States, Texas, Dallas-Fort Worth, Houston, San Antonio, Austin, El Paso, and Texas residual hubs.

TABLE 1

FORECASTS OF DOMESTIC AND INTERNATIONAL PASSENGER ENPLANEMENTS
TEXAS AND TEXAS HUBS, 1983-2000

HUB	Thousands of Passengers 1983	1985	1990	1995	2000
Abilene	53.3	58.7	74.6	94.7	120.3
Amarillo	~~433.8~~	495.0	659.0	905.0	1,098.0
Austin	~~1,230.7~~	1,452.8	2,283.6	3,414.5	4,845.8
Beaumont	80.6	63.5	78.4	96.9	119.7
Brownsville	58.4	71.0	101.0	139.0	183.0
Brownwood	1.1	1.2	1.7	2.3	3.2
Clear Lake	33.5	38.2	53.1	73.8	102.6
College Station	30.8	35.4	54.1	82.7	126.4
Corpus Christi	403.5	495.0	710.0	975.0	1,281.0
Dallas/Fort Worth	16,046.1	18,026.8	25,401.5	34,303.8	44,316.6
El Paso	1,042.2	1,170.0	1,420.0	1,600.0	1,650.0
Harlingen	352.8	460.0	710.0	975.0	1,372.0
Houston	8,564.0	10,653.2	15,736.3	22,273.6	30,132.8
Killeen	32.0	36.9	52.5	74.8	106.5
Lake Jackson	6.6	6.3	9.3	13.6	19.9
Laredo	~~25.0~~	28.6	39.2	53.9	73.9
Longview	17.9	20.0	26.6	35.3	45.0
Lubbock	501.6	637.0	862.0	1,184.0	1,464.0
McAllen	138.40	177.0	254.0	348.0	457.0
Midland	~~501.5~~	849.0	1,268.0	1,740.0	2,378.0
Paris	1.5	1.7	2.1	2.6	3.3
San Angelo	42.3	46.4	58.4	73.6	92.7
San Antonio	1,841.1	2,150.1	3,051.2	4,166.3	5,457.0
Sugar Land	5.7	7.2	12.7	22.6	40.0
Temple	6.3	7.3	10.4	14.7	21.0
Texarkana	~~24.1~~	29.7	36.8	44.8	52.2
Tyler	28.1	31.8	43.2	58.7	79.8
Victoria	14.0	15.0	20.3	27.7	37.6
Waco	21.3	23.3	29.3	37.0	46.6
Wichita Falls	49.4	54.9	69.7	88.6	112.6
Texas	31,677.6	37,135.8	53,116.3	72,900.9	95,798.5

Note: Includes international enplanements by U.S. flag carriers only

Source: TTI Analysis

TABLE 2

UNITED STATES CERTIFICATED ROUTE
AIR CARRIER SCHEDULED PASSENGER TRAFFIC

	Revenue Passenger Enplanements (millions)	
Fiscal Year	Total	Domestic
Historical		
1979	307.0	283.4
1980	302.3	278.2
1981	285.5	264.3
1982	292.5	272.8
1983E	311.4	290.3
Forecast		
1984	335.6	312.7
1985	354.1	330.0
1986	369.3	344.3
1987	387.8	361.5
1988	406.3	378.6
1989	423.8	394.9
1990	438.9	409.0
1991	459.2	427.8
1992	478.2	445.3
1993	496.7	462.4
1994	513.8	478.1
1995	535.2	497.8
1996	551.3	512.9
1997	569.5	529.7
1998	587.8	546.6
1999	606.0	563.5
2000	624.3	580.4

Sources: CAB Air Carrier Traffic Statistics 1979-1983E
FAA Aviation Forecasts 1984-1995
TTI Analysis 1996-2000

TABLE 3

AIR CARRIER DOMESTIC ENPLANEMENTS
UNITED STATES, TEXAS, TOP FIVE AND RESIDUAL HUBS FOR
1985-2000

	Millions of Passengers			
LOW	1985	1990	1995	2000
United States	330.00	409.00	497.80	580.40
Texas	32.74	43.44	50.50	68.49
Dallas/Fort Worth	15.98	20.85	23.84	31.78
Houston	9.49	12.99	15.55	21.71
San Antonio	1.90	2.52	2.93	3.97
Austin	1.34	1.95	2.47	3.63
El Paso	1.08	1.22	1.16	1.23
Residual Hubs	2.95	3.91	4.55	6.16
MEDIAN				
United States	330.00	409.00	497.80	580.40
Texas	35.38	50.71	69.64	91.47
Dallas/Fort Worth	17.26	24.34	32.87	42.44
Houston	10.26	15.16	21.45	29.00
San Antonio	2.05	2.94	4.04	5.31
Austin	1.45	2.28	3.41	4.84
El Paso	1.17	1.42	1.60	1.65
Residual Hubs	3.18	4.56	6.27	8.23
HIGH				
United States	330.00	409.00	497.80	580.40
Texas	38.25	58.04	83.43	114.50
Dallas/Fort Worth	18.67	27.86	39.38	53.13
Houston	11.09	17.35	25.70	36.30
San Antonio	2.21	3.37	4,84	6.64
Austin	1.57	2.61	4.09	6.07
El Paso	1.26	1.63	1.92	2.06
Residual Hubs	3.44	5.22	7.51	10.31

Sources: FAA Forecast, February 1984
TTI Analysis

The forecast of Texas air carrier enplanements is based on the State's share of the nation's population and enplanements, Table 4. The State's population is forecast to increase from 6.3 percent of the United States in 1980 to 7.9 percent of the United States in 2000. Texas enplanements as a share of the United States enplanements have been increasing even more dramatically from 6.4 percent in 1970 to 7.8 percent in 1975 to 9.5 percent in 1980. In 1982 Texas enplanements were 11.2 percent of the United States enplanements. Historically, Texans have been greater users of air travel than the nation as a whole, and their affinity for air travel appears to be increasing.

The ratio of the Texas enplanement share to the Texas population share has increased from 1.2 in 1970, to 1.3 in 1975, to 1.5 in 1980, and 1.7 in 1982. A ratio of 1.0 would indicate that Texas' share of national enplanements was equal to Texas' share of the national population. The ratio 1.7 indicates that Texans use air travel 70 percent more than does the nation as a whole.

In Table 5 future Texas enplanement shares are forecast based on the ratio of the Texas share of the United States enplanements to the Texas share of the United States population. Three trends are postulated for this ratio: low - remains at 1.49 through 2000 (the average for 1975 to 1982); high - keeps rising for the next 15 years, by 0.05 annually (similar to the 1975 to 1982 rate of increase); median - exhibits a moderate up trend halfway between the low and high.

The low forecast assumes that the increasing propensity of Texans to use air travel will stabilize at the 1975 to 1982 average. The high forecast assumes that 1975-1982 trend will continue unabated through

TABLE 4

TEXAS SHARE OF UNITED STATES POPULATION AND UNITED STATES AIR CARRIER DOMESTIC ENPLANEMENTS, 1962-1982, AND FORECAST OF UNITED STATES AND TEXAS POPULATION 1985-2000

YEAR	U.S. POPULATION (000)	TEXAS POPULATION (000)	SHARE TX%	U.S. ENPLANEMENTS	TEXAS ENPLANEMENTS	SHARE TX%	ENPLANEMENT% / POPULATION %
1962	185,822	10,122	5.44	60,494,550	3,720,498	6.15	1.13
1963	188,658	10,272	5.45	69,116,141	4,214,755	6.10	1.12
1964	191,372	10,270	5.37	78,807,760	4,767,313	6.05	1.13
1965	193,460	10,378	5.36	91,604,499	5,619,233	6.13	1.14
1966	195,923	10,492	5.36	105,254,137	6,978,065	6.63	1.24
1967	197,859	10,599	5.36	127,204,844	7,968,229	6.26	1.17
1968	199,312	10,819	5.43	144,463,507	9,265,904	6.41	1.18
1969	201,306	11,045	5.25	151,633,555	9,887,964	6.52	1.24
1970	203,810	11,241	5.52	153,727,377	9,877,964	6.43	1.16
1971	206,218	11,428	5.54	151,428,563	9,900,561	6.54	1.18
1972	208,232	11,649	5.59	170,950,237	10,973,038	6.42	1.15
1973	209,851	11,794	5.62	181,423,433	11,911,992	6.57	1.17
1974	214,600	11,880	5.54	187,803,499	12,907,136	6.87	1.24
1975	214,465	12,568	5.86	186,812,168	14,496,201	7.76	1.32
1976	217,563	12,903	5.93	204,139,559	16,223,188	7.95	1.34
1977	219,760	13,192	6.00	219,892,886	18,539,556	8.43	1.41
1978	222,095	13,498	6.08	251,255,997	22,127,728	8.81	1.45
1979	224,567	13,887	6.18	285,305,811	26,375,309	9.24	1.50
1980	226,505	14,229	6.28	268,253,703	25,532,016	9.52	1.52
1981	229,307	14,724	6.42	255,047,362	27,856,720	10.92	1.70
1982	231,500	15,280	6.60	267,246,094	30,154,769	11.28	1.71
1985	238,648	15,897	6.66				
1990	249,731	17,817	7.13				
1995	259,631	19,429	7.48				
2000	267,990	21,227	7.92				

Sources: Airport Activity Statistics, CAB, FAA, DOT, 1962-1982
Texas Department of Water Resources
Statistical Abstract of the United States, various years

TABLE 5

FORECASTS: TEXAS POPULATION AND ENPLANEMENT SHARES
AND ENPLANEMENT/POPULATION RATIO 1985-2000

	1985	1990	1995	2000
Population: Texas/U.S. (%)	6.66	7.13	7.48	7.92
$\frac{\text{Enplanement Share}}{\text{Population Share}}$: Ratio				
Low	1.49	1.49	1.49	1.49
Median	1.61	1.74	1.87	1.99
High	1.74	1.99	2.24	2.49
Enplanements: Texas/U.S. %				
Low	9.92	10.62	11.15	11.80
Median	10.72	12.40	13.99	15.76
High	11.59	14.19	16.76	19.72

Source: TTI Analysis

2000. An indepth analysis of the reasons for the dramatic increase in air travel usage between 1975 and 1982 is beyond the scope of this paper; however, it seems reasonable that some moderation in the rate of growth will occur. The median forecast appears the most probable.

The resultant Texas enplanement shares shown in the last three rows of Table 5 are the forecast population shares multiplied by the forecast enplanement/population ratio shown in the middle of Table 5. For example for 1985 low:

$$\text{Enplanement Share} = \text{Texas Population Share} \times \frac{\text{Enplanement Share}}{\text{Population Share}}$$

$$= 6.66\% \times 1.49 = 9.92\%$$

Applying the three series of Texas passenger shares to the one FAA forecast of United States domestic enplanements, Table 2, yields the low, median, and high Texas enplanement forecasts shown in Table 3.

With the Texas air carrier forecasts thus set, the next step was to allocate state traffic to each of the top five hubs--Dallas-Fort Worth, Houston, San Antonio, Austin, and El Paso--and to the residual hubs. The market shares of enplanements are computed for the 1962-1982 period, and projections made for 1985-2000, Table 6. The market shares of Table 6 were used to compute the forecasts shown in Table 3. The market share for the top five hubs has slowly increased from 85.1 percent in 1962 to 91.0 percent in 1982. Part of this increase is a result of the termination of air carrier service and the substitution of commuter service at several airports. Air carrier service is not expected to be lost from any additional Texas airports with the possible exception of one or two locations. The share of the top five

hubs Texas air carrier market is forecast at 91.0 percent for the 1985-2000 period.

Market shares of the top five hubs are forecast to change during the 15 year forecast period. During the last five years Austin's and Houston's shares have increased, San Antonio's share has remained stable, while Dallas-Fort Worth's and El Paso's shares have declined. This trend is projected to continue but at a more moderate rate. Improved service at Houston, San Antonio, and Austin have reduced the frequency of travel through Dallas-Fort Worth or Dallas Love which serves as a major interline point. Although this has reduced the Dallas-Fort Worth share of the Texas market, the Dallas-Fort Worth hub will continue as the dominant location for the remainder of this century.

Table 7 gives historical data for 1962-1982 on residual hub shares of the Texas market and forecasts of market shares to 2000. Seventeen hubs shown in Table 7 no longer had air carrier service, that is service by transport category aircraft, at the end of 1982. Four locations--Big Spring, Borger, Galveston, and Lufkin--no longer have any scheduled air service. Thirteen locations--Abilene, Beaumont, Brownwood, College Station, Laredo, Longview, Paris, San Angelo, Temple, Tyler, Victoria, Waco, and Wichita Falls--have scheduled commuter service. Abilene, Beaumont and San Angelo have subsequently reestablished some service by transport category aircraft, however, the preponderance of their enplanements are on aircraft of 60 seats or less.

The residual hub airports share of the Texas market was set at nine percent through 2000. Market shares for Harlingen and Midland

TABLE 6

TOP FIVE AND RESIDUAL HUBS AS SHARE OF TEXAS
AIR CARRIER ENPLANEMENTS: 1962-1982 HISTORY
AND FORECAST FOR 1985-2000

	Percent of Texas Market						
YEAR	DAL & DFW	IAH & HOU	SAT	AUS	ELP	Top 5	Residual
1962	49.0	21.0	7.2	2.3	5.6	85.1	14.9
1963	49.0	22.0	6.9	2.4	5.6	85.9	14.1
1964	49.0	22.0	7.0	2.5	5.5	86.0	14.0
1965	50.0	23.0	7.2	2.5	4.9	87.6	12.4
1966	51.0	21.0	8.1	2.4	5.4	87.9	12.1
1967	51.0	21.0	7.7	2.4	5.3	87.4	12.6
1968	50.0	22.0	8.7	2.6	5.2	88.5	11.5
1969	50.0	22.0	7.8	2.7	5.3	87.8	12.2
1970	52.0	22.0	8.6	2.6	5.0	90.2	9.8
1971	51.0	23.0	8.0	2.8	5.0	89.8	10.2
1972	52.0	22.0	8.0	2.7	5.0	89.7	10.3
1973	54.0	22.0	7.0	2.7	4.5	90.2	9.8
1974	55.0	22.0	6.2	2.9	4.5	90.6	9.4
1975	58.5	23.5	6.3	2.9	4.5	95.7	4.3
1976	54.6	22.5	5.8	3.0	4.1	90.0	10.0
1977	53.0	23.7	5.6	3.3	4.3	89.9	10.1
1978	52.5	25.3	5.8	2.9	4.5	90.7	9.3
1979	54.1	25.6	5.8	2.8	4.3	92.6	7.4
1980	50.3	26.8	5.9	3.6	3.7	90.3	9.7
1981	50.9	27.1	5.8	3.6	3.5	90.9	9.1
1982	49.6	28.6	5.6	3.8	3.4	91.0	9.0
1985	48.8	29.0	5.8	4.1	3.3	91.0	9.0
1990	48.0	29.9	5.8	4.5	2.8	91.0	9.0
1995	47.2	30.8	5.8	4.9	2.3	91.0	9.0
2000	46.4	31.7	5.8	5.3	1.8	91.0	9.0

DAL - Dallas Love Field
DFW - Dallas/Fort Worth Regional
IAH - Houston International
HOU - Houston/William P. Hobby
SAT - San Antonio International
AUS - Austin Robert Miller
ELP - El Paso International

Source: TTI Analysis

TABLE 7

TEXAS RESIDUAL HUB SHARES OF
TEXAS PASSENGER ENPLANEMENTS BY AIR CARRIERS,
1962-1982 and FORECASTS, 1985-2000

	Percent of Texas Market							
YEAR	ABI	AMA	BPT	CGS	BGD	BRO	BWD	CLL
1962	.441	2.262	1.070	.022	.052	.202	.042	.097
1963	.385	2.315	1.027	.023	.050	.165	.040	.086
1964	.499	2.351	2.914	.048	.034	.169	.044	.098
1965	.544	2.167	2.674	.045	.026	.202	.046	.121
1966	.515	2.203	.786	.047	.019	.245	.036	.105
1967	.469	2.010	.746	.052	.016	.269	.033	.104
1968	.522	1.849	.791	.050	.013	.229	.037	.077
1969	.412	1.691	.812	.056	.011	.250	.036	.058
1970	.389	1.646	.761	.049	.011	.251	.034	.045
1971	.385	1.613	.670	.045	--	.254	.036	.055
1972	.358	1.579	.562	.034	--	.310	.030	.039
1973	.319	1.536	.413	.027	--	.393	.031	.012
1974	.298	1.612	.378	.019	--	.531	.028	--
1975	.212	1.640	.219	--	--	.644	.027	--
1976	.317	1.610	.370	--	--	.462	.040	--
1977	.299	1.546	.376	--	--	.397	--	--
1978	.250	1.649	.425	--	--	.379	--	--
1979	.161	1.197	.186	--	--	.494	--	--
1980	.123	1.443	.265	--	--	.348	--	--
1981	--	1.350	.027	--	--	.232	--	--
1982	--	1.420	--	--	--	.189	--	--
1985	--	1.400	--	--	--	.200	--	--
1990	--	1.300	--	--	--	.200	--	--
1995	--	1.300	--	--	--	.200	--	--
2000	--	1.200	--	--	--	.200	--	--

ABI - Abilene Municipal
AMA - Amarillo International
BPT - Beaumont - Jefferson County
CGS - Big Spring
BGD - Borger - Hutchinson County
BRO - Brownsville/ South Padre Island International
BWD - Brownwood Municipal
CLL - College Station - Easterwood Field

Source: TTI Analysis

TABLE 7 (continued)

TEXAS RESIDUAL HUB SHARES OF
TEXAS PASSENGER ENPLANEMENTS BY AIR CARRIERS,
1962-1982 and FORECASTS, 1985-2000

	Percent of Texas Market							
YEAR	CRP	GLS	HRL	LRD	GGG	LBB	LFK	MFE
1962	1.767	.013	.303	.161	.229	1.666	--	.348
1963	1.764	.009	.321	.155	.242	1.699	--	.338
1964	1.820	.031	.327	.155	.254	1.775	--	.331
1965	1.804	.034	.293	.162	.226	1.760	--	.339
1966	1.724	.022	.251	.169	.184	1.786	.045	.344
1967	1.856	.009	.278	.157	.158	1.856	.042	.309
1968	1.844	.006	.515	.156	.153	1.845	.041	.176
1969	1.771	.030	.392	.161	.116	1.893	.041	.345
1970	1.689	.048	.347	.165	.101	1.852	.034	.379
1971	1.633	.106	.402	.166	.125	1.808	.025	.468
1972	1.535	.017	.366	.157	.104	1.807	.021	.545
1973	1.476	--	.353	.140	.080	1.814	.015	.603
1974	1.474	--	.328	.125	.095	1.808	.019	.550
1975	1.434	--	.094	.103	.094	1.870	.002	.382
1976	1.467	--	.184	.192	.050	1.810	.014	.473
1977	1.257	--	.218	.180	.043	1.788	.016	.586
1978	1.164	--	.202	.181	--	1.528	.016	.655
1979	1.130	--	.069	.150	--	1.156	--	.655
1980	1.500	--	1.152	.105	--	1.902	--	.557
1981	1.464	--	1.240	.082	--	1.829	--	.627
1982	1.414	--	1.264	.060	--	1.796	--	.559
1985	1.400	--	1.300	--	--	1.800	--	.500
1990	1.400	--	1.400	--	--	1.700	--	.500
1995	1.400	--	1.400	--	--	1.700	--	.500
2000	1.400	--	1.500	--	--	1.600	--	.500

CRP - Corpus Christi International
GLS - Galveston - Scholes Field
HRL - Harlingen - Rio Grande Valley International
LRD - Laredo International
GGG - Longview - Gregg County
LBB - Lubbock International
LFK - Lufkin - Angelina County
MFE - McAllen - Miller International

Source: TTI Analysis

TABLE 7 (continued)

TEXAS RESIDUAL HUB SHARES OF
TEXAS PASSENGER ENPLANEMENTS BY AIR CARRIERS,
1962-1982 and FORECASTS, 1985-2000

	Percent of Texas Market							
YEAR	MAF	PRX	SJT	TPL	TYR	VCT	ACT	SPS
1962	2.543	.041	.424	.211	.292	.096	.390	.677
1963	2.451	.034	.420	.192	.282	.089	.322	.703
1964	2.187	.030	.365	.251	.225	.053	.347	.655
1965	2.227	.025	.317	.323	.216	.061	.354	.604
1966	1.692	.021	.298	.299	.177	.070	.301	.672
1967	1.663	.024	.294	.275	.149	.059	.275	.672
1968	1.767	.026	.286	.228	.141	.043	.237	.730
1969	1.813	.012	.286	.147	.104	.046	.195	.769
1970	1.762	.011	.273	.141	.094	.055	.187	.648
1971	1.702	.013	.262	.149	.105	.074	.182	.580
1972	1.643	.013	.229	.126	.103	.060	.180	.546
1973	1.668	.013	.201	.074	.072	.005	.144	.437
1974	1.779	.013	.188	.042	.076	--	.151	.366
1975	1.868	.014	.156	.030	.042	--	.102	.263
1976	1.702	.012	.282	.024	.077	--	.094	.354
1977	1.817	.001	.325	--	.054	--	.038	.276
1978	1.582	--	.334	--	--	--	.002	.241
1979	1.258	--	.311	--	--	--	--	.149
1980	1.990	--	.159	--	--	--	--	.015
1981	2.171	--	.049	--	--	--	--	--
1982	2.338	--	--	--	--	--	--	--
1985	2.400	--	--	--	--	--	--	--
1990	2.500	--	--	--	--	--	--	--
1995	2.500	--	--	--	--	--	--	--
2000	2.600	--	--	--	--	--	--	--

MAF - Midland Regional
PRX - Paris - Cox Field
SJT - San Angelo - Mathis Field
TPL - Temple - Draughon - Miller Municipal
TYR - Tyler Pounds Field
VCT - Victoria Regional
ACT - Waco - Madison Cooper
SPS - Wichita Falls Municipal

Source: TTI Analysis

were forecast to increase slightly while market shares for Lubbock and Amarillo were forecast to decrease slightly. Enplanements at Harlingen and Midland, historically, have grown at a faster rate than the other residual hubs. Shares for Brownsville, Corpus Christi, and McAllen were forecast as unchanged. Forecasts for these seven residual hubs, based on the market shares of Table 7, are shown in Table 8.

International Enplanements by United States Flag Carriers

Texas international enplanements were forecast as a percent of Texas domestic enplanements. The forecasts are for enplanements by United States flag carriers at Texas airports. Enplanements by foreign flag carriers at Texas airports are not included in the historical data or forecasts.

International enplanements by United States flag carriers depend on intergovernmental agreements as well as market demand. Market demand for international business and leisure travel appears to be even more sensitive to the economy than is domestic travel. As a result, international travel patterns fluctuate more widely and exhibit less stability than domestic travel. Historically, the majority of Texas international enplanements have occurred at Dallas-Fort Worth, Houston, and San Antonio. Corpus Christi had a few international enplanements in 1974, Brownsville in 1974, El Paso from 1979 to 1982, and McAllen in 1982. International enplanements from El Paso declined from almost 15,000 in 1981 to only 3,000 in 1982. Forecasts were made for Dallas-Fort Worth, Houston, and San Antonio only. It is anticipated that El Paso will continue to have international enplanements and international enplane-

TABLE 8

FORECASTS OF AIR CARRIER ENPLANEMENTS
AT TEXAS RESIDUAL HUBS, 1985-2000

Hub	1985	1990	1995	2000
Amarillo	495,000	659,000	905,000	1,098,000
Brownsville	71,000	101,000	139,000	183,000
Corpus Christi	495,000	710,000	975,000	1,281,000
Harlingen	460,000	710,000	975,000	1,372,000
Lubbock	637,000	862,000	1,184,000	1,464,000
McAllen	177,000	254,000	348,000	457,000
Midland	849,000	1,268,000	1,741,000	2,378,000

Source: TTI Analysis

ments will resume at McAllen; however, there is insufficient data to forecast international enplanements for these hubs.

During the past ten years, market shares for Dallas-Fort Worth and Houston have increased while the market share for San Antonio has declined. Dallas-Fort Worth and Houston have made dramatic improvements in their international service during the last five years, and continued improvements are forecast. More recently, international enplanements at Houston have grown faster than international enplanements at Dallas-Fort Worth.

Texas international enplanements have averaged 2.14 percent of Texas domestic enplanements during the past 12 years, Table 9. In forecasting Texas international enplanements, the assumption is made that international enplanements will grow at the same rate as domestic enplanements and will remain a constant 2.14 percent of domestic enplanements for the forecast period.

International enplanements as a percent of domestic enplanements for Dallas-Fort Worth, Houston, and San Antonio are shown, Table 9. International enplanements as a percent of domestic enplanements are forecast to continue to increase for Dallas-Fort Worth and Houston and to continue to decline for San Antonio.

International enplanements for San Antonio are forecast to remain stable at 70,000 passengers per year which is the average number of international enplanements for the period 1971-1982. With the Texas and San Antonio forecast set, the Dallas-Fort Worth and Houston shares were calculated by first computing a linear regression trend line for each hub using the historical ratios of international to domestic passengers for each airport for the 1971-1982 period. The international

TABLE 9

INTERNATIONAL ENPLANEMENTS AND INTERNATIONAL ENPLANEMENTS AS A PERCENT OF DOMESTIC ENPLANEMENTS, TEXAS AND TEXAS HUBS, 1962-1982 AND FORECASTS, 1985-2000

	INTERNATIONAL ENPLANEMENTS*							
YEAR	TEXAS	%	DFW	%	HOU	%	SAT	%
1962	94,700	2.53	32,783	1.81	21,002	2.66	40,632	15.18
1963	109,208	2.77	36,180	1.75	24,300	2.63	48,728	16.64
1964	108,984	2.41	30,168	1.29	25,822	2.42	52,994	15.94
1965	114,749	2.24	33,451	1.20	30,290	2.39	58,635	14.51
1966	178,391	2.79	53,949	1.53	36,698	2.51	87,744	15.45
1967	188,576	2.37	57,565	1.41	40,692	2.43	90,319	14.69
1968	223,234	2.41	69,603	1.50	42,378	2.12	111,253	13.84
1969	217,161	2.20	66,425	1.33	46,228	2.10	104,508	13.51
1970	216,379	2.16	67,309	1.29	45,775	2.12	103,295	13.30
1971	223,912	2.26	70,302	1.36	43,595	1.95	110,015	14.76
1972	223,471	2.04	70,774	1.24	48,076	1.98	104,505	12.36
1973	263,456	2.21	118,871	1.86	60,280	2.40	84,305	10.05
1974	266,387	2.06	144,821	2.05	50,167	1.82	71,300	8.98
1975	260,895	2.02	145,548	2.04	53,229	1.86	62,118	8.03
1976	261,715	1.85	149,188	1.92	52,094	1.63	60,433	7.34
1977	270,099	1.74	155,563	1.88	57,177	1.55	57,359	6.52
1978	426,144	2.40	268,740	2.88	79,652	1.77	77,750	7.59
1979	570,572	2.73	342,292	3.29	128,917	2.58	91,267	8.02
1980	619,660	2.52	361,752	3.60	169,412	3.52	73,809	5.07
1981	592,052	2.21	275,943	2.48	225,770	4.41	75,518	4.89
1982	507,672	1.75	282,755	2.45	179,107	3.14	36,988	2.27
1985	757,000	2.14	422,000	2.44	265,000	2.58	70,000	3.41
1990	1,081,000	2.14	610,000	2.51	400,000	2.64	70,000	2.38
1995	1,490,000	2.14	841,000	2.56	579,000	2.70	70,000	1.73
2000	1,957,000	2.14	1,097,000	2.58	790,000	2.72	70,000	1.32

*Does not include enplanements by foreign flag carriers at Texas airports

Sources: Airport Activity Statistics, CAB, FAA, DOT,1962-1982
TTI Analysis

to domestic passenger ratio for each airport was then projected to 1985-2000 using the regression equation. Preliminary forecasts were calculated by multiplying the forecast ratio by the median domestic enplanement forecast shown in Table 3. The resulting forecasts were scaled to match the control total previously established for the two airports. The final international enplanement forecasts and the ratio of international to domestic enplanements are shown on Table 9.

Texarkana

Texarkana, located astride the Texas-Arkansas state line, is served by an airport located in Arkansas which also serves an area of northeast Texas. Texarkana is forecast separately as the methodology used for Texas airports served by commuter carriers could not be applied to Texarkana. Historic data, 1962-1982, and forecasts (1985-2000) for Texarkana are shown in Table 10. Texarkana's share of the United States and Texas market has declined four of the last six years. Enplanements have been stable for the last three years, essentially, no growth. Looking at a longer period, enplanements grew at a modest rate from 1962 to 1977 and have declined since. In 1978 commuter service was initiated and air carrier service terminated. Enplanements for Texarkana were forecast by assuming a constant 0.009 percent share of the United States market. This market share was applied to the FAA United States enplanement forecast, Table 2, to derive the forecast shown, Table 10.

TABLE 10

HISTORIC DATA AND FORECASTS FOR TEXARKANA

	Domestic Enplanements (000)		TEXARKANA		
	U.S.	Texas	Enplanements	%of U.S.	%of Texas
1962	60,495	3,720	8,960	.01481	.2409
1963	69,116	4,215	10,057	.01455	.2386
1964	78,808	4,767	11,963	.01517	.2509
1965	91,604	5,619	14,042	.01532	.2499
1966	105,254	6,978	16,957	.01611	.2430
1967	127,205	7,968	20,424	.01606	.2563
1968	144,464	9,266	23,425	.01622	.2528
1969	151,634	9,888	24,549	.01619	.2483
1970	153,727	10,010	24,714	.01608	.2469
1971	151,429	9,895	26,422	.01745	.2672
1972	170,950	10,984	27,798	.01626	.2531
1973	181,423	11,941	28,655	.01579	.2400
1974	187,803	12,934	27,322	.01455	.2112
1975	182,985	12,914	22,011	.01203	.1704
1976	204,139	14,208	32,674	.01601	.2300
1977	219,892	15,570	35,296	.01605	.2267
1978	251,256	17,777	37,177	.01480	.2091
1979	285,306	19,509	30,919	.01084	.1581
1980	268,254	24,627	33,832	.01261	.1374
1981	255,047	26,796	25,377	.00994	.0947
1982	267,246	28,995	23,430	.00877	.0808
1985	330,000	35,380	29,700	.00900	.0839
1990	409,000	50,710	36,800	.00900	.0726
1995	497,800	69,640	44,800	.00900	.0640
2000	580,400	91,470	52,200	.00900	.0571

Sources: Airport Activity Statistics, CAB, FAA, DOT, 1971-1983
TTI Analysis

Commuter Enplanement Forecast

Forecasting enplanements for communities with service by commuter carriers is more hazardous due to the absence of a clear trend for many cities. Several communities experienced rapid growth after initiation of commuter service or the initial substitution of commuter service for air carrier service. The growth did not continue and for several cities the number of enplaned passengers has actually declined. The reasons for the decline in passengers are not fully known; however, the availability and stabilization of automobile fuel prices and the cost of commuter service are probably the most important reasons. Commuter carriers due to their short stage length compete directly with the private automobile in most markets. The cost of commuter service has increased more rapidly than the cost of air carrier service. Due to their smaller aircraft size, the commuter industry has not realized the same degree of productivity gains as have operators of larger aircraft nor has the commuter industry engaged in widespread fare discounting. As a result, commuter carrier costs appear high compared to air carrier costs. In actuality the cost per seat mile to operate small aircraft over short stage lengths is about five times the cost to operate large aircraft over long stage lengths. The yield, revenue per passenger mile, is about 68 cents for commuter carriers compared to 13 cents for air carriers.

The recent national economic recession affected all air travel, commuter and air carrier; however, the decline in commuter boardings appears to be greater than would be caused by the recession alone. The automobile and fares are important factors limiting commuter carrier

growth. The commuter carriers primarily serve to connect smaller communities to the larger hubs where passengers interline with air carriers. Nationally, 90 percent of commuter carrier passengers interline with another carrier. Therefore, it is reasonable to expect that long-term growth rates for commuter carriers will be similar to the growth rates for air carriers.

Enplanement histories for commuter carriers are shown on Table 11, and forecasts are shown on Table 12. These forecasts were made by applying the annual growth rate implicit in the median Texas forecast, 6.5 percent per year, adjusted for differences in population growth expectations, to the reported 1983 enplanements for each community.

The adjustment factor was computed using the ratio of the projected county population growth rate (1980-2000) to the Texas population growth rate (1980-2000) and the Texas enplanement growth rate implicit in the median Texas forecast, Table 3, according to the following formula: $y = (0.065\ [x/0.49 + 1])/2$ where x = the projected county population increase from 1980 to 2000, y = the projected county enplanement growth rate, 0.49 is the projected Texas population increase from 1980 to 2000, and 0.065 is the projected median Texas enplanement growth rate from 1985 to 2000 from Table 3. The result of this adjustment is that for counties forecast to grow in population faster than the State as a whole, enplanements are forecast to grow faster than the State as a whole. For counties forecast to grow in population slower than the State as a whole, enplanements are forecast to grow slower than the State as a whole. The 1983 enplanements and the annual enplanement growth rate used for each community are shown on Table 12.

TABLE 11

COMMUTER CARRIER ENPLANEMENT HISTORY
1962-1983

YEAR	ABI	BPT	BWN	CLC	CLL	ILE
1962	--	--	--	--	--	--
1963	--	--	--	--	--	--
1964	--	--	--	--	--	--
1965	--	--	--	--	--	--
1966	--	--	--	--	938	--
1967	--	--	--	--	3,271	--
1968	--	--	--	--	7,145	8,810
1969	--	--	--	23,202	9,267	20,283
1970	1,519	--	--	42,667	8,908	30,690
1971	--	--	--	40,711	7,485	34,055
1972	--	1,276	--	39,086	10,278	35,260
1973	--	17,805	--	37,874	14,735	35,365
1974	--	25,199	--	42,426	17,409	39,281
1975	--	33,751	--	41,526	17,485	37,399
1976	1,932	26,671	293	43,831	20,437	40,179
1977	9,207	30,211	3,320	45,797	23,880	44,575
1978	13,542	35,959	3,784	51,334	31,428	46,237
1979	24,878	48,552	4,858	59,515	36,607	42,257
1980	34,908	47,712	3,376	45,711	33,896	30,514
1981	54,283	61,983	2,145	48,796	31,986	28,040
1982	58,749	70,904	1,477	39,816	30,261	26,174
1983	53,313	80,618	1,087	33,499	30,761	32,005

ABI - Abilene Municipal
BPT - Beaumont - Jefferson County
BWN - Brownwood Municipal
CLC - Clear Lake - Metro STOL Port
CLL - College Station - Easterwood Field
ILE - Killeen Municipal

Source: Texas Aeronautics Commission

TABLE 11 (continued)

COMMUTER CARRIER ENPLANEMENT HISTORY
1962-1983

YEAR	LJN	LRD	GGG	PRX	SJT
1962	--	--	--	--	--
1963	--	--	--	--	--
1964	--	--	--	--	--
1965	--	--	--	--	--
1966	--	--	--	--	--
1967	--	--	--	--	--
1968	--	--	--	--	--
1969	--	--	--	--	--
1970	702	370	2,344	--	243
1971	5,640	--	--	--	--
1972	3,743	--	--	--	--
1973	6,351	--	--	--	--
1974	6,748	--	3,676	--	87
1975	7,224	--	8,994	--	--
1976	9,119	--	10,505	--	--
1977	10,707	--	15,560	3,017	--
1978	13,593	7,681	20,127	3,202	--
1979	17,214	14,223	21,210	2,912	8,038
1980	15,157	13,535	18,878	1,824	16,892
1981	16,785	10,170	19,964	1,749	30,953
1982	11,020	11,977	19,748	1,564	40,422
1983	6,646	15,639*	17,891	1,508	42,287

LJN - Lake Jackson - Brazoria County
LRD - Laredo International
GGG - Longview - Gregg County
PRX - Paris - Cox Field
SJT - San Angelo - San Angelo - Mathis Field
* Total Commuter and air carrier enplanements for Laredo was 24,962 in 1983

Source: Texas Aeronautics Commission

TABLE 11 (continued)

COMMUTER CARRIER ENPLANEMENT HISTORY
1962-1983

YEAR	SGR	TPL	TYL	VCT	ACT	SPS
1962	--	--	--	--	--	--
1963	--	--	--	--	--	--
1964	--	--	--	--	--	--
1965	--	--	--	--	--	--
1966	--	--	--	--	--	--
1967	--	--	--	--	--	--
1968	--	--	--	--	--	--
1969	--	--	--	--	--	--
1970	--	--	2,993	--	--	10,164
1971	--	--	--	--	--	3,054
1972	--	--	--	--	--	7,746
1973	--	5,120	--	7,557	--	11,544
1974	--	7,762	5,039	8,292	--	17,296
1975	--	8,577	12,194	8,259	10,744	22,612
1976	--	11,250	13,402	10,169	20,378	16,381
1977	--	15,317	22,293	11,715	32,789	22,947
1978	--	16,373	28,005	12,660	41,572	31,616
1979	2,745	15,244	30,397	14,763	41,923	46,236
1980	1,468	11,741	26,860	14,531	31,944	64,275
1981	--	8,369	28,716	15,870	24,244	65,052
1982	--	6,594	26,204	13,958	22,033	58,042
1983	5,721	6,311	28,096	13,999	21,276	49,413

SGR - Sugar Land - Hull Field
TPL - Temple - Draughon-Miller Municipal
TYL - Tyler Pounds Field
VCT - Victoria Regional
ACT - Waco - Madison Cooper Municipal
SPS - Wichita Falls Municipal

Source: Texas Aeronautics Commission

TABLE 12

COMMUTER CARRIERS, ANNUAL GROWTH RATE, 1983 ENPLANEMENTS, AND FORECASTS 1985-2000

		ENPLANEMENTS				
	% Growth Rate	1983	1985	1990	1995	2000
Abilene	4.9	53,313	58,700	74,600	94,700	120,300
Austin		2,569	2,800	3,600	4,500	5,800
Beaumont	4.3	80,618	87,700	108,300	133,800	165,300
Brownwood	6.7	1,087	1,200	1,700	3,300	3,200
Clear Lake	6.8	33,499	38,200	53,100	73,800	102,600
College Station	8.9	30,761	36,500	55,000	85,200	130,300
Dallas/Fort Worth		308,113	345,600	452,000	594,400	782,100
Houston		130,409	152,700	206,800	283,500	380,000
Killeen	7.3	32,005	36,900	52,500	74,800	106,500
Lake Jackson	7.9.	6,646	7,700	11,300	16,600	24,300
Laredo	6.5	24,962	28,600	39,200	53,900	73,900
Longview	5.8	17,891	20,000	26,600	35,400	47,000
Paris	4.6	1,508	1,700	2,100	2,600	3,300
San Angelo	4.7	42,287	46,400	58,400	73,600	92,700
San Antonio		26,571	30,100	41,200	56,300	77,000
Sugar Land	12.1	5,721	7,200	12,700	22,600	40,100
Temple	7.3	6,311	7,300	10,400	14,700	21,000
Tyler	6.3	28,096	31,800	43,200	58,700	79,800
Victoria	6.3	13,999	15,800	21,500	29,300	39,800
Waco	4.7	21,276	23,300	29,400	37,000	46,600
Wichita Falls	4.9	49,413	54,900	69,700	88,600	112,600

Source: TTI Analysis

Enplanements were forecast for the smaller city of each route segment; for example, enplanements on the Abilene to Dallas-Fort Worth route segment were calculated for Abilene using the Abilene annual growth rate factor. Traffic was then assumed to be balanced so that commuter enplanements at Dallas-Fort Worth were assumed to equal the commuter enplanements at Abilene. Therefore, it was not necessary to calculate annual growth rates for Austin, Dallas-Fort Worth, Houston, and San Antonio as these hubs function as interline points rather than true origins or destinations. The 1983 enplanements and enplanement forecasts shown for these four hubs are the totals for the several commuter carriers feeding traffic to these locations.

For several cities, College Station, Lake Jackson, Waco, Temple, etc. the forecasts, Table 12, do not track well with recent commuter enplanement experience. During the last five years, commuter enplanements for these cities have remained stable or declined. Looking at a longer period of time, 15 years, enplanements have grown for all of these cities.

Enplanements are not forecast for Galveston which lost commuter service in 1982, Lufkin which lost commuter service in 1983, Fort Worth which lost service in 1983. Nor are enplanements shown for Midland or Sugar Land which initiated service in 1983.

Interpretational Forecast Comparisons

The state enplanement forecasts developed in this paper are based on FAA national level forecasts and assumptions about Texas' share of

national enplanements. City air carrier enplanements forecasts are based on historical city shares. City commuter enplanements are based on the state air carrier enplanement growth rate adjusted for projected county population growth rates.

In this section the forecasts shown in Table 1 are compared to FAA terminal area forecasts and forecasts prepared by various consultants as part of a recent airport master plan study.

Annually, the FAA prepares terminal area forecasts for major airports in the United States. FAA enplanement forecasts are based on an adjusted "top-down" methodology. Enplanements are disaggregated into originating, connecting, and returning passengers with separate equations used to adjust for cities characterized as industrial cities, trade centers, or recreation areas, and as connecting cities, terminating points, or intermediate cities. Passengers originating at cities are primarily dependent on income generated in the city, while the number of connecting and returning passengers depends on income levels at associated destinations. Growth rates for enplanements are based on Department of Commerce forecasts of income generated at these various cities. The income forecasts, which deviate from the national average, are used to adjust the enplanement forecast for each city.

Airport master plan forecasts are prepared employing a variety of methodologies. They are usually closely related to the operating history of the carrier serving the market of interest at the time the forecasts are prepared.

Airport capacity is constructed in large segments. For example, adding a parallel runway will increase the instrument flight rule (IFR)

hourly capacity of an airport by 30 to 100 percent depending on the distance between the runways. Similarly adding one additional terminal gate will increase capacity by about 1.5 narrow body aircraft per hour. One purpose of long range forecasting is to assist in identification of when significant facility expansion will be required for existing airports, to assist in designing adequate capacity into new airports, or to identify when additional or replacement airports will be needed. When used for these purposes annual enplanements must show significant changes before additional capacity is needed. For example, increasing the number of annual, enplaned passengers from 2 million to 4 million will increase the gate requirements from about 20 gates to 30 gates and peak hour aircraft operations from 25 operations per hour to 40 operations per hour. A single runway will handle between 42 and 53 IFR operations per hour. A forecast exceeding 4 million passengers per year would signal the need for a second runway.

A long range forecast is always hazardous as the assumptions on which the forecast was developed may change. The forecasts shown in this report assumes that Texas will continue to grow in population faster than the nation as a whole and that the rate of usage of air transportation by Texans will increase at a faster rate than the nation as a whole. Similarly, the forecast assumes that the metropolitan areas of Austin, Dallas-Fort Worth, and Houston will sustain the population and economic growth realized during the last 15 years for another 15 years. The forecasts also assume that technologies such as telecommunications or high speed trains will not materially impact intercity travel and that the cost of air transportation will not increase

relative to cost of other goods and services (i.e., no large increase in the cost of oil). Because the forecast assumptions do change, it is important that the forecasts be reviewed and updated periodically.

Enplanements by commuter carriers at the smaller cities in Texas are particularly difficult to forecast. Enplanements on commuter carriers are very sensitive to the quality of service provided, the frequency of service, and the cost of using the service. These factors, which cannot be forecast since they depend on the carrier, are more important than the rate of population growth and increase in economic activity. For most cities served by commuter carrier the automobile is also an important competitor. Automobile travel is sensitive to the availability of fuel and to a lesser extent, the cost of fuel.

Substantial changes in annual enplanements are required before cities now served by commuter carriers can anticipate service by jet transport aircraft in a city pair market. To support direct air service between two cities using jet transport aircraft a minimum of 65,000 annual passenger enplanements is required assuming the market can be served by four departures per day. For many cities four departures per day is not adequate. If eight departures per day are needed to serve a city pair market, 128,000 annual enplanements are needed to support jet transport service. This suggests that for those cities shown on Table 12 with only commuter service, only Abilene, Beaumont, Killeen, San Angelo, and Wichita Falls are candidates for jet transport services by 2000. For the other cities, the number of annual enplanements will have some impact on terminal size and parking requirements but will not materially impact runway requirements.

Table 13 shows TAFP, FAA, and selected airport master plan forecasts. Significant differences exist between the FAA forecast and the TAFP and AMP forecasts for Austin. Significant differences are those which would materially impact facility requirements. The FAA forecasts are also significantly below the TAFP and AMP forecasts for Harlingen. The Houston forecasts are very close. The magnitude of the forecast for Dallas-Fort Worth puts this area in a class by itself and worthy of individual study and analysis. For the other cities shown, the differences in the forecasts even out to the year 2000 will not significantly impact runway or terminal area capacity requirements.

TABLE 13

COMPARISON OF TAFP FORECASTS WITH FAA TERMINAL AREA FORECASTS
AND SELECTED AIRPORT MASTER PLAN FORECASTS

		1985	1990	1995	2000
Abilene	TAFP	58,700	74,600	94,700	120,300
	FAA	73,000	96,000	121,000	--
	AMP	--	--	--	--
Amarillo	TAFP	495,000	659,000	905,000	1,098,000
	FAA	470,000	597,000	759,000	--
1980	AMP	430,000	530,000	--	650,000
Austin	TAFP	1,452,800	2,283,600	3,414,500	4,845,800
	FAA	1,279,000 (1987)	1,559,000 (1992)	1,894,000	-- (2002)
1984	AMP	1,684,000	2,864,000	--	5,268,300
Beaumont	TAFP	87,700	108,300	133,800	165,300
	FAA	90,000	116,000	152,000	--
1984	AMP	100,000	130,000	160,000	200,000
Brownsville	TAFP	71,000	101,000	139,000	183,000
	FAA	63,000	80,000	102,000	--
1981	AMP	140,000	196,000	--	278,000
Brownwood	TAFP	1,200	1,700	2,300	3,200
	FAA	2,000	3,000	3,000	--
1975	AMP	5,900	7,100	8,700	--
Clear Lake	TAFP	38,200	53,100	73,800	102,600
	FAA	52,000	69,000	87,000	--
	AMP	--	--	--	--
College Station	TAFP	36,500	55,000	85,200	130,300
	FAA	37,000	49,000	62,000	--
1984	AMP	37,700	49,800	62,900	--
Corpus Christi	TAFP	495,000	710,000	975,000	1,281,000
	FAA	489,000	597,000	725,000	--
	AMP	--	--	--	--
Dallas/Fort Worth	TAFP	18,027,600	25,402,000	34,305,400	44,319,100
	FAA	17,693,000	22,488,000	27,843,000	--
	AMP	--	--	--	--
El Paso	TAFP	1,170,000	1,420,000	1,600,000	1,650,000
	FAA	1,194,000	1,455,000	1,771,000	--
1972	AMP	1,850,000	2,330,000	--	--

TABLE 13 (continued)

COMPARISON OF TAFP FORECASTS WITH FAA TERMINAL AREA FORECASTS
AND SELECTED AIRPORT MASTER PLAN FORECASTS

		1985	1990	1995	2000
Harlingen	TAFP	460,000	710,000	975,000	1,372,000
	FAA	381,000	452,000	536,000	--
1980	AMP	580,000	805,000	1,090,000	--
Houston	TAFP	10,677,700	15,766,800	22,312,500	30,170,000
	FAA	10,566,000	13,568,000	17,169,000	--
1983	AMP	11,585,000	15,735,000	--	30,350,000
Killeen	TAFP	36,900	52,500	74,800	106,500
	FAA	32,000	45,000	54,000	--
1980	AMP	64,650	76,550	89,450	112,750
Lake Jackson	TAFP	7,700	11,300	16,600	24,300
	FAA	17,000	23,000	29,000	--
	AMP	--	--	--	--
Laredo	TAFP	28,600	39,200	53,900	73,900
	FAA	37,000	46,000	58,000	--
1980	AMP	85,200	156,900	--	265,200
Longview	TAFP	20,000	26,600	35,300	45,000
	FAA	24,000	31,000	40,000	--
1980	AMP	31,000	36,000	40,000	45,000
Lubbock	TAFP	637,000	862,000	1,184,000	1,464,000
	FAA	613,000	747,000	908,000	--
1980	AMP	740,000	1,000,000	1,250,000	1,550,000
McAllen	TAFP	177,000	254,000	348,000	457,000
	FAA	267,000	323,000	389,000	--
			(1987)		(1997)
1978	AMP	--	260,860	--	447,346
Midland	TAFP	849,000	1,268,000	1,740,000	2,378,000
	FAA	793,000	967,000	1,176,000	--
1980	AMP	700,000	895,000	1,125,000	1,325,000
Paris	TAFP	1,700	2,100	2,600	3,300
	FAA	2,000	3,000	3,000	--
	AMP	--	--	--	--
San Angelo	TAFP	46,400	58,400	73,600	92,700
	FAA	48,000	62,000	80,000	--
1981	AMP	27,900	36,100	36,100	41,100

TABLE 13 (continued)

COMPARISON OF TAFP FORECASTS WITH FAA TERMINAL AREA FORECASTS
AND SELECTED AIRPORT MASTER PLAN FORECASTS

		1985	1990	1995	2000
San Antonio	TAFP	2,150,100	3,051,200	4,166,300	5,457,000
	FAA	2,128,000	2,595,000	3,154,000	--
			(1988)	(1993)	(2005)
1984 (Draft)	AMP	2,137,500	2,466,600	3,059,000	4,309,600
Sugar Land	TAFP	7,200	12,700	22,600	40,000
	FAA	4,000	6,000	7,000	--
	AMP	--	--	--	--
Temple	TAFP	7,300	10,400	14,700	21,000
	FAA	8,000	10,000	13,000	--
1978	AMP	33,990	41,990	--	58,090
Texarkana	TAFP	29,700	36,800	44,800	52,200
	FAA	35,000	45,000	58,000	--
	AMP	--	--	--	--
Tyler	TAFP	31,800	43,200	58,700	79,800
	FAA	34,000	45,000	57,000	--
		(1983)	(1988)	(1994)	
1972	AMP	24,800	36,400	60,000	--
Victoria	TAFP	15,800	21,500	29,300	39,800
	FAA	17,000	23,000	29,000	--
			(1989)		
1982	AMP	16,069	16,413	17,588	18,568
Waco	TAFP	23,300	29,300	37,000	46,600
	FAA	27,000	36,000	45,000	--
1984 (Draft)	AMP	25,900	31,600	--	40,300
Wichita Falls	TAFP	54,900	69,700	88,600	112,600
	FAA	54,000	74,000	100,000	--
1980	AMP	83,000	87,000	91,000	96,000

Sources: TTI Analysis
FAA Terminal Area Forecasts FY 84-95
Selected Airport Master Plan Studies

TEXAS GENERAL AVIATION FORECASTS

by
Dana L. Ryan

Texas Aeronautics Commission
Austin, Texas

September 1984

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General aviation encompasses all facets of aviation except military and commercial airline activity. In Texas, general aviation accounts for the majority of activity at state system airports. Forecasts of demand are, therefore, important guides for planning airport facility improvements.

Primary indicators of general aviation demand include:

- Total registered aircraft
- Aircraft fleet mix
- Aircraft flight hours
- Annual aircraft operations

The basic demand indicator is the number of registered aircraft. Based upon this element and other factors characteristic to the State of Texas, the growth of the remaining indicators can be formulated.

GENERAL AVIATION AIRCRAFT

The Texas general aviation (GA) fleet consisted of 22,461 registered aircraft as of December 31, 1982, (Table 1). This represented a 3.6 percent increase over the 1981 level of 21,692 units. During the same time period total aircraft registered in the United States decreased 1.2 percent from 249,851 to 246,942 -- the first national decline in aircraft growth experienced in more than a decade.

Table 1 -- Registered Aircraft

Year	Aircraft[1]	
	United States	Texas
1970	130,189	10,021
1971	129,463	9,647
1972	N/A	N/A
1973	151,289	10,985
1974	158,960	11,695
1975	165,643	12,425
1976	175,130	13,279
1977	207,344	15,773
1978	228,330	17,662
1979	240,964	19,064
1980	248,376	20,469
1981	249,851	21,692
1982	246,942	22,461

As shown in Table 2, although the size of the Texas GA fleet has been increasing, the rate of growth has been declining since 1977. This is especially true of piston-engine aircraft which have suffered a dramatic drop both nationally and in Texas. Conversely, growth of turbine-powered aircraft and rotorcraft has been cyclic -- periods of increase followed by declines.

[1]FAA, Census of U.S. Civil Aircraft. These figures do not include non-powered aircraft, such as gliders and balloons.

Table 2 - Annual Growth Rates by Aircraft Category

Period	Area	Growth Rate: Piston Engine Single	Piston Engine Multi	Turbine Engine Prop	Turbine Engine Jet	Rotor	Total
	Texas	8.6%	4.4%	-1.7%	2.5%	18.0%	7.7%
1976	U.S.	5.8%	14.9%	-1.3%	9.1%	10.6%	5.7%
	Texas	19.3%	14.7%	10.0%	12.0%	43.8%	18.8%
1977	U.S.	19.2%	10.0%	14.1%	28.0%	52.0%	18.9%
	Texas	11.7%	11.2%	5.0%	24.4%	24.7%	12.0%
1978	U.S.	9.1%	10.3%	19.2%	25.1%	11.5%	9.6%
	Texas	6.9%	8.8%	14.6%	7.1%	27.9%	7.9%
1979	U.S.	5.6%	5.2%	4.0%	-4.7%	9.1%	5.5%
	Texas	5.9%	8.6%	28.4%	20.5%	14.2%	7.4%
1980	U.S.	2.4%	4.8%	13.6%	8.5%	7.8%	3.1%
	Texas	4.0%	6.4%	23.1%	26.4%	21.3%	6.0%
1981	U.S.	-0.2%	0.2%	17.3%	20.7%	5.5%	0.6%
	Texas	2.5%	4.0%	6.7%	16.7%	12.0%	3.6%
1982	U.S.	-1.5%	-1.3%	9.7%	6.4%	2.6%	-1.2%

The growth patterns exhibited can be directly attributed to current economic conditions. For all aircraft owners high finance charges and fuel prices along with escalating maintenance costs have forced a re-evaluation of the need to operate an aircraft. The number of new aircraft delivered in 1983 plunged 36.9 percent - the fifth consecutive decline in annual deliveries - to 2,691 units compared to 4,266 in 1982.

Nationwide total numbers of piston-engined aircraft declined in 1981 and 1982, (Table 3). In-all-likelihood a decrease occurred again in 1983, although data is not yet available to substantiate this claim. Some of the decline in this market segment has been experienced by small businesses that

had only occasional use for a corporate plane. The brunt of the decline, however, has been suffered by people who fly for pleasure. The cost of flying has increased so significantly that many discretionary flyers have dropped from aviation or have turned to ultralights. To illustrate the potential of the ultralight industry, in one month of 1982 a single ultralight manufacturer came within one unit of selling the same number of aircraft as did the combined U.S. manufacturers of certificated aircraft.

Table 3 - General Aviation Fleet[2]

Period	Area	Piston Engine		Turbine Engine			
		Single	Multi	Turboprop	Turbojet	Rotor	Total
	Texas	10,479	2,932	349	242	276	13,279
1976	U.S.	144,881	21,320	2,486	1,938	4,505	175,130
	Texas	12,503	2,218	384	271	397	15,773
1977	U.S.	172,125	23,110	2,829	2,475	6,805	207,344
	Texas	13,960	2,467	403	337	495	17,662
1978	U.S.	188,355	25,853	3,381	3,109	7,638	228,336
	Texas	14,923	2,685	462	361	633	19,064
1979	U.S.	198,972	27,186	3,515	2,958	8,333	240,964
	Texas	15,803	2,915	596	435	723	20,469
1980	U.S.	203,706	28,502	3,994	3,208	8,966	248,376
	Texas	16,430	3,100	730	555	877	21,692
1981	U.S.	203,272	28,562	4,686	3,871	9,460	249,851
	Texas	16,833	3,225	779	642	982	22,461
1982	U.S.	199,788	28,259	5,120	4,111	9,664	246,942

[2]FAA, Census of U.S. Civil Aircraft, respective years.

Business dispersion and centralized management, coupled with loss of airline service to many cities, has bolstered growth in the turbine and rotorcraft fleet. Corporations continue to recognize aviation as a means to gain a relative cost advantage over other modes of transportation.

Overall, Texas has consistently maintained a total aircraft growth rate above the national average. The state has experienced the same decrease in piston-engine growth, however, at a rate considerably less than that experienced by the rest of the country. On the other hand, Texas has outstrided the nation in growth of its turbine and rotorcraft fleet.

Table 4 contains the historical shares of the U.S. aircraft market captured by Texas. In 1982, 9.1 percent of all the airplanes in the United States were registered in Texas, including one of every five twin-engine turbojets. The most significant increases have occurred in what can be labeled business aircraft. This includes major gains in the seven-place twin-engine piston class, one to twelve-place turboprops and turbojets, and the turbine rotorcraft category.

Table 4 - Market Shares: Texas versus U.S.

Aircraft Class	Texas Market Share							
	1975	1976	1977	1978	1979	1980	1981	1982
Piston Engine								
Single Engine								
1-3 Place	7.2%	7.4%	7.5%	7.6%	7.6%	7.8%	8.1%	8.3%
+4 Place	7.1%	7.1%	7.1%	7.3%	7.4%	7.7%	8.1%	8.5%
Twin Engine								
1-6 Place	8.7%	8.6%	9.1%	9.0%	9.3%	9.6%	10.1%	10.5%
+7 Place	10.5%	10.2%	10.6%	10.8%	11.1%	11.6%	12.5%	13.0%
Three+Engine	3.5%	1.6%	3.7%	4.3%	6.0%	6.7%	5.6%	4.9%
Turboprop								
Single Engine	6.1%	3.3%	7.7%	12.2%	14.1%	14.7%	10.9%	11.8%
Twin Engine								
1-12 Place	14.9%	15.4%	14.2%	12.5%	13.6%	15.2%	16.3%	16.7%
+13 Place	12.1%	10.6%	12.5%	10.5%	10.9%	12.0%	11.9%	7.6%
Three+Engine	10.0%	5.9%	4.4%	2.8%	3.4%	11.1%	8.7%	5.2%
Turbojet								
Single Engine	2.9%	3.3%	2.8%	3.3%	3.2%	3.4%	4.1%	7.7%
Twin Engine								
1-12 Place	13.3%	12.8%	13.1%	13.9%	13.9%	14.9%	16.4%	20.1%
+13 Place	15.5%	13.0%	10.0%	10.8%	12.0%	13.4%	13.1%	7.9%
Three+Engine	12.7%	11.0%	6.5%	4.1%	7.7%	10.3%	9.4%	10.3%
Rotorcraft								
Piston	5.3%	5.4%	5.0%	5.3%	5.8%	6.0%	6.4%	7.2%
Turbine	6.5%	7.3%	7.5%	8.8%	10.8%	11.3%	13.1%	13.6%
State Share	7.4%	7.6%	7.6%	7.7%	7.9%	8.2%	8.8%	9.4%

The increasing market shares reflect the strong population and business growth being experienced by the state. Texas has a vibrant economy. This serves as an inducement for new businesses to incorporate and for existing industries to expand. The resulting economic opportunities entice people to migrate. By the year 2000 Texas is expected to be the second most populated state with more than twenty-one million residents.

Business flying represents the largest area of general aviation growth. Under the following assumptions it is possible to chart the growth of business aircraft, shown in Table 5.

- Rotorcraft: 90 percent used for business
- Turbojets: 90 percent used for business
- Turboprops: 85 percent used for business
- Twin-engine piston: 65 percent used for business
- Single-engine piston: 25 percent used for business

Table 5 - General Aviation Business Fleet

Year	Business Aircraft		Total Aircraft	
	U.S.	Texas	U.S.	Texas
1975	30,920	2,750	165,643	12,425
1976	33,030	2,920	175,130	13,279
1977	38,790	3,380	207,344	15,773
1978	43,657	3,870	228,330	17,662
1979	46,000	4,310	240,964	19,064
1980	48,810	4,850	248,376	20,469
1981	50,810	5,460	249,851	21,692
1982	50,014	6,537	246,942	22,461

The number of aircraft dedicated for business and commercial use in Texas has increased 140 percent since 1975. This compared to a 62 percent increase for the nation. In 1982 business aircraft represented 29 percent and 20 percent, respectively, of the total state and national GA fleet.

FORECAST AND FLEET MIX

This section will present projections of future aircraft growth in the state of Texas and select a preferred forecast. The development of these projections proceed through two distinct processes: the analytical followed by the judgemental. During the analytical process, past trends are extended into the future by using a variety of techniques under a set of assumptions. Under the judgemental, the analyst examines the growth projections, studies the character of the locality and how it may influence events, then makes a subjective determination of the preferred forecast.

Preparatory to presenting aircraft growth projections a review of past trends in state aviation is in order, as is a brief examination of the anticipated path the Texas economy may follow.

Growth of the general aviation aircraft fleet in the state of Texas has consistently outstripped that experienced by the nation, particularly during the last economic recession. In general, this can be related to a stronger and more vibrant economic climate. Of note is the continuous growth of the turbine engine fleet, particularly since 1978, and the relatively flat growth of single-engine piston aircraft.

The state has consistently increased its share of the total U.S. aircraft market. Again the turbine aircraft category can be highlighted. As of 1982 more than 15 percent of the total turbine fleet was located in Texas. Between 1975 and 1982 the number of aircraft in the state's business fleet increased 140 percent.

Most economists share an optimistic outlook for the future of the Texas economy. The state's population growth will remain above the national average. The late economic recession is generally thought to have bottomed in 1983 and some measure of economy stability will be attained during the coming years. Employment will rise as the economy gains momentum, however, high interest rates will continue to be the norm.

Industrialization has been and will be the cornerstone of Texas economic growth. Recent key growth industries have been high technology and oil-drilling equipment. Both will continue to play major roles, but diversified industries being attracted to the state will assert greater influence on Texas growth. Considerable industrial development will occur in non-urban areas, continuing the trend of plant decentralization and placing increased emphasis on the use of business aircraft.

Over the long-term potential resource shortages, limitations in transportation or infrastructure, and environmental issues may constrain future economic growth in Texas. As the mix and distribution of industry becomes more heterogeneous the state will be more susceptive to downturns and swings of the national economy.

Tempered by the above observations, the following assumptions were used to project future general aviation aircraft growth in Texas.

- Recovery from the 1980-1982 recession will be a slow process of gradual increases in gross national product and real income

- Over the short term interest rates will fail to achieve significant declines

- The state will continue to capture a major share of the total U.S. aircraft market

- Decentralization of industry and airline deregulation will continue to serve as a catalyst for growth of the state business aircraft fleet

- Growth of the twin-engine piston aircraft market will continue to be soft until the economy indicates a strong measure of recovery

- Single-engine piston aircraft growth will continue to decrease unless a sharp decline of interest rates and overall flying costs is experienced, which seems unlikely for the remainder of this century

- The turbine fleet will continue to represent the major growth center in the state

Given the above observations and assumptions, a series of growth projections were prepared for powered aircraft. These projections are presented in Table 6.

Table 6 - Texas General Aviation Aircraft Growth Projections

Year	Aircraft Growth Projections				
	1	2	3	4	5
1985	24,685	24,545	27,050	23,500	27,740
1990	29,860	28,450	34,120	31,950	35,350
1995	35,090	32,980	41,200	41,020	42,960
2000	40,340	38,240	48,270	49,630	50,570

A brief explanation of each projection follows:

- Projection 1 - static market share of the U.S. projected at 11.0 percent per annum

- Projection 2 - static growth rate projected at 3.0 percent per annum

- Projection 3 - regression analysis of state population versus aircraft: aircraft = m(pop.)+b, where m = 3.254 and b = -2625.981, with correlation coefficient r = 0.946

- Projection 4 - trend market share of the U.S. aircraft = m(aircraft)+b, where m=180.406 and b=-16527.67, with correlation coefficient r=0.987

- Projection 5 - Time series extrapolation based on the period 1975-1982: aircraft = m(year) + b, where m = 1521.511 and b = -2992458.0, with correlation coefficient r = 0.991

The projections indicate a wide range of values are possible for general aviation aircraft growth in Texas. The preferred forecast, shown below, reflects a belief that aircraft growth will follow a low-side projection.

Year	Aircraft
1985	24,310
1990	28,900
1995	34,300
2000	40,700

Trends in the Texas economy are the major force creating change in state general aviation. Similar to the rest of the nation, the annual aircraft growth rate has been declining since 1976. This has been promulgated by instability and recession of the economy. However, as discussed earlier, it is largely believed that the recession bottomed in 1983 and a period of slow economic growth is being entered. If sustained growth in the economy is attained than it should have a positive impact on the demand for general aviation aircraft. Industry analysts are assuming this and aircraft manufacturers are preparing for a modest increase in the number of new aircraft deliveries for 1985. On this basis, growth over the entire forecast period for Texas general aviation is expected to be near 3.4 percent per year, resulting in an estimated 40,700 aircraft by year 2000.

Table 7 presents a breakdown of state general aviation fleet mix. To the turn of the century growth of turbine powered aircraft is expected to average about 5.8 percent per annum. For the same time period piston-engine aircraft are forecast to grow 3.1 percent per year, and rotorcraft 5.4 percent.

Table 7 - Texas General Aviation Fleet Mix

Year	Piston-Engine		Turbine		Rotorcraft	Total
	Single	Multi	Turboprop	Turbojet		
1985	17,900	3,545	925	775	1,165	24,310
1990	21,260	4,020	1,160	1,000	1,460	28,900
1995	24,770	4,700	1,530	1,370	1,970	34,300
2000	28,720	5,510	2,030	1,880	2,560	40,700

AIRCRAFT DISTRIBUTION

At present major aviation activity centers are confined to the state's twenty-eight Metropolitan Statistical Areas (MSA's). Employing a top-down model based on market share trends, the state aircraft forecast was allocated to the various MSA's. Shown in Table 8, seventy-five percent of the state's aircraft fleet will be concentrated in metropolitan areas.

Table 8 - Aircraft Allocation by MSA

MSA	1982	1985	1990	1995	2000
Abilene	247	270	320	390	460
Amarillo	349	360	400	450	500
Austin	746	770	940	1,140	1,380
Beaumont/Port Arthur	319	380	440	500	580
Brazoria	317	320	340	370	410
Brownsville/Harlingen	431	470	570	680	760
Bryan/College Station	130	130	160	180	220
Corpus Christi	394	410	470	540	620
Dallas	3,188	3,640	4,600	5,640	6,830
El Paso	396	440	510	590	690
Fort Worth/Arlington	1,796	1,930	2,260	2,640	3,390
Galveston/Texas City	226	260	310	360	420
Houston	3,519	3,910	4,790	5,820	7,050
Killeen/Temple	166	170	190	210	230
Laredo	93	100	130	160	190
Longview/Marshall	234	240	290	350	420
Lubbock	320	330	370	410	450
McAllen	403	440	510	590	690
Midland	496	520	580	640	700
Odessa	361	370	420	460	510
San Angelo	201	210	220	230	250
San Antonio	1,062	1,280	1,500	1,790	2,030
Sherman/Denison	131	140	150	170	190
Texarkana	137	140	160	180	210
Tyler	155	160	200	240	280
Victoria	116	120	140	180	210
Waco	226	230	280	350	420
Wichita Falls	263	270	320	390	460
Subtotal	16,452	18,010	21,570	25,650	30,550
Non-MSA	6,009	6,300	7,330	8,650	10,150
State Total	22,461	24,310	28,900	34,300	40,700

GENERAL AVIATION FLIGHT HOURS

Total hours flown by general aviation aircraft peaked in 1979 for both the United States and Texas. Since that year the amount of flying time has been declining, even though the actual number of aircraft in use has been increasing. Presently in Texas the average number of hours flown per individual aircraft is slightly lower than the national average.

A top-down forecast was prepared, Table 9, based on a trend analysis of Texas against the United States. Over the forecast period aircraft utilization is expected to increase. However, the gains achieved are not expected to match previous highs. Still, by the turn of the century total annual aircraft utilization in this state will approach seven million flight hours.

Table 9 - General Aviation Flight Hours

Year	United States		Texas	
	Total	Hours/Aircraft	Total	Hours/Aircraft
Historical[3]				
1977	35,792,000	173	3,108,000	197
1978	39,409,000	173	3,397,000	192
1979	43,340,000	180	4,034,000	212
1980	41,016,000	165	3,842,000	188
1981	40,704,000	163	3,753,000	173
1982	36,457,000	148	3,266,000	145
Forecast				
1985	39,100,000[4]	---	3,524,000	145
1990	49,60,0000	---	4,806,000	166
1995	58,40,0000	---	5,880,000	171
2000	68,70,0000	---	7,028,000	173

GENERAL AVIATION OPERATIONS

Estimates of statewide general aviation operations are a function of forecasted flight hours. The data for developing this measure was obtained from the FAA-Civil Air Patrol report General Aviation Pilot and Aircraft Activity Survey, 1983 and FAA Aviation Forecasts Fiscal Years 1984-1995.

[3]FAA, Statistical Handbook of Aviation, respective years.

[4]FAA, Aviation Forecasts - Fiscal Years 1984-1985.

The survey reported information at the aircraft category level (re: single-engine piston, 1-3 place; single engine piston, +4 place; multi-engine piston; etc). The results provided general characteristics of individual flights, by aircraft type, for local and itinerant operations. Major characteristics used in this analyses include the following:

Aircraft	Flight Distribution	Flight Hour Distribution		Operations Per Flight Hour	
		Local	Itinerant	Local	Itinerant
Piston					
- single 1-3 place	22.0%	69.2%	30.8%	5.6	1.6
- single +4 place	43.0%	39.3%	60.7%	4.8	1.7
- multi	15.7%	17.7%	60.7%	4.6	1.6
Turbine					
- prop	6.7%	7.3%	92.8%	3.8	3.5
- jet	4.7%	2.9%	97.1%	9.8	2.1
Rotorcraft					
- piston	1.5%	70.6%	29.4%	4.6	2.1
- turbine	6.4%	51.0%	49.0%	3.0	1.5

Total flight hours, forecasted previously, were disaggregated by aircraft category on the basis of flight distribution identified above. The flight characteristics were then employed to calculate the following forecast of state general aviation operations.

Year	Texas Operations
1985	10,918,000
1990	14,850,000
1995	18,176,000
2000	21,811,000

By the year 2000 total general aviation operations conducted in Texas should surpass twenty million. Activity per aircraft will average about 500 operations statewide. Variations will occur depending on locality with

higher activity levels expected for aircraft based in the state's metropolitan areas.

PILOTS

Recent trends in the pilot ranks reflect what is occurring in new aircraft sales -- a general decline. Since 1980 the Texas pilot population has been declining at an annual rate of nearly three percent and nationwide the figure is higher still. The drop is directly related to the high costs of flying being experienced today.

The current trend is expected to stabilize over the next few years. An early indicator of this possibility is a reported increase in student starts for the first quarter 1984 compared to 1983. However, real growth in Texas is not anticipated until sometime after 1985. The state could realize more than eight percent of the total pilot population. Presented in Table 10, by the end of this century more than 90,000 pilots will reside in Texas.

Table 10 - Pilot Population

Year	United States	Texas
Historical[5]		
1977	783,932	56,516
1978	798,833	58,188
1979	814,667	61,044
1980	827,071	63,289
1981	764,182	60,184
1982	733,255	59,851
Forecast		
1985	761,200[6]	59,000
1990	880,700	70,000
1995	990,600	81,000
2000	1,110,500	93,000

FUEL CONSUMPTION

Turbine fuel consumed in Texas jumped 51.8 percent between 1981 and 1982. Another 10.6% increase occurred in 1983. That year the 1.4 billion gallon Texas market amounted to nearly 15 percent of the estimated turbine fuel consumed by United States domestic civil aviation. The tremendous rise in Texas is largely unexplained, however, not withstanding a breakthrough in aircraft fuel efficiency, state consumption should remain near 15 percent of the United States market.

[5] FAA, Statistical Handbook of Aviation, respective years.

[6] FAA, Aviation Forecasts - Fiscal Years 1984-1995.

Significant declines in aviation gasoline (AVGAS) consumption have been sustained nationwide reflecting decreased aircraft flying time. Starting in 1981 the Texas market for AVGAS dropped 34 percent to less than 30 million gallons. However, because the decline is being experienced across the nation Texas has been able to maintain about a nine to ten percent share of the national market. Again, unless there is some technological innovation this trend should continue.

The Texas fuel consumption forecast is presented in Table 11. All GA fuels consumed are dependent on the materialization of additional aircraft and flying time. The commercial airline market will be driven by passenger enplanements and the need to schedule more flights to meet new demands. It should be noted that the historical series are estimates only. Also, consumption of AVGAS by commercial airline serving Texas is negligible.

Table 11 - Texas Aviation Fuel Consumption (gallons)

Year	General Aviation AVGAS	General Aviation Turbine	Commercial Turbine	Total
Historical[7]				
1980	40,891,000	46,573,000	808,399,000	895,853,000
1981	42,925,000	46,084,000	810,170,000	899,179,000
1982	35,103,000	49,758,000	1,250,087,000	1,344,948,000
1983	28,192,000	54,655,000	1,383,490,000	1,466,337,000
Forecast				
1985	37,210,000	58,520,000	1,444,770,000	1,540,500,000
1990	50,230,000	82,220,000	1,587,750,000	1,720,200,000
1995	60,410,000	104,130,000	1,751,860,000	1,916,400,000
2000	71,150,000	128,130,000	1,908,320,000	2,107,600,000

[7]Ethyl Corporation, Yearly Report of Gasoline Fuel Sales by State, 1983.