

AVIATION DEMAND FORECASTS



Chapter Two

AVIATION DEMAND FORECASTS

The purpose of this chapter is to develop forecasts that define future aviation demands for a proposed airport in Benson. These forecasts will serve as the basis for planning the aviation facilities required to meet the aviation needs of the Benson area over the next twenty years.

The primary objective of any forecasting effort is to define the magnitude of change over time. Because of the cyclical nature of the economy it is virtually impossible to predict exactly the aviation activity on a year-by-year basis over an extended period of time. It is possible, however, to establish a growth curve to predict the long term growth potential. While a single line is often used to express the anticipated growth it is important to remember that actual growth may fluctuate within a range both below and above this line. The primary point to remember is that forecasts serve only as guidelines and planning must remain flexible.

Aviation activity is affected by many external influences, as well as by the aircraft and facilities available. Few industries have experienced as dynamic a change as the aviation industry since the first powered flight. Major technological breakthroughs as well as regulatory and economic actions have resulted in erratic growth patterns and have had significant impacts upon activity at most airports.

FORECASTING METHODOLOGY

The development of aviation demand forecasts proceeds through two distinct phases or processes - the analytical and the judgmental. A series of mathematical relationships are tested to establish statistical logic and rationale for projected growth. The judgement of the forecaster based upon professional experience and knowledge of the

situation is important to the final subjective determination of the preferred forecast. The assessment of historic trends requires the collection of data on aviation indicators at both the local and national level. Among these are purely aviation-related factors such as historical operations and based aircraft, as well as more general socioeconomic indicators relating to population, employment, and income. Since historical aviation data (aircraft operations and based aircraft) pertaining to the Benson area are limited, a greater reliance will be placed on the relationships of these various indicators to county and regional aviation factors. This analysis will provide the initial step in the development of realistic forecasts of aviation demand in the Benson area.

As part of the analytical process, past trends in the various regional and county aviation demand elements are extended into the future by a variety of techniques, and with a variety of assumptions. Trend lines developed through the use of various analytical procedures are called projections. After preparing a number of such projections, the analyst is able to identify a range of growth within which the true trend will probably be located.

At the second stage of demand forecasting, a number of intangible factors are considered. These factors include potential changes in the business climate, pertinent state of the art advances in aviation, the impact of new facilities on growth, and the planning policies and objectives of the airport owner.

Facility and financial planning usually require at least a ten year preview. Even though thorough analysis and professional judgment is utilized in forecasting, one cannot always assume a high level of confidence in forecast values that extend beyond a five year period. It is important to use forecast values which do not result in overestimates of revenue generating capabilities or underestimates of facilities needed to meet public (user) needs.

For instance, should a forecast prove conservative, enough flexibility should be provided in the plan so that facilities do not become greatly overcrowded within the planning period. On the other hand, should a forecast prove to be overly optimistic, facilities should not become an economic burden to the airport because of revenue shortfalls. Year-to-year variations from the preferred forecast should be expected. Long-term commitments (such as revenue bonding) should not be made on short-term upturns in activity when historical activity generally indicates these cycles are moderated by subsequent declines in activity.

Technological advances in aviation can substantially alter the growth rates in aviation demand. The most obvious example is the impact of jet aircraft on the aviation industry, which resulted in a growth rate that far exceeded expectations. Such changes are difficult, if not impossible to predict, and there is simply no mathematical way to estimate their impacts.

The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include: trend line projection, correlation/regression analysis, and market share analysis.

Trend line projection is probably the simplest and most familiar of forecasting techniques. By fitting classical growth curves to historical demand data, then extending them into the future, a trend line projection is produced. A basic assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past. As broad as this assumption may be, the trend line projection does serve as a reliable benchmark for comparing other projections.

Correlation analysis provides a measure of the direct relationship between two separate sets of historic data. Should there be a

reasonable correlation between the data sets, further evaluation using regression analysis may be employed.

In **regression analysis**, values for the aviation demand element in question, the **dependent variable**, are projected on the basis of one or more of the other indicators, the **independent variables**. Historical values for all variables are analyzed to determine the relationship between the independent and dependent variables. These relationships may be used, with projected values of the independent variable(s), to project corresponding values of the dependent variable.

Market share analysis involves a historical review of the activity at an airport or airport system as a percentage share of a larger statewide or national aviation market. Trend analysis of this historical share of the market is followed by projecting it into the future. These shares are then multiplied by forecasts of the activity within the larger geographical area to produce a market share projection. This method has the same limitation as a trend line projection and can provide a useful check on the validity of other forecasting techniques.

DEFINITION OF SERVICE AREA

The initial step in determining aviation demand is to define the geographic area served by the airport. The airport service area is determined primarily by evaluating the location of competing airports, their capabilities and services, and their relative attractiveness and convenience. With this information, estimates can be made regarding the amount of aviation demand likely to be accommodated by an airport. It should be recognized that aviation demand does not necessarily conform to political or geographical boundaries.

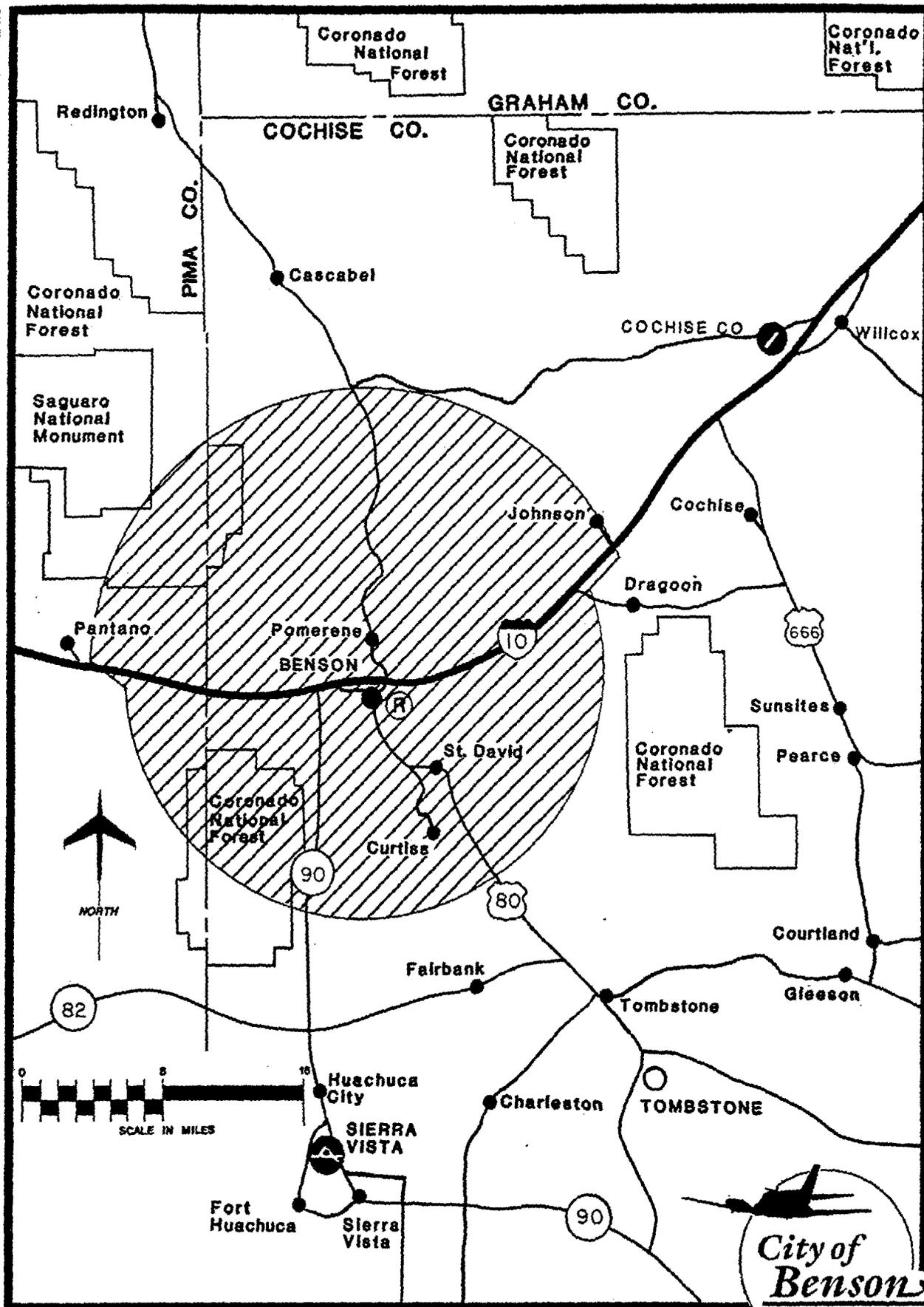
In determining the aviation demand for an airport it is necessary to identify the role of that airport. The primary role of the proposed Benson Municipal Airport has been to serve the general aviation aircraft in the City of Benson and the Benson area, including the communities of Pomerene, St. David, Mescal, Pantano and Curtis. The population in this service area also has access to Cochise County Airport in Willcox, Sierra Vista Municipal Airport in Sierra Vista and Tucson International Airport in Tucson.

The Benson area and highway system is fairly well developed with I-10 providing a major access route through the airport search area. The existence of I-10 provides the opportunity for excellent access and reasonable travel times for many potential airport sites within the designated search area.

The airport service area, **Exhibit 2A**, depicts an area where there is a potential market for airport services. The Service Area, a radius of approximately 15 miles from the center of Benson, does not extend as far to the south as it does to the west and east due to Benson's proximity to Sierra Vista Municipal Airport. As in any business venture, the more attractive the facility, in services and capabilities, the more competitive it will be in the market. If the attractiveness increases in relation to nearby airports, so will the service area.

If facilities are adequate and rates and fees are competitive at the proposed Benson Municipal Airport, some level of general aviation traffic will be attracted to Benson from the Tucson and Sierra Vista airports. Tucson International Airport currently serves the majority of the commercial passengers from the Benson Area. This trend is likely to continue through the planning period. The following section will examine the factors affecting aviation demand.

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City of Benson

Exhibit 2A
SERVICE AREA

SOCIOECONOMIC VARIABLES

Local socioeconomic variables provide a strong indication of the community's potential for supporting growth in general aviation activity. The variables considered most applicable to projecting aircraft activity are population and economic trends, including employment and per capita personal income. The following discussion will outline the current and projected socioeconomic trends that play a role in the forecasting of aviation factors.

POPULATION

Many aviation factors such as based aircraft, aviation demand, passengers, etc., are influenced by population statistics. For this reason, the historical demographics of not only the City of Benson but the Benson service area, County and State will be examined and used in projecting aviation factors for the proposed Benson Municipal Airport. Examination of the historical population counts and estimates indicates that Benson's annual compounded percentage change in population was roughly the same as that of the County from 1960 to 1980. After 1980, Benson's population growth rate began to slow somewhat and in 1983, 1984 and 1985, the estimates showed a drop in population. The annual compounded percentage change in population for Benson for the period of 1980 to 1985 was a negative 2.3 percent. The dip in population for the City of Benson in 1983 was a direct result of the closing of Johnson Mine. Several hundred people working at the Johnson Mine lost their jobs in that closure. According to City officials, major suppliers to the Johnson Mine were also impacted, resulting in job cutbacks at the Apache Powder Plant and Sulphur Springs Valley Electric Cooperative.

Since 1985, population estimates have been indicating growth in population, and projections predict that the City of Benson population will be 6,229 by the year 2010.

As depicted in Table 2A, the estimated population of the incorporated City of Benson for 1989 is 3,945 people, compared with 2,494 for 1960, 2,839 for 1970, and 4,190 for 1980.

Determination of the approximate population of the proposed airport service area was accomplished through the analysis of population figures and geographic boundaries of the Benson County Census Division (CCD). The outlying population in the Service Area closely approximates the Benson CCD. The population estimate for the Benson CCD for 1989 is 11,378, which includes the City of Benson and the communities of Pomerene, Dagoon and Saint David. In 1980, this CCD had an estimated population of 9,459, and in 1988, an estimated population of 11,205.

During the period 1980-1985, Cochise County continued to gain in population, however, the annual compounded percentage change reflected a much slower rate than that of previous years. Benson's population for 1989 is approximately 3.8 percent of the Cochise County total, and the Benson CCD is roughly 11 percent.

The population statistics for the State of Arizona depict the expansion in the State's population due to migration from other States, which began in the late 1970's and has continued to date. Recently, the rate of growth has begun to decline but the State's growth rate is still higher than the national average.

TABLE 2A
Historical Population Statistics
Benson Municipal Airport

<u>Year</u>	<u>State of Arizona</u>	<u>Cochise County</u>	<u>Benson CCD¹</u>	<u>Benson</u>	<u>Annual Compounded Percentage Change</u>	
					<u>Benson</u>	<u>Cochise County</u>
1960	1,301,161	55,100 ²	NA	2,494 ²	NA	NA
1970	1,775,400	62,800 ²	NA	2,839 ²	+1.3	+1.3
1980	2,716,633	85,686 ³	9,459 ⁴	4,190 ³	+3.7	+3.2
1985	3,160,600	92,900 ³	NA	3,725 ³	-2.3	+1.6
1987	3,469,000	99,300 ³	NA	3,810 ³	+1.1	+3.4
1989	3,619,800	103,074 ⁴	11,378 ⁴	3,945 ⁴	+1.8	+1.9

NA = Not Available

¹ Benson Census County Division = Service Area

² Source: Bureau of the Census, U.S. Department of Commerce

³ Source: Arizona Department of Economic Security, 1989

⁴ Source: Southeast Arizona Governments Organization, (SEAGO), 1989

A review of population forecasts is also necessary in the development of aviation forecasts. The Southeast Arizona Association of Governments (SEAGO) provides population statistics for Benson and Cochise County. Ultimately, projections made by SEAGO are reviewed and approved by the Arizona Department of Economic Security (DES). Table 2B provides the available population projections for the area. Those

projections with a SEAGO source, have not yet been approved by DES. The projections provided in Table 2B were used in the forecasting analysis whenever population was used as the independent variable in regression analysis. Four population segments that could influence aviation forecasts were reviewed: Arizona, Cochise County, Benson and the Service Area (Benson CCD).

TABLE 2B
Population Projections
Benson Municipal Airport

<u>Year</u>	<u>State Arizona²</u>	<u>Cochise County²</u>	<u>Benson CCD¹</u>	<u>Benson¹</u>	<u>Benson²</u>
1990	3,714,300	105,200	11,619	4,135	4,029
1995	4,209,900	118,400	13,069	4,535	4,532
2000	4,800,700	134,200	14,814	4,935	5,136
2010	5,940,300	162,800	17,966	5,735	6,229

¹ Source: SEAGO, 1989 Benson CCD = Service Area

² Source: Arizona Department of Economic Security. Arizona and Cochise Forecasts as of June 1989. Benson Forecast as of April 1988.

ECONOMIC TRENDS

Economic trends in the United States are positive. Average personal income in the country, an important economic indicator, has been rising and is projected to grow at a compounded rate in excess of three percent during the planning period. Although the most recent economic indicators appear to indicate a slowdown in economic growth, it appears the national growth will continue to keep pace with the inflation rate.

The economic indicators within the State of Arizona have been following the national trends, however, the differences are more dramatic. The Gross State Product (GSP) for Arizona during the period 1982-1986 was more than double the Gross National Product (GNP) in terms of growth. However, in the most recent economic slowdown, 1987-1988, Arizona's GSP has been less than the GNP.

The elements that make up the GSP are Finance, Insurance and Real Estate; Transportation, Communications and Public Utilities; Trade; Government; Agriculture; Mining; Construction; Services; and Manufacturing. The Services industry has recently captured first place as the sector contributing the most to the State's GSP (18.3 percent), surpassing the Finance, Insurance and Real Estate (FIRE) sector which has dominated the state's GSP in most recent history. For the second consecutive year, Transportation, Communications and Public Utilities (TCPU) and Manufacturing were the state's fastest growing industries. Services is the only other industry to have grown in each year since 1982. These four industries (FIRE, TCPU, Services and Manufacturing) account for more than two-thirds of the State's GSP. The Construction

industry and FIRE (specifically, the Finance and Real Estate sectors) are the industries most prominent in the State's economic downturn and the outlook for any immediate improvement is not on the horizon. If the State follows its historical trend, an economic recovery will begin in 1992, according to an Arizona State University publication entitled **Arizona Business**, January 1989.

In the past, the economies of both Cochise and Pima Counties have had an influence on the economy of the Benson area. It is anticipated that these two counties will continue to influence the Benson area economy in the future as well. A review of the industrial economy of these two counties along with a comparison with Benson's economy may provide some insight on the possible direction of the Benson economy in the future.

Employment

Table 2C illustrates the percentage of employment within the industrial sectors of each economic unit. It is apparent that Benson is more closely aligned with employment percentages of the State and Pima County in the Manufacturing, Construction, Trade, Services and Government sectors when compared to Cochise County employment. Two of these industries, Services and Manufacturing, posted positive growth rates during the recent economic downturn, and Services has been a consistent growth industry since 1982. The fact that nearly a third of Benson's employment is within this industrial sector means that the future trend of the Services industry is important to the region's economy.

TABLE 2C**County-State Economic Comparisons of Employment - 1989****Benson Municipal Airport****Percentage of Employment**

<u>Descriptor</u>	<u>Arizona</u>	<u>Pima County</u>	<u>Cochise County</u>	<u>Benson</u>
Manufacturing	13.5	9.2	4.8	11.4
Mining	.8	.6	.5	5.4
Construction	6.7	5.0	3.4	5.9
TCPU	5.2	24.3	5.8	9.3
Trade	24.6	18.1	23.1	22.4
FIRE	6.6	3.7	2.7	1.7
Services	25.6	21.8	18.9	31.2
Government	17.0	17.3	40.8	13.4
Unemployment Rate	6.3	5.1	7.8	7.2

FIRE = Finance, Insurance, Real Estate

TCPU = Transportation, Communications, Power, Utilities

Source: Labor Market Information Newsletter, Arizona DES, March 1989
Arizona Department of Commerce, March 1989, Industrial Profile of Benson

Most of Arizona's economists predict a continued slowdown in the next two years with a small recovery beginning in 1991-1992.

After nearly three years of decline, it is possible that the Construction industry will show signs of a modest climb in the 1991 timeframe which will be generated by the single-family home market rather than the commercial building market, which is not expected to recover by this time. Real Estate and Finance, the sectors receiving the most impact from the 1980 real estate boom should see a modest recovery begin in 1990, but the influence will be more statistical (0.1 percent growth rate in 1990) than substantive. Manufacturing (1.3 percent growth rate in 1990) may be an important factor to the State's economic recovery in the 1990's as well as the anticipated continued growth in the Service sector (3.0-4.0 percent growth rate in 1990). These last two industries alone

should boost confidence in the ability of both Pima County and Benson to reap the benefits of a positive growth rate in these two industries in particular.

In the Trade sector, a modest growth rate (2.5 percent growth rate in 1990) reflects the influence of employment and population growth on this sector of the economy. Population is expected to increase at about 2.5 to 3.0 times the national average. Although this is not the kind of growth that fueled the economy of the State in the early 1980's, this growth rate will be more easily sustained and allow the infrastructure to catch up with the tremendous growth experienced in the mid-1980's.

Another advantage in the economic upturn will be the influence of increased mining activity expected to continue throughout the 1990's. Those communities with a significant

amount of employment in the mining industry (5.4 percent in Benson) should be encouraged by the relatively stable copper prices and the expansion plans of several mining companies. Tourism will also continue to grow at a rate well above the State's average annual growth rate and contribute to, rather than subtract from, the Benson economy. Personal Income will continue to expand by approximately 2.0 percent in 1989-90, a growth rate that appears sustainable even if some of the forecasts are prematurely optimistic.

Although not illustrated as a major employment sector, Tourism is a major source of income to the State. Visitors to national parks, monuments and historic sites in Arizona have risen at an average of approximately 10 percent per year from 1983 to 1987 (the latest data available) with nearly 10.6 million visitors to these areas in 1987.

Kartchner Caverns State Park, located about 8 miles south of I-10, is expected to become a major attraction in Southeast Arizona. With projected tourism estimated at 100,000 annually in the first ten years and perhaps as much as 200,000 in the second half of the planning period. It is anticipated that an airport in the Benson area would attract a portion of the tourists who travel by air to this attraction. As an example, approximately 7 percent of the visitors to Grand Canyon National Park travel by air. This percentage has been as high as 18 percent in the past and recent tabulations of visitors to the park appear to indicate a trend toward higher percentages in the future.

Personal Income

Personal Income in the County has risen every year since 1969, growing at approximately 23 percent on an average annual basis during the period 1969-1987. This dramatic growth has not been sustained in the more recent history. For the past five

years, personal income in the county has grown at an average annual rate of 8.4 percent, ranking it sixth highest in total personal income in the state. Per Capita income in Cochise County has not grown as fast as total personal income, rising at an average annual rate of 12.3 percent from 1969-87 and nearly 6 percent in the past five years. Per Capita Income in Cochise County ranked 9th in the state in 1987, at nearly 74 percent of the state average (\$14,310) and approximately 68 percent of the national average (\$15,484). Table 2D provides a historical and projected personal and per capita income statistics for Cochise County.

TABLE 2D
Historical & Projected
Personal/Per Capita Income
Cochise County

<u>Total</u> <u>Historic</u> ¹	<u>Personal</u> <u>Income</u>	<u>Per Capita</u> <u>Income</u>
1970	\$214,362,000	\$3,419
1975	362,255,000	4,709
1980	605,754,000	7,015
1985	906,064,000	9,693
1987	1,036,865,000	10,566
<u>Projected</u> ²		
1990	\$1,107,495,000	11,392
1995	1,341,872,000	13,487
2000	1,576,248,000	15,582
2010	2,045,002,000	19,772

¹ Source: U.S. Bureau of Economic Analysis, April 1989

² Projections based on a historical growth rate of 3.11 (personal income) 2.8 (Per Capita Income.)

Summary

The economic forecasts reviewed in the previous paragraphs were used to predict the growth in several economic indicators that will be used to analyze and project aviation factors. The economic forecasts predict a short range annual growth rate of 2.0 - 3.0 percent, 1990-1995, and a more optimistic 4.0 percent annual growth rate in the mid-term (1996-2000). During the latter half of the planning period, 2001-2010, it is anticipated that another slight downturn in the economy will occur followed by a steady modest growth (3.0 percent annually throughout the period). One must be cautious about forecasts that extend beyond five years. External factors, that the country, state, county, and city have little ability to control, can alter economic conditions. The world economic climate is relatively stable and in much better economic condition than in the past.

GENERAL AVIATION DEMAND

BASED AIRCRAFT

The number of based aircraft is an important basic indicator of general aviation demand. By first developing a forecast of based aircraft, the affect of this aviation factor on other aviation growth indicators can be projected. A review of the current trends in general aviation is necessary to provide a background for the analysis to follow.

Evaluation Of Current Trends

There are some significant changes taking place within the general aviation industry. The data which follows was extracted from the **FAA Aviation Forecasts, Fiscal Years 1988-2000**.

Shipments of general aviation aircraft have declined continuously over the past ten years.

The number of people employed in the workforce producing piston-engined aircraft have also been reduced. The larger aircraft manufacturers have shifted their emphasis to turbine powered aircraft. As might be expected, aircraft sales have declined as aircraft prices have risen. There are fewer student and private pilots nationally with the former declining from 210,000 to 150,273 in 1987 while the latter fell from 343,276 to 300,949 in 1988. Ultimately, these declines will slow the rate of growth in the general aviation industry.

The socioeconomic and general aviation trends appear to be going in opposite directions, a change in the historical relationship between these two components. The active general aviation fleet is forecast to continue to decline through the end of 1992, remain constant in 1993 and then grow slowly until the end of the year 2000. Active single engine piston aircraft are expected to decline at an annual rate of 0.4 percent. Multi-engine aircraft will decline through 1993 and then increase at about 100 aircraft a year until reaching the present level of 23,400. However, turbine powered aircraft are projected to increase at the rate of 4.0 percent per year. Turbine powered rotorcraft are anticipated to grow at an average annual rate of 4.2 percent.

As described in the following paragraphs, these economic trends were compared with the trends locally and statewide. Whenever possible, these projections were compared with statistical forecasts made by Federal, State and other agencies.

Projections Of Registered Aircraft

The number of general aviation aircraft that would be based at the airport is primarily dependent upon the nature and magnitude of aircraft ownership in the area and on ownership trends in the nation. Therefore,

preparation of the based aircraft forecast was initiated with a review of historical general aviation aircraft ownership trends. This analysis concentrated on registered aircraft ownership in Cochise County, the State of Arizona and the United States. Although

several years of historical data on registered aircraft were reviewed for the State and County, historical information available on the existing Benson Airport was more limited. Table 2E depicts aircraft registration figures for the years 1980 to 1989.

TABLE 2E
Aircraft Registrations
Benson Municipal Airport

<u>Year</u>	<u>U.S. Active¹</u> <u>General</u> <u>Aviation</u>	<u>Cochise</u> <u>Arizona²</u> <u>Registered</u> <u>Aircraft</u>	<u>County³</u> <u>Registered</u> <u>Aircraft</u>	<u>Based</u> <u>Aircraft</u> <u>Benson</u>
1980	210,300	5,832	183	6 ⁴
1981	211,000	5,863	199	NA
1982	213,300	5,874	208	NA
1983	209,700	6,025	211	NA
1984	213,300	6,158	213	NA
1985	220,900	6,182	215	8 ⁵
1986	210,700	6,235	198	NA
1987	220,000	5,749	200	NA
1988	217,200	5,967	207	5 ⁶
1989	NA	NA	209	5 ⁶

¹ FAA Aviation Forecasts 1988-2000

² Arizona Department of Transportation (ADOT) Aeronautics Division

³ U.S. Census of Registered Aircraft - 1980-1989

⁴ Cochise County Airport Systems Plan

⁵ FAA Form 5010

⁶ Existing Benson Airport

Historical data indicates that the State's registered aircraft steadily increased from 1980 to 1986. In 1987, the number declined significantly, partly caused by an out-migration of helicopters. A reversal in this trend is indicated in 1988 as nearly 40 percent of the

loss in registered aircraft has been recovered. Cochise County's registered aircraft has been consistent, rising steadily throughout the period with the exception of 1986. Cochise County's registered aircraft owners are depicted in Table 2F.

TABLE 2F
Registered Aircraft Owners
Cochise County 1988
Benson Municipal Airport

<u>City/Town</u>	<u>Number of Registered Aircraft</u>
<u>Service Area</u>	
Benson	8
Pomerene	0
Dragoon	1
St. David	1
Curtiss	0
Mescal	0
Subtotal	10
<u>Other</u>	
Amado	1
Bisbee	20
Bowie	3
Cochise	1
Douglas	61
El Prida	2
Ft. Huachuca	4
Hereford	11
Huachuca City	5
McNeal	5
Pearce	4
San Simon	8
Sierra Vista	34
Tombstone	7
Willcox	22
Subtotal	188
Total	198

Please note that a registered aircraft owner may reside in one location and base his aircraft in another. For instance, there are eight registered owners in Benson, however, only five aircraft are located on the Benson Airport.

Pima County's registered aircraft trend line was very similar to that of Cochise County, experiencing a downturn in 1986 and a recovery the next year. The rate of growth in Pima County's registered aircraft, however, has been nearly three times that of Cochise County. Conclusions based upon statistical trend analyses utilizing historical based aircraft and/or operational activity from the existing Benson Airport must be made cautiously.

Forecasting Techniques

Linear Regressions

The use of linear regression analysis technique in the projection of future based aircraft at the proposed Benson Municipal Airport was limited to projections of county registered aircraft. The lack of any definitive historical data for the existing airport and the possibility that the airport may be located at a new site required the use of different forecasting techniques.

The linear regression forecast technique was used to determine the future registered aircraft in Cochise County and Pima County. Linear Regression forecasts of the number of registered aircraft in Cochise County were based upon on the personal income and per capita income statistics for Cochise County from 1969 to 1987. These projections were then used in combination with other forecasting methods to analyze the based aircraft potential of the Benson area.

Market Share

Market share analysis was one of the methods used to project the number of based aircraft at the proposed Benson Municipal Airport. Market shares were analyzed for four markets: the U.S. Active General Aviation fleet; the State's registered aircraft; Cochise County's registered aircraft; and Pima

County's registered aircraft. Based on the analysis of these four markets, four market share scenarios were analyzed, each using the 1988/1989 period as the base year.

Market Share Scenario 1 was derived from a static share based upon the existing share of the market in 1988/1989. Market Share Scenario 2 was based upon a four percent average annual growth in market share every five years throughout the planning period.

Scenario 3 addresses a market share that was based on a 10% increase the first five years, with increases for the subsequent five-year periods of 8%, 6% and 4% respectively. Market Share Scenario 4 addresses a very optimistic growth of 10 percent in the share of the market every five years throughout the planning period. Each of these scenarios produced a high and low range of potential based aircraft at the proposed Benson Municipal Airport, indicated in Table 2G.

TABLE 2G
Market Share Projections Of Based Aircraft
Benson Municipal Airport

<u>Year</u>	<u>Scenario 1</u>		<u>Scenario 2</u>		<u>Scenario 3</u>		<u>Scenario 4</u>	
	<u>High</u>	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>	<u>Low</u>
1990	10	8	10	8	11	8	11	8
1995	12	8	13	8	14	9	15	9
2000	14	8	16	9	16	9	19	10
2010	19	8	23	10	23	10	31	13

Based Aircraft Per Population

Another forecasting technique was based upon the ratio of based aircraft to population. In this technique, the ratio of based aircraft per 10,000 population is applied to population forecasts for the demographic area. Three of the previously discussed population bases were analyzed: the State, County and service area (Benson CCD).

The number of based aircraft per 10,000 population rate had been rising steadily in the state until the 1979-1983 period, when this ratio began to decline. However, the projected rate for future registered aircraft numbers forecast in the 1988 SASP indicates that this recent trend will reverse itself and

again increase the ratio of based aircraft per 10,000 population.

A number of scenarios for several different based aircraft per 10,000 population growth rates were analyzed for each demographic area, and three were selected for comparison. The first scenario was based on the rate of based aircraft per 10,000 population similar to that used in the 1988 SASP. The second scenario increased the rate by 10, 8, 6, and 4 percent for each of the five year forecasting periods. The third scenario was based upon an optimistic increase of 10 percent in each of the five year planning periods. The based aircraft forecasts for the Benson area tabulated for each of these forecast scenarios are illustrated in Table 2H.

TABLE 2H
Based Aircraft Projections - Per 10,000 population
Benson Municipal Airport

Based Aircraft per 10,000 Population

Year	1988 SASP Growth Rate			10,8,6,4 % Growth Rate			10% Growth Rate		
	Arizona	Cochise County	Benson CCD	Arizona	Cochise County	Benson CCD	Arizona	Cochise County	CCD
1990	8	8	8	9	9	9	9	9	9
1995	9	9	9	11	11	11	11	11	11
2000	11	11	10	14	13	13	14	14	14
2010	13	13	13	18	17	17	22	21	20

Other Forecasts

Forecasts for the nation's registered aircraft were obtained from FAA Aviation Forecasts, 1988-2000; the 1988 SASP and the 1985 Pima Regional Aviation System Plan (Pima RASP) were the source of forecasts for State and County based aircraft. The Cochise County Airport System Study - 1982, was the only available source of forecasts for the Benson area.

as the airport's proximity to other general aviation airports and the potential for competition also will influence the number of based aircraft. With continued growth of aviation in Pima County, it is anticipated that some general aviation aircraft will migrate to the Benson Municipal Airport in order to avoid the higher density traffic in the Tucson area.

The forecasts of based aircraft at Benson are illustrated graphically in Exhibit 2B.

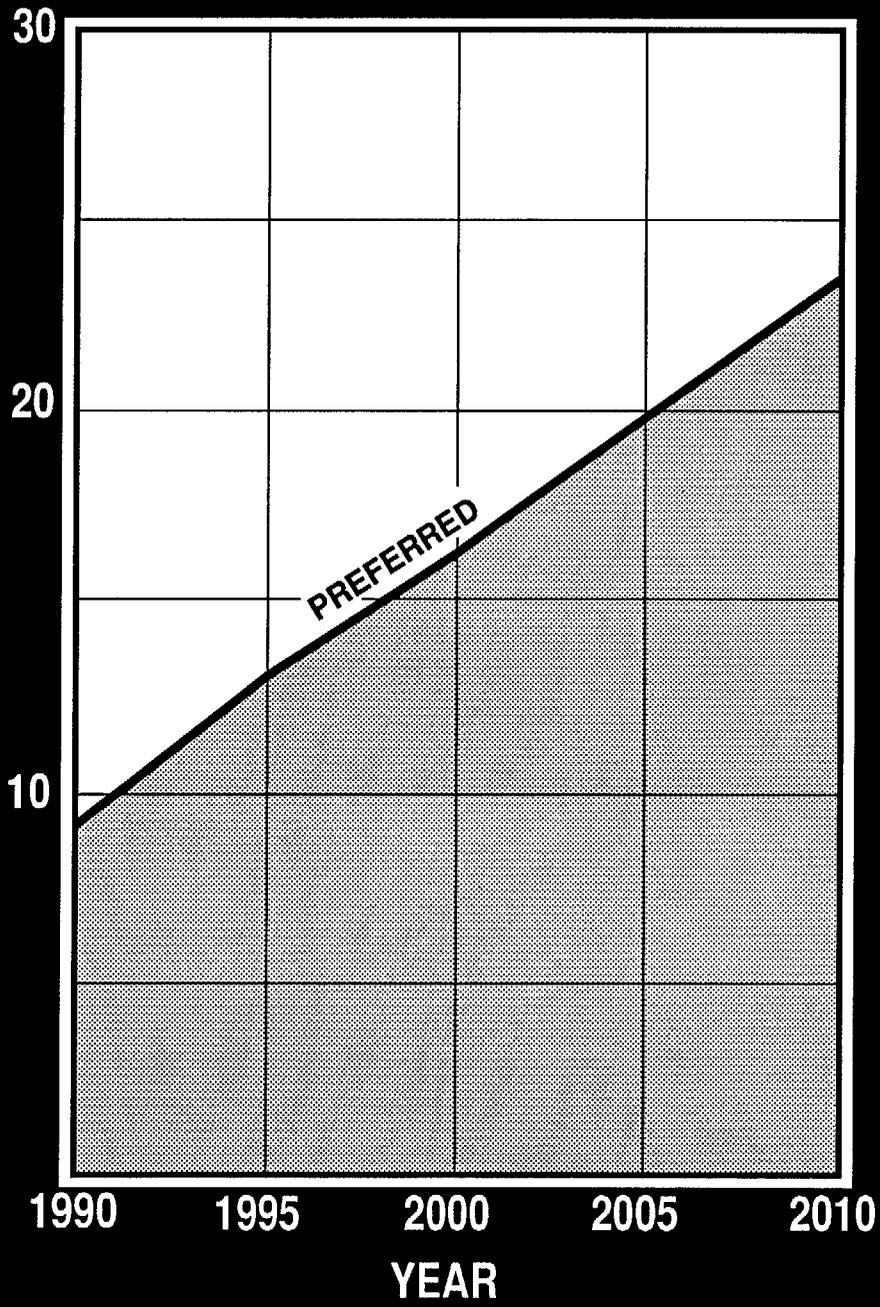
Preferred Forecast

The preferred forecast for the Benson area is illustrated in Table 2I. This forecast represents a somewhat higher prediction than midpoint between the high and low range forecast, a prediction justified by the historical economic growth in the County and adjacent area. The influence that a new airport has on early airport activity also plays an important role in the projections, especially influencing the first seven years of based aircraft growth. New facilities will be an inducement to aircraft owners to base at the new airport. On the other hand, factors such

TABLE 2I
Based Aircraft - Preferred Projection
Benson Municipal Airport

<u>Year</u>	<u>Based Aircraft</u>
1990	9
1995	13
2000	16
2010	23

BASED AIRCRAFT



AIRCRAFT FLEET MIX

The aircraft fleet mix expected to use the airport must be known in order to properly size future airport facilities. The existing based aircraft fleet mix at the proposed Benson Municipal Airport is made up primarily of single engine aircraft. The overall trend in general aviation is toward a slightly higher percentage of larger, more sophisticated aircraft. A similar trend can be expected to occur at the proposed Benson Municipal Airport.

The FAA Aviation Activity Forecasts, 1988-2000, projects a declining ratio of single engine aircraft to total aircraft throughout the planning period. The rate of decline varies annually, but the trend is downward. The predicted decline for multi-engine piston

aircraft is much smaller, declining from 15 percent in 1988 to 13 percent in 2000. The aircraft categories that are increasing in numbers are the turbine powered aircraft: turbopropeller and turbojet aircraft, turbojet helicopter, and the "Other" category (which includes balloons, ultra lights, etc.).

As the Benson community grows, it will continue to attract more industry and the probability of sophisticated corporate aircraft (such as twin engine piston, turboprop, and turbojet aircraft) will increase. Helicopters are not anticipated to become a significant part of the aircraft mix since this type of aircraft is more closely identified with large metropolitan areas.

Table 2J shows the aircraft mix forecasts for proposed Benson Airport.

TABLE 2J
Projected Fleet Mix
Benson Municipal Airport

<u>Year</u>	<u>Total</u>	<u>Piston</u>		<u>Turbo Prop</u>	<u>Turbo Jet</u>	<u>Rotorcraft</u>
		<u>Single Engine</u>	<u>Twin Engine</u>			
1990	9	8	1	0	0	0
1995	13	11	2	0	0	0
2000	16	13	2	1	0	0
2010	23	18	2	1	1	1

AIRCRAFT OPERATIONS

An airport operation is defined as any takeoff or landing performed by an aircraft. There are two types of operations-local and itinerant. A local operation is a take off or landing performed by an aircraft that will operate within the local traffic pattern in site of the airport or will execute simulated approaches or touch-and-go operations. A touch-and-go operation refers to an aircraft

that lands then makes an immediate take-off without coming to a complete stop or exiting the runway. These operations are normally associated with training. Itinerant operations are all arrivals and departures other than local. Generally, local operations are comprised of training operations and itinerant operations are those aircraft with a specific destination away from the airport. Typically, itinerant operations increase with business and industry use since business aircraft are used

primarily to move people from one location to another.

Since the existing Benson Airport does not have an air traffic control tower, accurate operations data was not available. The one historical record available (1980) for the airport did not include a differentiation as to local versus itinerant operations. For this reason, a great deal of reliance is placed on the operational characteristics of other airports in the county for forecasting efforts.

Forecasting Techniques

Operations Per Based Aircraft Forecast
Traditionally, general aviation operations have had a close correlation to the number of based aircraft at an airport. Generally, an airport the size of Benson Municipal Airport can expect from 200 to 500 annual operations per based aircraft. However, in order to project future aircraft operations from the forecast of based aircraft, a more accurate picture of the existing operations at the current airport would be desirable. Since

this data was not available, county-based information was utilized in the analysis.

The 1988 SASP conducted an analysis of airports in Cochise County and projected operations-per-based-aircraft ratios from 3,056 (Cochise College Airport) to 192 (Bisbee Municipal Airport). Clearly, a wide disparity exists in operations-per-based aircraft between airports in Cochise County. If Cochise College Airport, a college that trains pilots and mechanics for the aviation industry, is excluded from the figures, an average operations-per-based aircraft for the remainder of the County would be 560. This ratio appears more logical for the Benson Municipal airport.

The Pima RASP analyzed both national and State aviation activity trends to produce projections of both high and low operational levels at airports in Pima County. The Pima RASP forecast a range of 550-650 operations per based aircraft in the County. Table 2K illustrates the projections of aviation operations at the proposed Benson Municipal Airport based upon varying rates of operations per based aircraft.

TABLE 2K
Aviation Operations Projections - Operations Per Based Aircraft
Benson Municipal Airport

<u>Year</u>	<u>Total Operations</u>			
	<u>Pima RASP</u> <u>Low Range</u>	<u>PIMA RASP</u> <u>High Range</u>	<u>1988 SASP</u> <u>Low Range</u>	<u>1988 SASP</u> <u>High Range</u>
1990	4,950	5,850	5,040	6,750
1995	7,150	8,450	7,280	9,750
2000	8,800	10,400	8,960	12,000
2010	12,650	14,950	12,880	17,250

Source: 1988 SASP
1985 PIMA RASP

Market Share Analysis

An analysis of projected levels of aviation operations at the proposed Benson Municipal Airport was conducted based upon a market share of operations anticipated in Cochise County. The 1988 SASP projected the annual operations at the public airports in Cochise County. In 1980, the Cochise County Aviation System Plan recorded a 2 percent share of the market for the Benson Airport.

The projected operations for Cochise County depicted in the 1988 SASP did not include the operations for smaller private and public airports in the County. For this reason, an adjustment was made in the projected operational levels by adding an additional 10 percent to the 1988 SASP projections. The market share analysis assumed the operational levels depicted in Table 2L.

In the first market share projection of operations at the proposed Benson Municipal Airport, it was assumed that this initial market share (2 percent) would be sustained throughout the planning period. The second market share projection (Scenario #1) assumed a growth in the market share from 2 percent to 4 percent by the end of the planning period. The last projection (Scenario #2) assumed a growth in the market share from 2 percent to 6 percent by the end of the planning period. All of these projections are illustrated in Table 2M.

TABLE 2L
Market Share Analysis
Operational Level Assumptions
Benson Municipal Airport

	Operations	
<u>Year</u>	<u>1988 Cochise Co.</u>	<u>Adjusted Cochise Co.</u>
1990	151,359	166,000
1995	176,166	193,800
2000	205,089	225,600
2010	278,143	306,000

TABLE 2M**Aviation Operations Projections - Market Share
Benson Municipal Airport****Cochise County Operations**

<u>Year</u>	<u>Cochise County Operations</u> ¹	<u>Market Share - 2 percent</u>	<u>Market Share - Scenario 1</u>	<u>Market Share - Scenario 2</u>
1990	166,500	3,330	3,600	3,600
1995	193,800	3,900	4,800	5,800
2000	225,600	4,500	6,800	9,000
2010	306,000	6,100	12,200	18,400

¹ Cochise County Projected Operations were obtained from the 1988 SASP and adjusted for public/private airports in Cochise County that were not included in SASP tabulations.

Preferred Forecast

The preferred forecast of operational levels projected for the proposed Benson Municipal are illustrated in Table 2N. The preferred

forecast takes into consideration the effect of two important factors: the influence of Kartchner Caverns tourism and the migration of general aviation aircraft from the Tucson area.

TABLE 2N**Aviation Operations Projections - Preferred Forecast
Benson Municipal Airport**

<u>Years</u>	<u>Low Range Forecast</u> ¹	<u>Kartchner High Range Forecast</u> ²	<u>Caverns Impact</u> ³	<u>Preferred Operations Forecast</u>
1990	4,900	3,600	1,500	7,000
1995	7,200	5,800	2,600	11,000
2000	8,800	9,000	4,000	16,000
2010	12,700	18,400	9,000	26,000

¹ Pima RASP Low Forecast Range

² Market Share - Scenario, #2

³ Kartchner Caverns operations based upon varying percentage (6-9%) of 50,000/75,000/100,000/200,000 visitors projected during the planning period. The number of operations were estimated by assuming two passengers per itinerant aircraft operation.

As previously discussed in the Socioeconomic section, it is anticipated that the development of the Kartchner Caverns State Park will attract numerous tourists to the area. It is expected that a portion of these tourists will fly into the Benson Municipal Airport. If one assumes that the tourist level by the end of the planning period will reach 200,000, then a basis exists for calculating the number of itinerant operations that might be generated by this tourist attraction.

To establish a rough estimate of the number of tourists that would travel to the Caverns by air rather than by other modes of transportation, available statistics on Grand Canyon National Park visitorship were reviewed. Benson Municipal Airport, like the Grand Canyon National Park Airport, will provide access to a significant tourist attraction. The quantity of itinerant operations was estimated based on the anticipated visitorship of Kartchner Caverns and the percentage of this visitorship expected to travel by air. A level of two passengers per itinerant operation was assumed in the calculations.

The impact of the growth in Pima County aviation on the general aviation pilots is a little more difficult to quantify, however, one only has to observe the impact of Phoenix-Sky Harbor Airport in Maricopa County on general aviation aircraft operations to understand that the higher the traffic levels, the more stringent are the rules governing aircraft operations. When this occurs, general aviation pilots will avoid these areas in order to find less encumbered airspace. This factor has been taken into consideration in the tabulation of preferred operations at the Benson Municipal Airport illustrated in Table 2N. This range of operational levels appears to best reflect the current trends in general aviation operations and assumes that there will be a substantial increase in the facilities available to general aviation aircraft in the Benson area.

Exhibit 2C graphically depicts the Operations Forecast for the proposed Benson Municipal Airport.

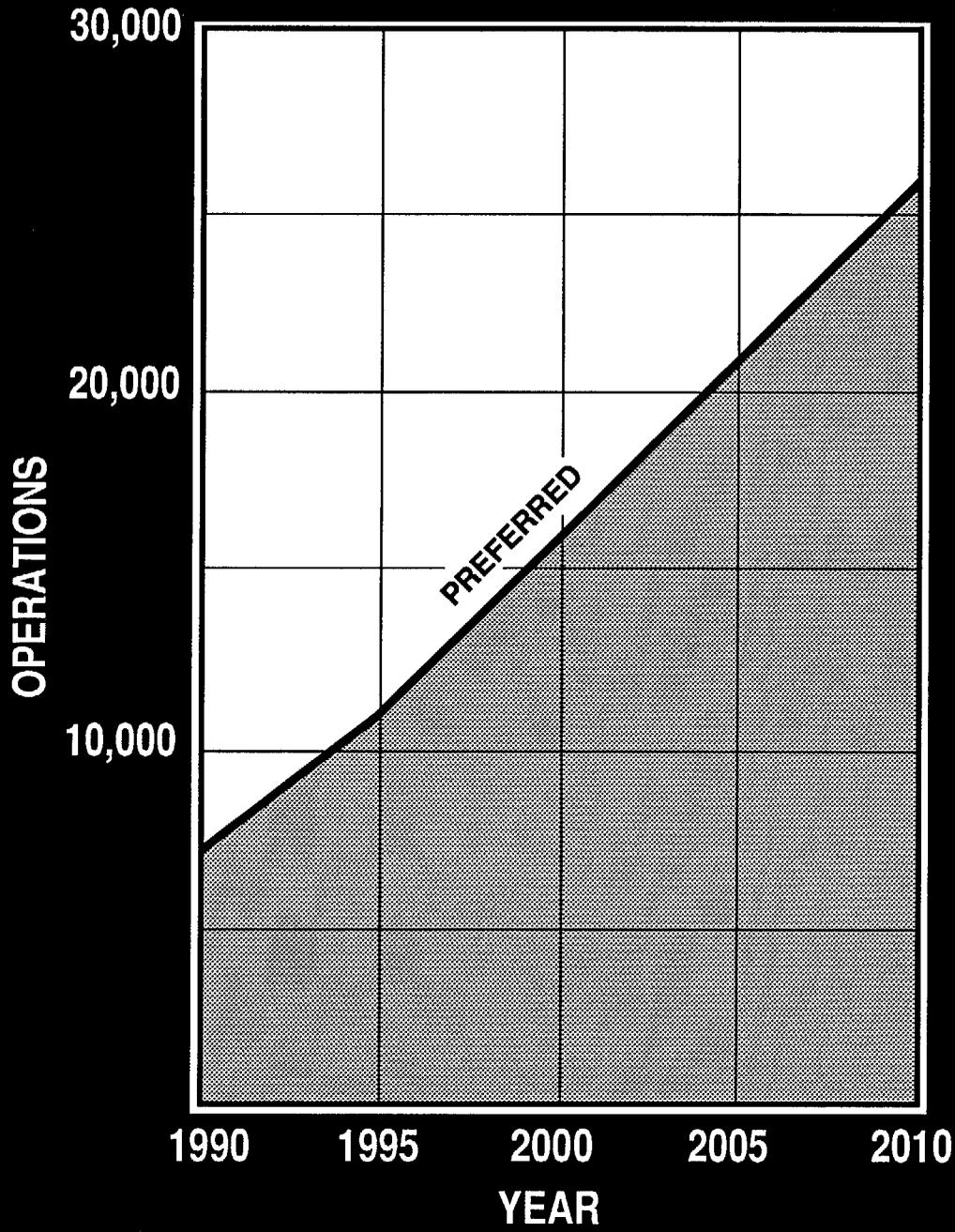
MILITARY OPERATIONS

Military operations do not occur at the existing Benson Airport and it is not likely that any military operations will occur at the proposed Benson Municipal Airport. However, there is considerable military air activity in the area, from Davis-Monthan Air Force Base in Tucson and Libby Army Airfield (Sierra Vista Municipal Airport) in Sierra Vista. There is a remote possibility that some military operations, from small utility aircraft or helicopters, will occur at the airport. Therefore, a factor of one percent has been used to project future military operations.

LOCAL VERSUS ITINERANT OPERATIONS

Initially, the airport's operational activity should exhibit a slow growth rate, a rate which is exemplified by a moderate level of both local operations and itinerant operations. As the economic growth and tourism within the area begin to influence the operational activity, operational levels will begin to rise.

Tourist visitation of the region is expected to increase significantly with the opening of Kartchner Caverns. Air Taxi operations will increase as tourism activity begins to impact the airport. An Air Taxi operator "... is an air carrier which directly engages in any combination of air transportation of persons, property or mail and do not directly/indirectly utilize an aircraft over 30 passenger seats and/or 71,500 pounds of payload . . ." It is anticipated that Itinerant activity will increase at a more rapid rate than local operations initially. Local operations are expected to grow in the latter half of the planning period



as operations-per-based aircraft increase. In addition, increases in local operations are anticipated due to expected increases in training activities, particularly touch-and-go operations.

Information was not available for the current percentage of operations associated with touch-and-go activities at the Benson Airport, and therefore, an assumption had to be made.

The percentage of touch-and-go operations at the airport during the planning period was assumed to be 50 percent, based on the percentages found at similar type airports attracting training operations from Tucson International Airport. **Table 20** depicts the local versus itinerant split of forecasts for the proposed Benson Municipal Airport during the planning period.

TABLE 20
Forecast of Itinerant - Local Operations Mix
Benson Municipal Airport

<u>Year</u>	<u>Itinerant Operations</u>			<u>Local Operations</u>		<u>Total Operations</u>
	<u>Air Taxi</u>	<u>General Aviation</u>	<u>Military</u>	<u>General Aviation</u>	<u>Military</u>	
1990	700	1,500	0	4,800	0	7,000
1995	1,300	2,000	0	7,700	0	11,000
2000	2,000	3,100	100	10,800	0	16,000
2010	4,500	4,100	300	17,100	0	26,000

PEAKING CHARACTERISTICS

Many airport facility needs are related to the levels of activity that occur during peak periods. The various categories of peak periods used to develop facility requirements for this study are as follows.

- ◆ **Peak Month** - The calendar month when peak aircraft operations occur.
- ◆ **Design Day** - The average day in the peak month. Normally this indicator is easily derived by dividing the peak month operations by the number of days in the month.
- ◆ **Busy Day** - The busy day of a typical week in the peak month. This descriptor is

used primarily to determine ramp space requirements.

- ◆ **Design Hour** - The peak hour within the design day. This descriptor is used particularly in airfield demand/capacity analysis, as well as in determining terminal building and access road requirements.
- ◆ **Busy Hour** - The peak hour within the busy day. This descriptor is used particularly in facility requirement determinations related to passengers.

It is important to note that only the peak month is an absolute peak within a given year. All the other will be exceeded at various times during the year, however, they do represent reasonable planning standards

that can be applied without resulting in over or underbuilding.

DESIGN HOUR OPERATIONS

There were no available data on the peaking characteristics at the existing Benson Airport and the low level of activity at the airport would not provide very usable data. An analysis was made of the general aviation peaking activity at several airports with similar activity levels in the State and County. By combining the data with standards used at other general aviation airports nationwide, a reasonable analysis can be made.

Historically, as activity levels increase, peak periods tend to level out. Therefore, the forecasts for the design hour are based upon the annual operations forecast and a gradual decrease in peaking factors.

The peak month for the Benson Municipal Airport is expected to account for approximately 10 percent of the airport's operations during the year. The peak month operations, as a percentage of annual operations, is expected to remain at this level throughout the planning period.

The design hour is anticipated to be approximately 15 percent of the design day's activity. The Busy day's activity levels are

expected to be approximately 14 percent higher than the Design Day.

DESIGN HOUR PASSENGERS

The definition of general aviation passengers, as used in this section, refers to the average number of pilots and passengers expected to utilize the airport's terminal facilities during a given time. Because it is expected that the tourist attractions in the area will result in a significant amount of passenger traffic through the years, this factor will be adjusted to include the higher passenger levels anticipated.

Touch-and-go operations would be an exception to the higher passenger levels anticipated. Pilots conducting touch-and-go operations only use the terminal facilities at the start and finish of their training activity. In order to ensure that space requirements are not overestimated in the planning effort, these operations were not considered in determining design hour passengers. In calculating the design hour passengers, an average of 2.5 passengers per operation, excluding touch-and-go operations, was assumed for the existing condition. It is anticipated that the passenger ratio will rise to 3.0 by the end of the planning period as larger aircraft utilize the airport. Table 2P depicts the peaking characteristics for the airport.

TABLE 2P
General Aviation Peak Operations Forecast
Benson Municipal Airport

	Planning Years			
	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2010</u>
Annual Operations	7,000	11,000	16,000	26,000
Peak Month Operations	700	1,100	1,600	2,600
Design Day Operations	23	35	52	84
Design Hour Operations	3	5	8	13
Busy Day Operations	26	40	59	96
Busy Hour Passengers	4	7	10	16
Design Hour Passengers	4	7	11	20

ANNUAL INSTRUMENT APPROACHES

Forecasts of annual instrument approaches (AIA) provide guidance in determining an airport's requirements for navigational aid facilities. An instrument approach is defined by FAA as "...an approach to an airport with intent to land by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when the visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude."

Examination of weather records show a very low occurrence of actual IFR weather conditions in the area. IFR weather conditions occur less than 0.1 percent of the

time, therefore, actual instrument approaches at Benson Municipal Airport would be estimated by applying a factor of 0.1 percent to the total itinerant approaches. Table 2Q summarizes the forecast of AIA's for the proposed Benson Airport.

Since the FAA definition applies to only those instrument approaches that occur during IFR conditions, actual instrument approaches are often higher, particularly at airports with a high percentage of training activity. With this low forecast of IFR activity, any requirement for additional navigational aids and/or instrument approach procedures would have to be based on factors other than weather, such as training capacity and overall safety.

TABLE 2Q
Annual Instrument Approaches
Benson Municipal Airport

<u>Descriptor</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2010</u>
Itinerant Approaches	1,100	1,650	2,600	4,450
Total Instrument Approaches	1	2	3	5

SUMMARY

Based on the forecast results, total annual aircraft operations for the proposed Benson Municipal Airport are expected to reach 26,000 by the end of the planning period (2010). The itinerant operations are

forecasted to be roughly 34 percent of this total and local operations are expected to make up the remaining 66 percent. **Table 2R** summarizes the demand levels for the proposed Benson Municipal Airport throughout the planning period.

TABLE 2R
Summary of Forecasts
Benson Municipal Airport

<u>Descriptor</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2010</u>
Based Aircraft				
Single Engine Piston	8	11	13	18
Twin Engine Piston	1	2	2	2
Turboprop	0	0	1	1
Turbojet	0	0	0	1
Rotorcraft	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>
Total	9	13	16	23
Aircraft Operations				
Itinerant				
Air Taxi	700	1,300	2,000	4,500
General Aviation	1,500	2,000	3,100	4,100
Military	<u>0</u>	<u>0</u>	<u>100</u>	<u>300</u>
Subtotal	2,200	3,300	5,200	8,900
Local				
General Aviation	4,800	7,700	10,800	17,100
Military	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Subtotal	4,800	7,700	10,800	17,100
Total	7,000	11,000	16,000	26,000
Annual Instrument Operations	1	2	3	5
Peaking Factors				
Operations				
Peak Month	700	1,100	1,600	2,600
Design Day	23	35	52	84
Design Hour	3	5	8	13
Busy Day	26	40	59	96
Busy Hour	4	7	10	16
Passengers				
Peak Month	140	325	600	1,575
Design Day	5	11	20	53
Design Hour Passengers	1	2	4	11
Design Hour Pilots and Passengers	4	7	11	20