



BISBEE MUNICIPAL AIRPORT

Bisbee, Arizona

AIRPORT MASTER PLAN - 1999

FORECASTS OF AVIATION ACTIVITY

INTRODUCTION

Forecasts of aviation activity serve as a guideline for the timing required for implementation of airport improvement programs. While such information is essential to successful comprehensive airport planning, it is very important to recognize that forecasts are only approximations of future activity, based upon historical data and from the standpoint of present situations. They therefore must be used with careful consideration, as they may lose their validity through the passage of time. For this reason, an ongoing program of examination of local airport needs, as well as national and regional trends, is recommended and encouraged in order to promote the orderly development of the Bisbee Municipal Airport.

Air Traffic Control personnel maintain records of aircraft operations at towered airports. At airports which are not served by air traffic control towers, estimates of existing aviation activity are necessary in order to form a basis for the development of realistic forecast projections. These estimates are usually based upon a review of available historical data, as well as observations of activity, and contacts with airport users.

Following the development of the estimated current demand, projections are made based upon established growth rates, area demographics, industry trends and other important indicators. Forecasts are prepared for the Initial Term (five-year), the Intermediate Term (ten-year) and the Ultimate Term (fifteen and twenty-year) time frames. Having forecasts within these time frames will allow the construction of airport improvements to be timed to meet demand, but not so early as to remain idle for an unreasonable length of time.

Types of
Operations

There are four general types of aircraft operations which are considered in the planning process. These are termed local, based, itinerant, and transient. They are defined as follows:

- **Local operations** are defined as aircraft movements (departures or arrivals) for the purpose of training, pilot currency or pleasure flying, within the immediate area of the local airport. These operations typically consist of touch-and-go operations, practice instrument approaches, flights to and within local practice areas, and pleasure flights which originate and terminate at the airport under study.
- **Itinerant operations** are defined as arrivals and departures other than local operations, as described above. This type of operation is closely tied to local demographic indicators, such as local industry and business use of aircraft and usage of the facility for recreational purposes.
- **Based aircraft operations** are defined as the total operations made by aircraft based at the airport under study, with no attempt to classify the operations as to purpose.
- **Transient operations** are defined as the total operations made by aircraft other than those based at the airport under study. These operations typically consist of business or pleasure flights originating at other airports, with termination or a stopover at the study airport.

The forecasts for Bisbee Municipal Airport will be confined to definition of Based and Transient operations, since they tend to give a more meaningful illustration of the character of activity at the airfield.

COCHISE COUNTY
DEMOGRAPHICS

As part of the data collection and research for this master planning project, records of Cochise County and City of Bisbee demographics were collected. These are listed for reference in the Summary of Historical Data for Bisbee and Cochise County, Arizona, on the following page.

Record data for population, per capita income, total employed persons, numbers of registered aircraft, and other demographic and economic indicators for Bisbee and Cochise County were collected from various sources. The sources of the data are referenced in the summary tabulation.

From 1970 through 1983, the number of registered aircraft in Cochise County increased at an average rate of +9.5% annually. However, from 1983 until 1994, the number of registered aircraft has declined at an average rate of about -4.3% per year.

SUMMARY OF HISTORICAL DATA FOR BISBEE AND COCHISE COUNTY, ARIZONA

YEAR	POPULATION (POP)			ECONOMIC INDICATORS							AVIATION ACTIVITY			
	Cochise County Population	City of Bisbee Population (2)	Bisbee's Share of County Population	County Per Capita Income	Employed Persons in County (2)	Civilian Labor Force in Bisbee (2)	Employed Persons in Bisbee (2)	Bisbee's Unemployment Rate	Postal Receipts at Bisbee (2)	Taxable Sales in Bisbee (2)	County Registered Aircraft (3)	Bisbee Based Aircraft (5)	Bisbee Share of County Aircraft	Aircraft Per 1,000 Population (Bisbee)
1970	62,770			\$3,453	15,300						65			
1971	67,149			\$3,785	19,050						85			
1972	70,938			\$4,005	20,325						97			
1973	74,558			\$4,293	21,175						74			
1974	76,165			\$4,574	18,700						119			
1975	76,922			\$4,763	17,900						120			
1976	78,946			\$5,128	18,300						139			
1977	80,688	9,800	12.15%	\$5,405	18,900						145	23	15.86%	2.35
1978	83,160	10,005	12.03%	\$6,018	20,700						157	19	12.10%	1.90
1979	86,268			\$6,283	20,900						160			
1980	85,686 ²	7,154	8.35%	\$7,177	21,400	2,523	2,286	9.39%			183			
1981	88,036	7,250	8.24%	\$7,848	21,400						199	20	10.05%	2.76
1982	88,373	7,257	8.21%	\$8,251	21,100						208	22	10.58%	3.03
1983	88,872	7,309	8.22%	\$8,888	21,200						211	13	6.16%	1.78
1984	90,937	7,605	8.36%	\$9,508	22,000						202	12	5.94%	1.58
1985	91,192	8,032	8.81%	\$10,109	23,700						206	12	5.83%	1.49
1986	94,093	8,055	8.56%	\$10,468	24,800						179	15	8.38%	1.86
1987	96,690	8,060	8.34%	\$10,938	31,150						200	23	11.50%	2.85
1988	96,316			\$11,602	31,800						199			
1989	97,551			\$12,042	33,410						194			
1990	97,624 ²	6,288	6.44%	\$12,888	26,738	3,205	2,985	6.86%	\$576,762	\$34,577.65	181			
1991	98,626			\$13,580					\$679,950	\$36,623.50	174 ⁴			
1992	100,661			\$14,378							129 ⁴			
1993	103,325 ²	6,455	6.25%	\$14,705		2,737	2,500	8.66%	\$705,236	\$35,897.25	131 ⁴			
1994	107,693			\$14,777	37,680						130 ⁴			
1995	110,414			\$15,311							130 ⁴	12 ⁴	9.23%	
1996	114,925 ²			\$16,136					\$882,689	\$39,032.95	(130)			
1997	119,650 ²	6,515			36,003	2,800	2,570	8.21%	\$878,507	\$43,900.95		8		1.23
1998												(11)		
1999												14		

Sources: U.S. Department of Commerce, Bureau of Economic Analysis unless noted otherwise / (2)=Arizona Department of Economic Security -1997 / (3)=FAA Census of Civil Aircraft / (4)=ADOT Records / (5)=City of Bisbee

The number of aircraft that were based at Bisbee declined from 23 (about 16% of the county's aircraft) in 1977 to 12 in 1995 (about 9% of the county's aircraft).

The number of aircraft per 1,000 population averaged about 2.12 county-wide between 1977 and 1987. Even though the population and economic climate declined in Bisbee during this period, the local ratio of aircraft to population seemed to keep pace with the county, at an average of about 2.08 aircraft/1,000 people.

During the 1970-1983 period, County population increased at an average rate of +2.72% per year. This trend continued at the rate of about +1.70% per year through 1996. The City of Bisbee's population, however, declined from a peak of 10,005 in 1978 to about 6,580 at the present time.

County per capita income increased at an average annual rate of +7.55% from 1970 to 1983, then at an average rate of +4.70% per year through 1996.

REVIEW OF OTHER
APPLICABLE
PLANNING
DOCUMENTS

Over the past several years there have been several planning studies conducted that either directly or indirectly affect the airports within Arizona, Cochise County and the Bisbee Municipal Airport. These have been reviewed in Section 1, and include the following:

- the 1982 Cochise County Airport System Plan (Willdan Associates - July, 1982);
- the 1994 Cochise County Airport System Plan update (WLB Group, Inc. - March, 1994);
- the 1995 Arizona State Aviation Needs Study (Bucher, Willis & Ratliff - November, 1995); and
- the FAA Terminal Area Forecasts or TAF (updated December, 1998).

Other nearby airports within Cochise County have had their master plans updated, or new master plans prepared in recent years. These include:

- the 1997 Cochise County Airport Master Plan (Bucher, Willis & Ratliff - December, 1997);
- the 1997 Bisbee-Douglas International Airport Comprehensive Master Plan (Nicholas J. Pela & Associates/Gannett Fleming, Inc. - June, 1997); and
- the 1999 Tombstone Municipal Airport Master Plan (Nicholas J. Pela & Associates/Gannett Fleming, Inc. - March, 1999).

Of these documents, the 1995 Arizona State Aviation Needs Study (SANS), the FAA Terminal Area Forecast (TAF), and the 1982 and 1994 Cochise County Airport System Plans (RASP) directly address the Bisbee airport, providing inventory and forecast information regarding airport activity and based aircraft.

The master plans for the Tombstone, Cochise County and Bisbee-Douglas International airports provide planning information for these three nearby facilities that may indirectly affect development and activity at the Bisbee Municipal Airport.

The SANS and 1994 RASP include activity forecasts for the key public-ownership/public-use Cochise County airports within the overlapping Bisbee service area. The Terminal Area Forecasts (TAF) also includes forecast information for Bisbee Municipal and Bisbee-Douglas International airports.

The table on the following page is a summary of selected forecast information from each of the studies listed above (RASP projections have been interpolated to the SANS/TAF planning years for ease of comparison).

The SANS also includes information regarding historic and forecast licensed pilots within the state and Cochise County:

Historic and Forecast Licensed Pilots - Arizona and Cochise County

Year	Arizona Licensed Pilots	Cochise Licensed Pilots	County Share of Licensed Pilots
1980	12,180	349	2.87%
1990	11,672	260	2.23%
1995	13,072	279	2.13%
2000	14,921	303	2.03%
2005	16,803	326	1.94%
2010	18,734	348	1.86%
2015	20,732	368	1.78%
Trend (%/year)	+1.54%	+0.16%	-1.36%

Source: 1995 Arizona State Aviation Needs Study (SANS)
(calculations by N.J. Pela & Associates)

**SANS, RASP and TAF Airport Activity Projections for Cochise County
and Key Overlapping Service Area Airports**

		<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>
Cochise County						
SANS	Based Aircraft . . .	130	141	150	161	169
RASP	Based Aircraft . . .	169	198	227	258	---
SANS	Total Operations .	106,060	110,033	112,853	117,862	121,523
RASP	Total Operations .	129,716	151,063	170,431	191,118	---
Bisbee-Douglas Intl.						
SANS	Based Aircraft . . .	10	10	11	12	13
RASP	Based Aircraft . . .	25	26	28	29	---
TAF	Based Aircraft . . .	31	31	31	31	31
SANS	Total Operations .	1,946	1,946	2,141	2,335	2,530
RASP	Total Operations .	6,900	7,860	8,280	8,760	---
TAF	Total Operations .	32,000	32,000	32,000	32,000	32,000
Bisbee Municipal						
SANS	Based Aircraft . . .	12	13	14	15	16
RASP	Based Aircraft . . .	19	21	24	27	---
TAF	Based Aircraft . . .	10	10	10	10	10
SANS	Operations	7,610	8,245	8,879	9,513	10,147
RASP	Total Operations .	4,440	5,630	6,545	7,970	---
TAF	Total Operations .	3,020	3,020	3,020	3,020	3,020
Douglas Municipal						
SANS	Based Aircraft . . .	20	20	21	21	22
RASP	Based Aircraft . . .	28	31	36	41	---
SANS	Total Operations .	7,459	7,459	7,832	7,832	8,205
RASP	Total Operations .	13,500	16,195	19,470	23,840	---

*Source: 1995 Arizona State Aviation Needs Study (SANS),
1994 Cochise County Airport System Plans (RASP),
and FAA Terminal Area Forecasts (TAF)*

The recently completed master plans for the Cochise County (Willcox) Airport, Tombstone Municipal Airport, and the Bisbee-Douglas International Airport (BDI) project a relatively strong rate of growth for the area in terms of aeronautical activity, as well as a leveling of the distribution of activity between the airports in the overlapping service area as planned improvements are made. The projections for based aircraft and total annual operations by general aviation aircraft included in these documents are presented on the following page.

The forecast activity for the Cochise County Airport was based upon a continuation of the historic trend in the growth of aeronautical activity in and around the Willcox area.

The estimated number of operations at the Bisbee-Douglas airport for 1997 was based on the *potential level of activity* at the airfield, predicated upon major improvements being made. Currently, activity at the airfield is severely dampened as a result of the condition of runway pavements and other infrastructure. The estimated actual level of activity in 1997 was estimated to be only 3,285 annual operations. The major runway improvements at Bisbee-Douglas that were recommended in the master plan were in the initial stages of development at the time of preparation of this report.

The forecasts for the Tombstone Municipal Airport were based upon an analysis of the potential market share of aviation activity that may occur at Tombstone if significant improvements are made.

Forecast Aeronautical Activity for Cochise County Airport, Tombstone Municipal Airport & Bisbee-Douglas International Airport

<i>Based Aircraft:</i>	<u>1997</u>	<u>2002</u>	<u>2007</u>	<u>2012</u>	<u>2017</u>
Cochise County Airport	24	24	25	28	34
Trend (%/year 1997-2017)					+1.76%
Bisbee-Douglas Int'l Airport	24	34	44	53	63
Trend (%/year 1997-2017)					+4.95%
	<u>1998</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>
Tombstone Municipal Airport	0	5	5	6	6
Trend (%/year 2000-2015)					+1.23%

<i>Annual Operations:</i>	<u>1997</u>	<u>2002</u>	<u>2007</u>	<u>2012</u>	<u>2017</u>
Cochise County Airport	7,000	7,000	7,250	9,060	9,680
Trend (%/year 1997-2017)					+1.64%
Bisbee-Douglas Int'l Airport	25,650	30,770	35,878	40,467	45,556
Trend (%/year 1997-2017)					+2.92%
	<u>1998</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>
Tombstone Municipal Airport	200	4,401	4,714	5,049	5,409
Trend (%/year 2000-2015)					+1.39%

Sources: Cochise County Airport Master Plan (Bucher, Willis & Ratliff - December, 1997), Bisbee-Douglas International Airport Comprehensive Master Plan (N.J. Pela & Associates/Gannett Fleming, Inc. - June, 1997), Tombstone Municipal Airport Master Plan (N.J. Pela & Associates/Gannett Fleming, Inc. - March, 1999)

**AVERAGE
OPERATIONS PER
BASED AIRCRAFT:
MULTIPLE AIRPORT
USER SURVEYS**

In the process of preparing numerous airport master plans for U.S. general aviation airports, an extensive database of information regarding aircraft operations has been accumulated. Over a ten year period, airport user survey questionnaires have been distributed to aircraft owners who base their aircraft at 21 different airports. These questionnaires made inquiry as to the number of total operations performed by each aircraft and give a good indication of the probable level of use of private general aviation aircraft at Bisbee.

The results of the surveys, in terms of total annual operations by based aircraft, are summarized below.

Airport User Surveys: Summary of Based Aircraft Operations

AIRPORT	YEAR	Annual Operations
Sawyer County Airport (WI)	1988	208
Buffalo Municipal Airport (MN)	1989	481
Mora Municipal Airport (MN)	1989	232
Two Harbors Municipal Airport (MN)	1989	275
Rusk County Airport (WI)	1989	97
Chippewa Valley Regional Airport (WI)	1990	217
Cumberland Municipal Airport (WI)	1990	220
Canby Municipal Airport (MN)	1991	118
Glencoe Municipal Airport (MN)	1991	119
Portage Municipal Airport (WI)	1992	360
Rush City Municipal Airport (MN)	1992	116
Thief River Falls Regional Airport (MN)	1992	194
Brainerd-Crow Wing County Regional (MN)	1990	566
Cambridge Municipal Airport (MN)	1993	115
Cloquet Municipal Airport (MN)	1993	410
Red Wing Municipal Airport (MN)	1994	128
Rexburg - Madison County Airport (ID)	1994	427
Pershing County - Derby Field (NV)	1993	205
Douglas Municipal Airport (AZ)	1994	138
Baudette International Airport (MN)	1994	64
Bisbee-Douglas International Airport (AZ)	1996	30

Average Annual Operations by Each Based Aircraft: 225

In the surveys, it was found that airports with a very high level of training operations, such as Buffalo, Minnesota and Rexburg, Idaho, have the highest use per based aircraft. The same is true of airports in communities with heavily tourism-based economies, such as Brainerd and Cloquet, Minnesota.

CURRENT ACTIVITY
AT BISBEE
MUNICIPAL
AIRPORT

Of the Cochise County airports included in the surveys, The Bisbee-Douglas International Airport's aircraft owners responded with the lowest use of their aircraft (30). In contrast, the Douglas Municipal Airport's based aircraft owners indicated 138 average annual operations per based aircraft.

There are currently 14 aircraft based (regularly parked) at Bisbee Municipal Airport. These aircraft represent about 10% of the total number of aircraft in Cochise County. The population of Bisbee (about 6,580 people) represents about 5.3% of the population of Cochise County.

The 1995 Arizona State Aviation Needs Study (SANS) estimated that there were about 106,060 total annual operations in the county and 7,610 total annual operations at Bisbee Municipal during 1995. According to the SANS, operations at Bisbee Municipal represented about 7.2% of total Cochise County activity.

The 1994 Cochise County Airport System Plan (RASP) estimated about 3,600 total annual operations at Bisbee Municipal in 1992, roughly one-half the SANS estimate. The RASP estimated about 117,430 total general aviation operations in the county in 1992 in comparison to the SANS 1995 estimate of 106,060. According to the RASP, activity at Bisbee only amounted to about 3% of county aviation activity.

An empirical method was utilized to estimate the probable current activity at the Bisbee Municipal Airport, as follows:

- ▶ The estimated number of annual local, itinerant, and total operations were calculated by application of the empirical airport activity equations derived from 1995 research of airport activity within 24 Metropolitan Service Areas in the FAA Great Lakes Region (A Method of Estimating Annual Aircraft Operations at Non-towered Airfields, Nicholas J. Pela & Associates - June, 1995).

The equations are as follows:

$$\begin{aligned}
 x &= \text{Number of Based Aircraft} \\
 y_t &= \text{Total Annual Operations} \\
 y_l &= \text{Annual Local Operations} \\
 y_i &= \text{Annual Itinerant Operations} \\
 y_t &= 13,321 + 515x - 0.053x^2 \\
 y_l &= 4,933 + 268x - 0.039x^2 \\
 y_i &= 8,388 + 247x - 0.014x^2
 \end{aligned}$$

- ▶ The User Survey activity estimate average for 21 U.S. general aviation airports was used to indicate the current average number of *annual based operations per resident aircraft (225)*.
- ▶ The average number of *transient operations per based aircraft* was calculated as the difference between the total operations per based aircraft and the average annual based operations per resident aircraft. Thus, *total transient operations* were computed as:

Total Annual Operations - 225(Total Based Aircraft)

- ▶ The mix of various types of transient aircraft was based on the FAA's 1994 records of hours flown by the U.S. aircraft fleet, differentiated by type as follows:

Fixed-Wing Piston 18,700,000 hrs	81.3%
Jet and Turboprop 2,400,000 hrs	10.5%
Piston Rotorcraft 400,000 hrs	1.7%
Turbine Rotorcraft 1,500,000 hrs	6.5%

The Estimated 1999 Activity at the Bisbee Municipal Airport has been estimated as presented on the following page, based on the above criteria.

It is important to understand that the level of current activity presented below, as well as the forecast projections that follow, are statistical estimates of potential levels of activity, and not necessarily reflections of actual activity. These empirical values may be viewed as the "worst case" scenario for demands that may be placed upon the airport's infrastructure, based upon analysis of similar-sized facilities. Actual aviation demand is always related to changes in local, national and regional industry and commerce, the ability and willingness of the airport owner to promote the airport as a viable economic asset, as well as intangible variables such as public preference and confidence in government.

Comparison of the differences in forecasts between the SANS, RASP and TAF illustrate that estimating activity at an airport is more of an art than a science (see page 2-6). The approach used in the preparation of the projections contained in this study is to identify a conservative level of activity that represents the maximum demand that may be placed on the airport. This level is then used as a baseline for recommending improvements that will ensure that the airport will be able accommodate future demand.

Estimated 1999 Activity
 Bisbee Municipal Airport - Bisbee, Arizona

Total Based Aircraft				14
TOTAL ANNUAL OPERATIONS				20,521
Annual Local Operations				8,677
Annual Itinerant Operations				11,843
Type of Aircraft Operation	Based	Transient	TOTAL	
Fixed-Wing Piston (ARC A-I through ARC B-I)	3,150	14,122	17,272	
Jet and Turboprop (to ARC B-II)	0	1,824	1,824	
Piston Rotorcraft	0	295	295	
Turbine Rotorcraft	0	1,129	1,129	
TOTAL ESTIMATED 1999 ACTIVITY	3,150	17,371	20,521	

FORECASTS OF
FUTURE ACTIVITY:
MARKET SHARE
ANALYSIS MODEL

The methodology developed for the forecast scenario involves the use of Cochise County population data from the Arizona Department of Economic Security (DES) as compared to records of the number of based aircraft in the county from ADOT/Aeronautics Division records for 1996.

A figure for anticipated based aircraft was arrived at by applying the following Aircraft-to-Population Index equation:

Aircraft-to-Population Index for Cochise County

- A_c = Registered Aircraft in Cochise County
- P_c = Cochise County Population
- I_c = Number of Aircraft Per Person in Cochise County

$$I_c = A_c \div P_c$$

$$I_c = 130 \div 114,925 = 0.001131$$

The number of potential based aircraft in Cochise County for the 2000-2020 planning period was estimated by applying this Aircraft-to-Population Index for Cochise County to the projected county population from the Arizona Department of Economic Security (DES). The number of based aircraft at Bisbee Municipal Airport was estimated by assuming that 10% of Cochise County's aircraft will be based at Bisbee throughout the planning period. A validation of this assumption is that about 10% are based there at the present time.

The number of total operations, Itinerant operations and Local operations at the Bisbee airport were estimated by applying the empirical formulas for total annual operations from A Method of Estimating Annual Aircraft Operations at Non-towered Airfields (see page 2-9).

Annual Based operations were estimated by applying the average annual operations for based aircraft as derived from the multiple aircraft owner surveys (225 annual operations per based aircraft). Transient operations are equal to the total annual operations minus annual Based operations.

The forecast total general aviation operations for Cochise County as contained in the 1995 SANS were used as the basis of the estimates. Since the SANS projections only extend through 2015, values for 2020 have been extrapolated.

Market-Share Analysis Model
Forecast Aviation Activity in Cochise County
and
Bisbee Municipal Airport

	Jan, 1999	2000	2005	2010	2015	2020
Cochise County Population (Az DES)	118,492	121,837	129,580	137,035	143,793	149,990
SANS Forecast of County GA Operations	<u>108,271</u>	110,033	112,853	117,862	121,523	<u>125,774</u>
SANS Forecast of County Based Aircraft	135	141	150	161	169	<u>181</u>
Adjusted Forecast of County Based Aircraft	130 (actual)	138	147	155	163	170
Bisbee Municipal Airport Forecasts Market-Share Analysis Model						
Forecast Based Aircraft	14	14	15	16	16	17
Annual Based Operations	3,150	3,150	3,375	3,600	3,600	3,825
Annual Transient Operations	17,371	17,371	17,659	17,947	17,947	18,236
Total Annual Operations	20,521	20,521	21,034	21,547	21,547	22,061
Annual Local Operations	8,677	8,677	8,944	9,211	9,211	9,478
Annual Itinerant Operations	11,843	11,843	12,090	12,336	12,336	12,583

Aviation Activity Forecasts Broken Down By Aircraft Type - Bisbee Municipal Airport

	Jan, 1999	2000	2005	2010	2015	2020
Forecast Based Aircraft	14	14	15	16	16	17
Annual Based Operations	3,150	3,150	3,375	3,600	3,600	3,825
Annual Transient Operations	17,371	17,371	17,659	17,947	17,947	18,236
Total Annual Operations	20,521	20,521	21,034	21,547	21,547	22,061
Annual Local Operations	8,677	8,677	8,944	9,211	9,211	9,478
Annual Itinerant Operations	11,843	11,843	12,090	12,336	12,336	12,583
<i>Fixed-Wing Piston:</i>						
No. Based	14	14	15	16	16	17
Based OPS	3,150	3,150	3,375	3,600	3,600	3,825
Transient OPS	14,122	14,122	14,356	14,590	14,590	14,825
<i>Jet & Turboprop:</i>						
No. Based	0	0	0	0	0	0
Based OPS	0	0	0	0	0	0
Transient OPS	1,824	1,824	1,854	1,884	1,884	1,915
<i>Piston Rotorcraft:</i>						
No. Based	0	0	0	0	0	0
Based OPS	0	0	0	0	0	0
Transient OPS	295	295	300	305	305	310
<i>Turbine Rotorcraft:</i>						
No. Based	0	0	0	0	0	0
Based OPS	0	0	0	0	0	0
Transient OPS	1,129	1,129	1,148	1,167	1,167	1,185

CRITICAL AIRCRAFT

The "critical", or "design", aircraft for any given airport facility is defined as that aircraft (or group of aircraft) whose dimensional and/or performance characteristics are the basis for selection of facilities design criteria. The critical aircraft must be demonstrated to account for a minimum of 500 annual actual or forecast operations.

Different aircraft may govern the requirements for runway design, and for lateral and vertical separation standards. The factors usually considered are the aircraft maximum gross takeoff weight, approach speed category, wingspan, and tail height.

Based on a comparison between the design criteria contained in FAA Advisory Circular AC 150/5300-13 and the existing airport facilities, the Bisbee Municipal Airport is presently able to accommodate small aircraft (less than 12,500 pound takeoff weights), up to Approach Category B (less than 121 knot approach speeds), and Airplane Design Group II (wingspan less than 79 feet).

Therefore, an ARC B-II reference code is indicated as the airport's present role.

See Section 1, Page 1-30 for definitions of the FAA Aircraft Reference Code, or "ARC", system of airport classification.

The critical aircraft currently using the Bisbee Municipal Airport facilities is a mix of ARC B-I through B-II piston singles and twins, and B-II jets and turboprops, which may account for a total of over 500 annual operations.

The character of the aeronautical activity at Bisbee will most probably not change significantly through the planning period, and the level of demand is not forecast to increase significantly.

A representative "design fleet" of ARC A-I, A-II, B-I and B-II aircraft is presented in the tables on the following pages. The tables are output files from the AcData v6.10 aircraft database, which provides aircraft dimensional and approximate performance criteria for 465 aircraft types and configurations. Runway requirements for the various aircraft were computed based on a density altitude of 7,841', which was derived by using a pressure altitude of 4,804' MSL at 90° Fahrenheit.

In each of the tabulations, critical design elements are indicated by **Bold** type.

Page 2-18 is a tabulation of aircraft with takeoff weights up to 12,500 pounds that can be accommodated by the present runway configuration and length (5,900').

Page 2-19 lists a mix of aircraft through ARC B-II that could be accommodated at Bisbee if additional runway length were to be made available in the future. These

critical aircraft listings indicate that an 8,950' long runway would accommodate all of the selected database aircraft at the 7,841' density altitude. Most of the listed types could be accommodated by a 7,000' runway.

In addition to the longer runway, accommodating the larger and faster aircraft would require that the runway be strengthened and that adequate turnarounds, taxiways, parking and access improvements are made. With these improvements, the present runway could be used by aircraft as large as the Saab 340 and Metro III commuter airline turboprops and the Falcon 200 business jet.

Bisbee Municipal Airport
 Critical Aircraft Design Fleet
 Existing Runway Length (5,900') and 12,500# Maximum Takeoff Weight

PARAMETERS :
 DENSITY ALTITUDE : 7841 MSL
 GENERAL TYPE CODE : General
 U.S. CUSTOMARY UNITS : Speed in knots.....Lengths in Feet.....Weight in Pounds

 Model-----AppSpeed--WingSpan--AClength--TailHite--TOWeight---RWindex

ARC A-I:

Beechcraft 65 Queen Air	90	45.88	33.33	14.17	7700	4198
Cessna 177B	60	35.50	27.25	8.58	2500	2796
Cessna 182Q	64	36.00	28.00	9.20	2950	2697

A-II:

Beechcraft E-18S	87	49.20	35.10	10.50	9300	5208
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ARC B-I:

Beechcraft B100	111	45.90	39.90	15.40	11500	5360
Metro III	112	46.20	59.40	16.70	12500	4476
Metro II SA226-TC	112	46.25	59.42	16.67	12500	4602
Cessna 425	103	44.10	35.90	12.60	8600	5231
Cessna 340A	92	38.10	34.30	12.60	5990	4594
Cessna 402C	95	44.12	36.38	11.45	6850	4999
Cessna 414A	94	44.10	36.40	11.50	6750	5659
Cessna 421C	96	41.10	36.40	11.50	7450	4848
Cessna Citation I/SP	107	47.10	43.50	14.33	11850	4355

ARC B-II:

Beechcraft B200	98	54.50	43.80	15.00	12500	4460
Merlin IVC	113	57.00	59.33	16.67	12500	4472
Cessna 441	99	49.30	34.70	12.80	9850	5050

Source: AcData v6.10 computer database of 465 aircraft

**Bisbee Municipal Airport
Critical Aircraft Design Fleet - ARC B-I and ARC B-II
Unlimited Runway Length and 30,000# Maximum Takeoff Weight**

PARAMETERS :
 DENSITY ALTITUDE : 7841 MSL
 GENERAL TYPE CODE : General
 U.S. CUSTOMARY UNITS : Speed in knots.....Lengths in Feet.....Weight in Pounds

 Model-----AppSpeed--WingSpan--AClength--TailHite--TOWeight---RWindex

ARC B-I:

Falcon 10	104	42.90	45.50	15.10	18740	6068
Learjet 28/29	120	43.75	47.58	12.25	15000	4710
Metro III	112	46.20	59.40	16.70	16000	6568
Sabreliner NA-265-60	120	44.50	48.30	16.00	20000	8618

ARC B-II:

Falcon 20	107	53.50	56.30	17.40	26000	7009
Falcon 200	114	53.50	56.30	17.40	26000	4668
Falcon 50	113	61.90	60.80	22.90	30000	4152
Falcon 900	100	63.40	66.30	24.80	28000	3297
Merlin IVC	113	57.00	59.33	16.67	16000	6260
Saab 340B	104	70.33	64.67	22.50	30000	7734
Saab-Fairchild SF 340A	104	70.33	64.67	22.50	28000	7163
Westwind Astra	110	52.67	55.58	18.17	24650	8944
Embraer EMB-120 Brasilia	108	64.90	65.60	20.80	25353	6965
Sabreliner NA-265-65	105	50.50	46.10	16.00	19000	6586

Source: AcData v6.10 computer database of 465 aircraft

AIRPORT SEASONAL USE

Some level of seasonal fluctuation in aircraft operations may be expected at any airport. This fluctuation is most apparent in regions with severe winter weather patterns, at nontowered general aviation airfields. The fluctuation is less pronounced at major airports, with a high percentage of commercial and scheduled airline activity, and also at those facilities with a milder winter climate and/or a high percentage of training activity.

The southeastern Arizona climate provides a very stable environment for aviation activity. The winter weather is mild and although daytime summer temperatures are typically in the 90's and 100's, the morning and evening hours are usually quite comfortable.

According to weather observers at the Bisbee-Douglas International Airport, instrument conditions in the Cochise County area occur less than 3% of the time.

The probable future seasonal use at Bisbee Municipal Airport was modeled by applying the forecast total annual operations to the average seasonal use trend derived from the Airport Manager's records of air traffic activity and fuel sales at the airport. This seasonal use curve is presented below. For the purposes of comparison, seasonal use curves from the 1979-84 FAA records of aircraft operations handled by towered and non-towered facilities nationally (from the FAA Statistical Handbook of Aviation) is also presented.

Typical Seasonal Use Trend Curves

<u>MONTH</u>	<u>Nontowered w/Severe Winter Weather</u>	<u>FAA Towered Airports</u>	<u>BISBEE RECORDS</u>
January	3.5%	7.2%	6.4%
February	4.0%	8.2%	6.9%
March	4.8%	8.6%	7.0%
April	7.5%	9.0%	6.7%
May	11.3%	9.1%	6.2%
June	13.5%	9.4%	5.8%
July	14.8%	9.1%	13.8%
August	13.0%	8.7%	7.7%
September	10.0%	8.7%	9.8%
October	8.0%	7.8%	8.0%
November	5.8%	7.1%	12.8%
December	3.8%	7.1%	9.0%

PEAK DEMAND
CALCULATIONS

In order to arrive at a reasonable estimate of the actual peak demand upon the airport facilities, it was necessary to develop a method to calculate the estimated Maximum Peak Hourly Demand which might be expected to occur during the hours of peak usage of the airport. The Seasonal Use Trend Curve, as presented above, was used as a tool to determine this usage.

Using the Seasonal Use information, a formula was derived which will calculate the average daily operations in a given month, based on the percentage of the total annual operations for that month, as determined by the curve.

The formula is as follows:

$$\begin{aligned}
 \text{Where } T &= \text{Monthly percent of use (from curve).} \\
 M &= \text{Average monthly operations.} \\
 A &= \text{Total annual operations.} \\
 D &= \text{Average Daily Operations in a given month.} \\
 M &= A (T / 100) \\
 D &= M / (365 / 12)
 \end{aligned}$$

Experience has shown that approximately 90% of total daily operations will occur between the hours of 7:00 AM and 7:00 PM (12 hours) at a typical General Aviation airport, and that the maximum peak hourly occurrence may be 50% greater than the average of the hourly operations calculated for this time period.

Therefore, the *Estimated Peak Hourly Demand* (P) in a given month was determined by compressing 90% of the Average Daily Operations (D) in a given month into the 12 hour peak use period, reducing that number to an hourly average for the peak use period, and increasing the result by 50%, as follows:

$$\begin{aligned}
 \text{Where } D &= \text{Average Daily Operations in a given month.} \\
 P &= \text{Peak Hourly Demand in a given month.} \\
 P &= 1.5 (0.90D / 12)
 \end{aligned}$$

The monthly, daily, and hourly demand was computed for both the present 1999/2000 and the ultimate year 2020 conditions.

The results are as follows:

Estimated Hourly Demand / Month
 Bisbee Municipal Airport
 Estimated Potential Activity - 1999/2000

Planning Year:	2000
Operations:	20,521

Month	% USE	Monthly	Daily	Hourly
January	6.40	1,313	43	5
February	6.90	1,416	47	5
March	7.00	1,436	47	5
April	6.70	1,375	45	5
May	6.20	1,272	42	5
June	5.80	1,190	39	4
July	13.80	2,832	93	10
August	7.70	1,580	52	6
September	9.80	2,011	66	7
October	8.00	1,642	54	6
November	12.80	2,627	86	10
December	9.00	1,847	61	7

Estimated Hourly Demand / Month
 Bisbee Municipal Airport
 Estimated Potential Activity - 2020

Planning Year:	2020
Operations:	22,061

Month	% USE	Monthly	Daily	Hourly
January	6.40	1,412	46	5
February	6.90	1,522	50	6
March	7.00	1,544	51	6
April	6.70	1,478	49	6
May	6.20	1,368	45	5
June	5.80	1,280	42	5
July	13.80	3,044	100	11
August	7.70	1,699	56	6
September	9.80	2,162	71	8
October	8.00	1,765	58	7
November	12.80	2,824	93	10
December	9.00	1,985	65	7

As is evident in the tables above, the maximum peak demand occurs in July, with a present potential for 10 operations per hour and an ultimate demand potential of 11 peak operations per hour.

AIRPORT DEMAND
VERSUS CAPACITY

The methodology for computing the relationship between an airport's configuration and its theoretical capacity is contained in FAA Advisory Circular AC 150/5060-5, Airport Capacity and Delay. The FAA's Airport Design version 4.2A computer program includes a routine for estimating capacity of small airports that is based on this methodology.

The Annual Service Volume, or ASV, is a calculated reasonable estimate of an airport's total annual capacity, taking into account differences in runway utilization, weather conditions and aircraft mix that might be encountered in a year's time. When compared to the existing or forecast operations of an airport, the ASV will give an indication of the adequacy of the facility in relationship to its activity level.

The ASV for Bisbee Municipal Airport, in its present two-runway crossing configuration, is 230,000 annual operations. The forecasts developed in this study indicate that total annual activity will be about 22,000 operations in the year 2020, or about 9.6% of the airport's ASV.

Bisbee's capacity in terms of operations per hour is estimated as 98 operations per hour in Visual Flight Rules (VFR) conditions, and 59 operations per hour in Instrument Flight Rules (IFR) conditions. The hourly demand estimates developed in this study indicate that hourly activity will not exceed 11 operations during the twenty year planning period.

There are no capacity constraints apparent for the Bisbee Municipal Airport.