

View to the north of the main hangar and tiedown areas

3.1 INTRODUCTION

The planning period for this Master Plan Update covers a 20-year period divided into short-term (2002), medium-term (2007), and long-term (2017). The updated general aviation forecasts for Bagdad Airport include:

- Based Aircraft
- Aircraft Operations
 - Local, itinerant, touch & go
 - VFR/IFR
- Fleet Mix
- Peak Demand

The primary objective of the forecasting effort is to define the magnitude of change that can be expected over time. The Bagdad Airport demand forecasts presented in this chapter are also intended to update the 1982 Master Plan forecasts. This analysis compares activity levels forecast in the 1982 Plan with activity levels actually experienced through 1997.

3.2 GENERAL AVIATION TRENDS

According to the FAA forecasts, the national trends in general aviation aircraft demand from 1978-1988 reflect an average 2.4 percent annual increase. As indicated in the AOPA general aviation trends, dated February 1998, new aircraft shipment levels are also on an upswing, but aircraft registration totals are not improving.

The total number of registration applications received by the federal government averaged 4,490 per month during 1997 and January 1998. However, in 1996, the monthly average totaled 4,669. This represents a 3.9 percent decrease from 1996-1998.¹ In Arizona, according to the 1995 State Aviation Needs Study (SANS), aircraft registrations decreased an average of four percent from 1987 through 1993.

The national general aviation market has been depressed for sometime and the local area has experienced periodic downturns. However, there are strong indications from the community that by providing the appropriate level of facilities, the airport can make substantial service contributions to the locally based aircraft owners, Forest Service Fire Fighting operations, Embry-Riddle Aeronautical University (ERAU) training operations, and Phelps Dodge Bagdad Inc. business charters.

¹ AOPA – Online: Aircraft Owners and Pilots Association, March 21, 1998

3.3 LOCAL TRENDS

According to data available, based aircraft at Bagdad Airport increased between 1980 and 1990 and then decreased between 1990 and 1997 as shown in **Table 3-1**. These fluctuations have seen based aircraft at a peak of 17 and a low of 12. While this trend does not run parallel with past national and state based aircraft level changes, local conditions in this isolated community have also had an impact on based aircraft.

Master Record 5010	Master Record 5010	Master Record 5010	1995 SANS	Master Record 5010 & Airport User
1980	1985	1990	1995	1997
12	15	17	16	14
--	+ 25%	+13%	-6%	-12%

Key factors identified as the most prominent factors influencing based aircraft at Bagdad Airport include:

- **Population and Economic Growth in the Bagdad Area.** Due to Phelps Dodge Bagdad Inc.'s influence in the economy of the town, mining employees' aircraft represent most, if not all of the based aircraft at Bagdad Airport. Similar to other companies around the world, Phelps Dodge Bagdad Inc. (formerly Cyprus Bagdad Mining Company) has experienced a reduction in employees. Therefore, there are less aircraft based at Bagdad Airport.
- **The City of Bagdad's Geographical Location.** Due to its isolation from other communities, aviation becomes a viable method of transportation.
- **The Relative Cost of Owning General Aviation Aircraft.** The real cost of maintaining and owning a general aviation aircraft coupled with the local economic conditions influence the choice to actually own an aircraft. Increased liability costs and lower demand for new single-engine aircraft also influence the number of GA aircraft that are currently airworthy.
- **Favorable Weather and Flying Conditions in Arizona.** Arizona enjoys more than 90 percent VFR (Visual Flight Rules) flying conditions throughout the year. The demand for personal flying is directly influenced by the good weather conditions.

3.4 FORECAST METHODOLOGY

Airport activity forecasts are developed through a combination of mathematical, analytical, and judgmental approaches. The first step in the forecasting process is the assessment of historical trends. Socioeconomic indicators such as population and employment are evaluated for their effect on aviation activity. The comparison of relationships between these indicators provides the initial step in the development of realistic forecasts of aviation demand. The forecasts will focus primarily on aircraft operations and the number and type of based aircraft. In addition, the projections are then evaluated in comparison to forecasts from other sources.

These may include other aviation demand forecasts or projections by governmental agencies for socioeconomic directions. The following summarizes the four primary elements used for determining Bagdad's current and future aviation activity:

- Consideration of current socioeconomic trends.
- Evaluation of available data on historic and current activity.
- Testing of forecasting models (where input data is available).
- Reviewing existing federal, state and local forecasts.

Using a broad spectrum of local, regional and national socioeconomic information and aviation trends, forecasts are developed in several key aviation activity categories, including:

- Based Aircraft and Fleet Mix
- Aircraft Operations by Type
- Operational Peaking Characteristics

The most reliable approach to estimating future aviation demand is to use several different analytical models, and then compare the results. A few more common statistical techniques used in forecasting include, linear and multiple regression analysis, time-series extrapolation, correlation and market-share analysis. The approach taken for the Bagdad Airport aviation activity forecast was a combination of time-series extrapolation and correlation analysis.

Time-Series Extrapolation is probably the simplest most widely used method of forecasting. This technique involves applying historical growth trends to future years. The assumption in this technique is made that the same factors will continue to affect future demand in approximately the same way as they have in the past. This provides a reliable benchmark upon which to compare results of other analyses.

Correlation Analysis examines the direct relationship between two or more sets of historical data. This analysis detects significant correlation between sets of variables.

The results of the forecasting process provide input to the subsequent facility requirements element of the master plan. It is important to note that a forecast is merely a single interpretation of many different outcomes. Therefore, if forecasts appear conservative or overly optimistic, flexibility should be provided for adequate responsiveness.

3.5 SOCIOECONOMIC ACTIVITY

Projections of local socioeconomic elements play an important role in developing aviation projections. Growth in aviation activity is related to a number of factors, including local activity trends. Furthermore, existing population forecasts for the local community and the county help to define the overall growth expectations for the area.

The demographic data for the Bagdad region shown in **Table 3-2** reflect the surrounding areas and local population census. The population growth within Yavapai County has been very consistent since 1970.

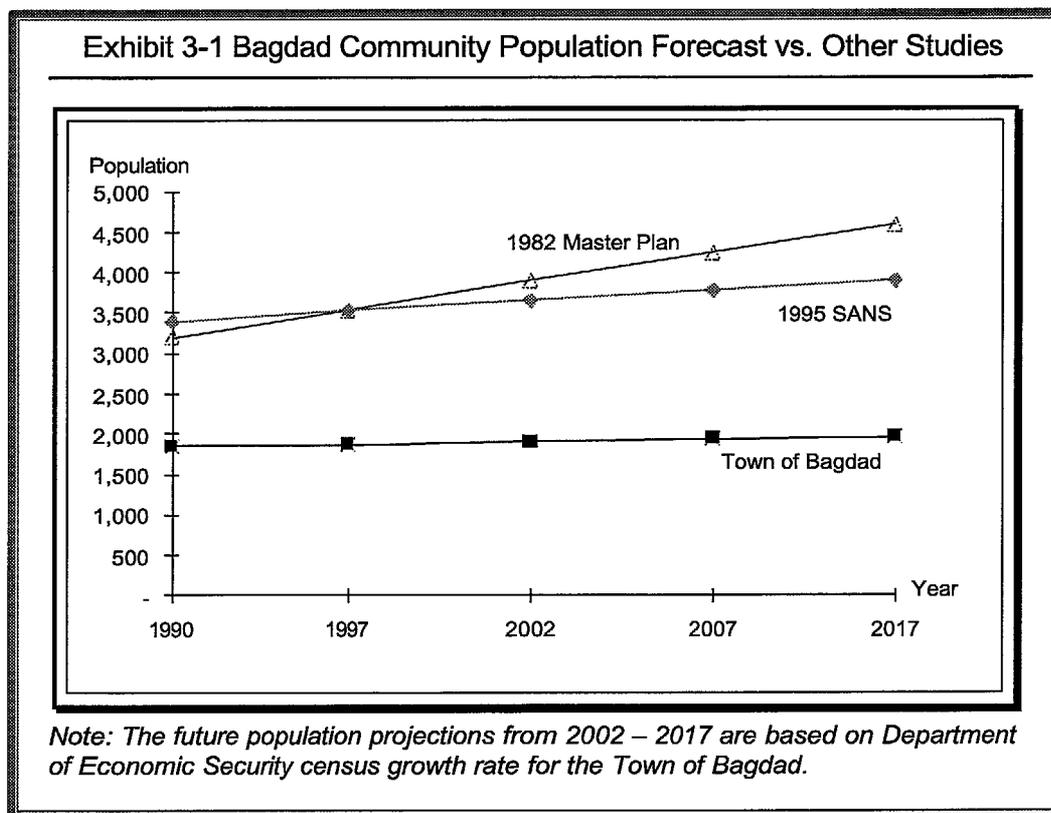
Table 3-2 Bagdad Area Population

Population	1990	1997	2002	2007	2017	Percent Growth
Town of Bagdad	1,858	1,860*	1,908	1,944	1,971	1.9%
Yavapai County	107,714	139,475	150,617	166,634	182,652	19.9%

*Source: Department of Economic Security; 1999 DES Population = 1,861 *DES estimate shown (1860) is lower than local estimate provided (2500)*

The population growth for Yavapai County from 1990 to 1997 was 19.9 percent (1.9 percent for Bagdad). Based on this growth rate, the County population would increase to nearly 183,000 by the year 2017.

This estimate is a simple extrapolation for the year 2017 projection, and is intended only to provide a general indication of potential population increase. The population forecasts for Bagdad were also compared with the 1982 Master Plan forecast and 1995 State Aviation Needs Study (SANS). Shown in **Exhibit 3-1**, both the 1982 Master Plan and SANS projected higher population in 1990.



3.6 AVIATION DEMAND FORECASTS

Activity at Bagdad Airport is almost exclusively general aviation. To properly plan any type facility to accommodate general aviation activity at Bagdad Airport, certain elements need to be included in the forecast:

- Based Aircraft
- Aircraft Fleet Mix
- Annual Aircraft Operations

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft, the growth of other indicators can be projected based on this growth and other factors specific to Yavapai County and the Bagdad area.

3.7 BASED AIRCRAFT FORECAST

The number of based aircraft at any airport is dependent on factors such as the availability of aircraft facilities and services such as fueling or storage, the number of airports in the immediate vicinity, and aircraft ownership trends in the area. Therefore, the first step in projecting based aircraft was to review aircraft ownership data for the Bagdad Area.

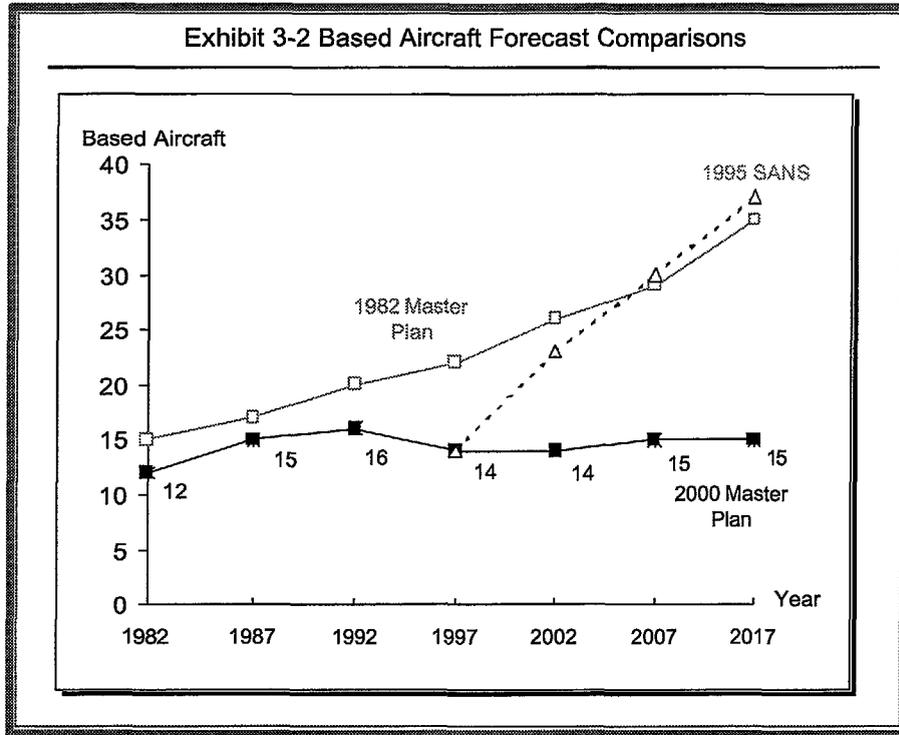
Determining the ratio of based aircraft ownership per 1000 population identifies the relationship between population and based aircraft activity forecasts. Since annual records of based aircraft are not maintained for the airport, the acting airport manager indicated that the FAA Airport Master Record (Form 5010) estimates of based aircraft were reasonably accurate. According to the Forms, there were 14 based aircraft in 1997. The population estimate for the community for 1997 totaled 1,873. This produced a based aircraft ownership ratio of 7.5 aircraft per 1,000 population. While this ratio is considered high, it is representative of an isolated community. Further, it is anticipated that this high aircraft ownership ratio will continue through the planning period resulting in a total projection of 15 based aircraft by the year 2017.

Table 3-3 summarizes the existing and projected population and based aircraft levels for Bagdad. The previous 1982 Master Plan projected based aircraft to grow at the same rate as projected population. However, population projections in the 1982 Plan were higher than those presented in this Plan.

Based Aircraft Forecast	1997	2002	2007	2017
Bagdad Population	1,860	1,908	1,944	1,971
Based Aircraft Forecast	14	14	15	15

**Actual Based Aircraft count from Airport Manager and FAA Form 5010.*

Exhibit 3-2 compares the various based aircraft forecasts to include the previous 1982 Master Plan, 1995 SANS, and the current Plan projections.



3.8 FLEET MIX AT BAGDAD AIRPORT

Aircraft fleet mix expected to operate at the airport is determined in order to plan for the proper types of facilities. The mix of based aircraft at Bagdad Airport was determined by an inventory of the types of aircraft currently based at the airport. Table 3-4 summarizes this fleet mix forecast.

Table 3-4 Based Aircraft Fleet Mix

Type	1997	2002	2007	2017
Single Engine	14	14	15	15
Multi-Engine	0	0	0	0
Turboprop	0	0	0	0
Turbojet	0	0	0	0
Rotorcraft	0	0	0	0
TOTAL	14	14	15	15

Recently, the national aircraft fleet mix has experienced decreases in the percentage of single-engine piston aircraft and increases in the percentage of other aircraft types. The national trend has revealed an increasing percentage of more sophisticated and higher performance aircraft.

In contrast, it is estimated that single-engine aircraft conduct 100 percent of aircraft operations at Bagdad Airport. Further, it is anticipated that this fleet mix will remain unchanged for Bagdad in the future based on the character of the airport and the types of users it serves.

While a twin-engine Piper, owned by the former Cyprus Bagdad was based at the airport prior to 1995, this type of aircraft is not expected to return as a based aircraft in the future

3.9 TYPES OF AIRCRAFT OPERATIONS

Aircraft operations are defined as local or itinerant.

Local Operations: Aircraft operating in the local traffic pattern or within sight of a tower, or aircraft known to be departing for or arriving from flight in local practice areas, or aircraft executing simulated instrument approaches at the airport. Generally, local operations are characterized as training operations.

Itinerant Operations: All aircraft arrivals and departures other than local operations. Itinerant operations are those aircraft operating with a specific destination away from the airport. Typically, itinerant operations increase with increases in business or industrial activity.

Local and itinerant operations are conducted by a variety of airport users. For Bagdad, these users have typically included five groups as described here.

Flight Training at Embry-Riddle Aeronautical University in nearby Prescott. This includes touch-and-go operations, which occur year-round and comprise approximately 60% of local operations on the field.

Recreational Flyers Local residents, including owners of kit and homebuilt aircraft, represent the majority of the recreational flyers. While there are some aircraft that are not currently airworthy, they continue to use tiedown space.

Corporate Aviation. According to airport users, corporate aviation includes Phelps Dodge Bagdad Inc. and other related business charters. The type of aircraft used varies from a King Air to an extended version of the Citation with 10 or less passengers.

Military Operators. Although National Guard helicopters flew into Bagdad Airport in the past, the airport estimates that there have been no military operations within the last five years.

Air Taxi Operators. According to the airport manager, air taxi operations are conducted primarily by the hospital and occur about four or more times a year.

Firefighting Operators. Although the firefighting season changes from one year to another, Bagdad Airport consistently serves firefighting operators.

3.10 OPERATIONS FORECAST

Annual operations are the total number of takeoffs and landings that occur at the airport during the year. Many external factors, as well as the aircraft and airport facilities available influence annual aviation activity.

Generally, an airport of the size and character of Bagdad Airport will have a broad range of activity levels anywhere from 200 to 1000 annual operations per based aircraft (OPBA). The level of aircraft operations at an airport in a rural area can vary significantly as a result of activity such as flight training (GA student pilots, military, etc.) conducted at the airport or businesses with corporate aircraft that fly in regularly rather than drive from large commercial service airports.

For Bagdad, the OPBA averages approximately 200. This OPBA level is projected to continue through the planning period since the character of the airport is expected to remain unchanged.

Since the airport is without a tower, an accurate breakdown of local and itinerant operations is unavailable. However, the airport manager's estimates were used to determine the local/itinerant split for the airport: 65 percent local (flights within a 20-mile radius) and 35 percent itinerant.

Table 3-5A summarizes the operations forecast based on an OPBA of 200 and a local/itinerant split of 65/35 percent.

Tables 3-5B and C provide a more detailed overview of the local/itinerant operations through the planning period.

Current airport operations are estimated at 2,800 annually. This varies considerably from the 14,000 annual operations published in the current FAA Airport Master Record (FAA Form 5010-1). This activity represents a small increase of 6.5 percent over the 2,628 estimated annual operations identified for 1982 (15 years ago) when the last master plan was published.

Military operations are not included since historical operations were minimal, no military activity has occurred recently (last five years), and no military activity is anticipated in the future.

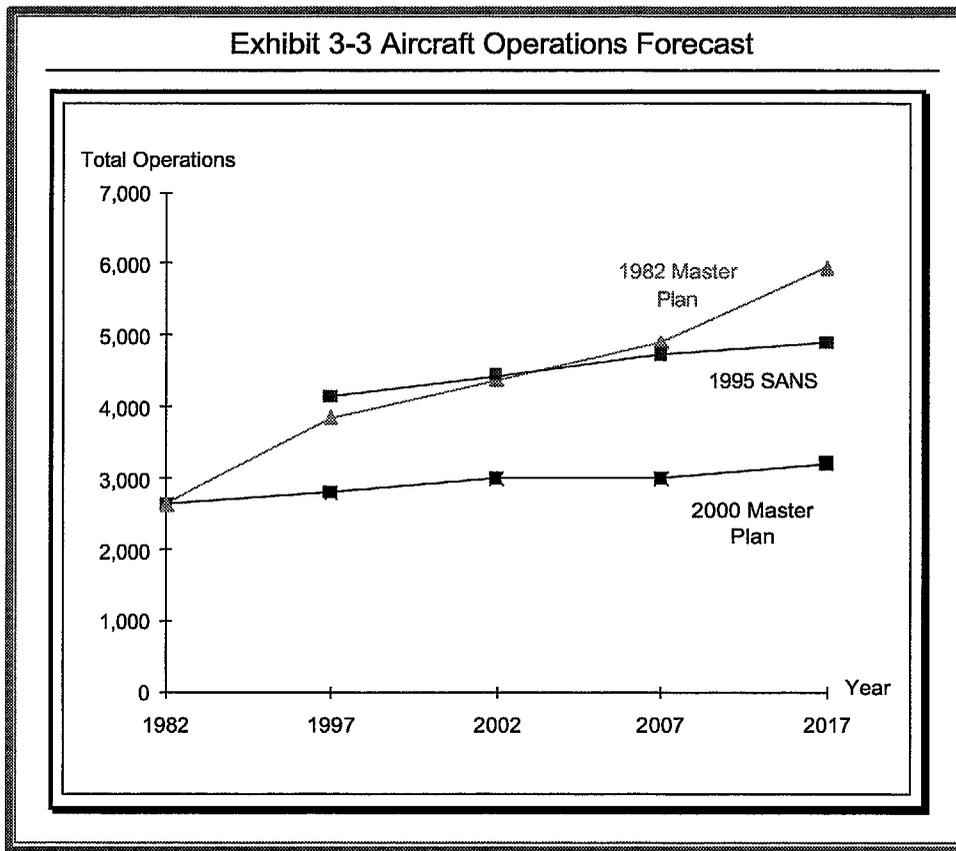
Year	Based Aircraft	Local Operations	Itinerant Operations	Total** Operations
1982	15	1,708	920	2,628*
1997	14	1,820	980	2,800
2002	14	1,820	980	2,800
2007	15	1,950	1,050	3,000
2017	15	1,950	1,050	3,000

**1982 Master Plan Forecast ; ** Based on approximate 200 annual operations per based aircraft*

Year	Touch-and-Go's (60%)	Other Local (40%)	Total Local Operations
1997	1,109	711	1,820
2002	1,109	711	1,820
2007	1,170	780	1,950
2017	1,170	780	1,950

Year	Air Taxi (40%) Charter, Hospital	Other Users (60%) ERAU, Fire	Total Itinerant Operations
1997	389	591	980
2002	389	591	980
2007	430	620	1,050
2017	430	620	1,050

Exhibit 3-3 illustrates the differences between the 1982 Master Plan, 1995 SANS, and the current Master Plan forecast of aircraft operations.



3.11 PEAK DEMAND

The level of activity drives a number of airport facility requirements during peak periods. The periods used in the demand-capacity analyses and the development of airport facility requirements are listed below. According to the FAA publication, *Air Traffic Activity*, the following are standard peak activity factors:

Peak Month

This is the calendar month when peak aircraft operations occur. For planning purposes, the peak month has been estimated at 10 percent of annual operations.

Peak Day

The Design Day is an average day of the peak month or one-thirtieth of the peak month activity. This translates to a Design Day factor of 0.40 percent of annual operations.

Busy Day

The Busy Day operations for a general aviation airport typically will run ten to 20 percent greater than an average day. Since all the other activity characteristics are consistent with the norms at general aviation airports, the busy day operations factor has been assumed to be 115 percent of design day activity. This peaking factor has been projected to remain constant throughout the planning period.

Design Hour

Design Hour operations are used to establish the peak hourly demand affecting airfield and terminal facilities. Current Design Hour operations are estimated to be approximately 10 percent of the design day operations. Design Hour operations will normally range from 10 to 15 percent of average day depending on the total activity. The Design Hour factor will tend to decrease as total activity increases. The Design Hour activity at Bagdad Airport has been projected to remain at its current 10 percent level throughout the planning period.

A summary of the peaking characteristics for Bagdad is presented in **Table 3-6**.

Table 3-6 Peak Activity Forecast

Year	Annual Operations	Peak Month	Design Day	Busy Day	Design Hour
1992	2,628	263	11	12	1
1997	2,800	280	11	13	1
2002	2,800	300	12	13	1
2007	3,000	300	13	15	1
2017	3,000	300	13	15	1

It is important to note that only the peak month is an absolute peak within a given year. All others will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without over-building or being too restrictive. The peaking characteristics of the airport are not expected to change significantly during the planning period.

3.12 SUMMARY

This chapter has provided forecasts for those indicators of aviation demand that are essential to the effective analysis of future facility requirements of Bagdad Airport. The next step in the master planning process is to assess the capacity of the existing facilities and to determine the size and quantities of various aviation facilities that will be necessary to meet future aviation demand. →