CHAPTER TWO: PROJECTIONS OF AVIATION DEMAND

INTRODUCTION

Projecting future aviation demand is a critical element in the overall master planning process. The activity forecasts developed in this chapter will be used in subsequent tasks to analyze the airport's ability to accommodate future activity and to determine the type, size, and timing of future airside and landside facility developments.

This chapter discusses the findings and methodologies used to project aviation demand at Chandler Municipal Airport. It must be recognized that there are always short-term fluctuations in an airport's activity due to a variety of factors that cannot be anticipated. The forecasts developed in this Master Plan Update provide a meaningful framework to guide future Airport development needs and alternatives.

The projections of aviation demand developed for Chandler Municipal Airport are documented in the following sections:

- Regional Demographics
- Historic Aviation Activity
- National Aviation Trends
- FAA Activity Forecasts
- Projections of Aviation Demand
- Critical Aircraft
- Peaking Analysis
- Instrument Approach Forecasts
- Summary

Projections of air cargo operations, as well as military operations are not addressed in this chapter. Chandler Municipal currently has no scheduled air cargo activity. Over the last five years, military activity has averaged only 50 operations per year. Circumstances are not anticipated to change related to air cargo or military activity in the future. Therefore, these two indicators are not included in the projections of aviation demand for Chandler Municipal Airport.

This forecast analysis includes methodologies that consider historical aviation trends at Chandler Municipal Airport and throughout the nation. Local historical data were collected from Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) records, Airport records, and the 1998 Chandler Municipal Airport Master Plan. In addition, demographic data for the City of Chandler and the surrounding Phoenix Metropolitan area were used to track local trends and conditions that can impact general aviation demand levels. Projections of aviation activity for the Airport were prepared for the near-term (2010), mid-term (2015), and long-term (2020 and 2025) timeframes. These projections are generally unconstrained and assume the Airport will be able to develop the facilities necessary to accommodate based aircraft and future operations.

REGIONAL DEMOGRAPHICS

Regional demographic data were examined in the preceding inventory chapter. Where applicable, this demographic data can be used in the master planning process to relate future aviation activity levels at Chandler Municipal Airport to local demographic trends. This analysis examines the historical trends and future projections of the region's population, employment and earnings.

Since 1990 the City of Chandler has been of one of the fastest growing municipalities in the country. Among cities with a population over 100,000, the City of Chandler was the second fastest growing in the country between 1990 and 1996 and the fourth fastest growing between 2000 and 2003 according to the U.S. Census Bureau data.

There are a number of demographic factors that impact, to varying degrees, the demand for general aviation in any particular region. In addition to population trends, regional employment and earnings trends also have an impact on aviation demand. **Table 2.1** presents historic population and employment data for the City of Chandler and Maricopa County. Earnings data is also presented for Maricopa County. For comparison purposes, population, employment and earnings data for the State of Arizona and the United States is also presented.

Data presented in Table 2.1 indicates that from 1990 through 2004 the population of the City of Chandler grew at an average annual rate of 6.71 percent, over twice the annual rate of growth experienced in Maricopa County and the State of Arizona.

Employment growth in the City of Chandler averaged 5.78 percent annually from 1990 to 2004. This rate greatly exceeds the rate of growth for jobs nationally of 1.52 percent and is almost double the rate of job growth experienced in Maricopa County and the State of Arizona.

Statistical analysis typically indicates that regional earnings are one of the most important demographic factors influencing aviation demand. The assumption is made that as earnings, and consequently discretionary income grows, local residents have more to spend on all goods and services, including aviation-related goods and services. Gross earnings in Maricopa County are estimated to have grown at an average annual compound growth rate of 5.61 percent between 1990 and 2004. This is significantly above the national average of 2.91 percent, and slightly above the average for the State of Arizona of 5.06 percent.

Table 2.1
HISTORICAL POPULATION EMPLOYMENT AND EARNINGS DATA

Year	City of Chandler Population	Maricopa County Population	Arizona Population	United States Population
1990	90,533	2,132,249	3,684,097	249,622,814
2000	176,581	2,954,157	5,165,765	282,177,838
2001	190,091	3,029,150	5,297,684	285,093,870
2002	201,262	3,104,077	5,441,125	287,974,001
2003	211,984	3,179,155	5,580,811	290,810,789
2004	224,644	3,254,363	5,707,121	293,545,244
1990 -2004 CAGR	**6.71%**	**3.07%**	**3.18%**	**1.16%**
Year	**City of Chandler Employment**	**Maricopa County Employment**	**Arizona Employment**	**United States Employment**
1990	50,222	1,068,480	1,909,879	139,380,891
2000	100,442	1,543,315	2,819,304	166,758,782
2001	102,865	1,580,553	2,844,359	166,908,258
2002	102,876	1,612,455	2,873,564	167,033,565
2003	105,516	1,653,834	2,953,036	169,545,983
2004	110,262	1,694,213	3,032,571	172,058,819
1990 -2004 CAGR	**5.78%**	**3.35%**	**3.36%**	**1.52%**
Year		**Maricopa County Total Earnings[1]**	**Arizona Total Earnings[1]**	**United States Total Earnings[1]**
1990		$35,133.30	$51,966.82	$4,302,268.33
2000		$68,537.76	$94,139.35	$6,084,932.22
2001		$69,502.39	$95,565.12	$6,143,464.25
2002		$69,857.64	$97,024.24	$6,150,408.14
2003		$72,610.75	$100,028.63	$6,288,178.38
2004		$75,392.34	$103,649.20	$6,426,363.59
1990 -2004 CAGR		**5.61%**	**5.06%**	**2.91%**

CAGR: Compound Annual Growth Rate
SOURCE: Woods & Poole, Inc. City of Chandler Long Range Planning Division April, 2005, U.S. Bureau of Labor Statistics
PREPARED: January 2006
[1] - Millions in 1996 Dollars

Projections of population, employment, and earnings developed for Chandler and Maricopa County indicate that the City and County are expected to experience continued growth in all categories over the forecast period. The population of the City of Chandler is expected continue to grow rapidly over the next several years, and then begin to level off as the amount of developable land within the City of Chandler becomes limited. Maricopa County and the State of Arizona are projected to add population at significantly higher rates than the City of Chandler.

Employment growth in Chandler is projected to outpace population growth in the future. As businesses continue to add jobs, more people are projected to commute to the City of Chandler from surrounding communities. Chandler is home to many fast growing high technology manufacturing companies with Intel being by far the largest employer in the City of Chandler. **Table 2.2** identifies the top employers in the City of Chandler as of early 2006.

Table 2.2
TOP EMPLOYERS IN THE CITY OF CHANDLER

Company	Number of Employees
Intel	5,100
Intel Fab 12 and 22	4,400
Chandler School District	2,400
Countrywide Home Mortgage	2,350
Wells Fargo	2,200
Freescale Semiconductor	1,800
City of Chandler	1,523
Microchip Technology	1,485
Chandler Regional Hospital	1,100
Motorola	1,100
Orbital Sciences	1,100
Verizon Wireless	1,100

SOURCE: City of Chandler Economic Development
PREPARED: March 2006

Employment in the City of Chandler is projected to grow at an average annual rate of 1.67 percent, as opposed to 2.37 percent in Maricopa County, between 2010 and 2025. By comparison, employment in the State of Arizona is expected to grow at a slightly higher average annual rate of 1.97 percent, with the U.S. projected to grow at a slightly lower average annual rate of 1.23 percent. Growth in earnings in Maricopa County and the State of Arizona are both projected to exceed the national average. Earnings in Maricopa County are projected to grow at an average annual rate of 3.20 percent and by 3.06 percent in the State of Arizona. Nationally earnings are projected to grow at an average annual rate of 2.08 percent. **Table 2.3** presents demographic projections for the City of Chandler and Maricopa County. Projected growth rates for the State of Arizona and the U.S. are also included for comparison purposes.

Table 2.3
PROJECTED POPULATION EMPLOYMENT AND EARNINGS DATA

	Year	City of Chandler Population	Maricopa County Population	Arizona Population	United States Population
Historic	2004	220,705	3,524,175	5,707,121	293,545,244
Projected	2010	260,000	4,134,400	6,482,263	311,034,645
	2015	286,600	4,649,250	7,145,207	326,491,564
	2020	287,000	5,164,100	7,821,821	342,544,203
	2025	288,600	5,664,000	8,518,319	359,383,445
2010 - 2025 CAGR		**0.70%**	**2.12%**	**1.93%**	**0.97%**
	Year	**City of Chandler Employment**	**Maricopa County Employment**	**Arizona Employment**	**United States Employment**
Historic	2004	110,262	1,694,213	3,032,571	172,058,819
Projected	2010	134,900	2,112,000	3,510,210	187,135,175
	2015	150,500	2,408,500	3,908,889	199,698,512
	2020	166,100	2,705,000	4,308,251	212,262,142
	2025	173,000	3,002,000	4,708,399	224,825,649
2010 - 2025 CAGR		**1.67%**	**2.37%**	**1.98%**	**1.23%**
	Year		**Maricopa County Total Earnings[1]**	**Arizona Total Earnings[1]**	**United States Total Earnings[1]**
Historic	2004		$75,392.34	$103,649,198	$6,426,363,594
Projected	2010		$92,961.65	$126,422,163	$7,280,034,272
	2015		$109,523.29	$147,820,516	$8,071,704,169
	2020		$128,141.96	$171,811,048	$8,946,968,959
	2025		$149,119.36	$198,770,407	$9,915,861,492
2010 - 2025 CAGR			**3.20%**	**3.06%**	**2.08%**

CAGR: Compound Annual Growth Rate
SOURCE: Woods & Poole, Inc, Maricopa Association of Governments *Interim Socioeconomic Projections*, July 2003 and U.S. Bureau of Labor Statistics
PREPARED: February 2006
[1] - Millions 1996 Dollars

The projected growth rates of these demographics for the City of Chandler and Maricopa County indicate that demand for aviation services in this area will continue to remain strong. These factors will have a significant influence on the projection of aviation activity at Chandler Municipal Airport.

HISTORIC AVIATION ACTIVITY

Historic based aircraft and operations data for Chandler Municipal Airport provides the baseline from which future activity at the Airport can be projected. While historic trends are not always reflective of future periods, historic data does provide insight into how local, regional, and national demographic and aviation-related trends may be tied to the airport. A based aircraft is generally defined as an aircraft that is permanently stored at an airport. An aircraft operation represents either a take-off or landing conducted by an aircraft. For example, a takeoff and a landing would count as two operations.

Historic activity data for Chandler Municipal Airport has been compiled from several sources including Airport and air traffic control tower (ATCT) records. Information from

the Maricopa Association of Governments Regional Aviation System Plan was also used, as applicable.

The number of based aircraft at Chandler Municipal Airport has steadily increased from the year 1990 to 2005, with single-engine aircraft comprising the majority of the Airport's based aircraft fleet. **Table 2.4** presents the number of historical based aircraft by category from 1990 through 2005.

Table 2.4
HISTORIC BASED AIRCRAFT

Year	Single-engine	Multi-engine	Jet	Helicopter	Total Based Aircraft
1990	207	20	0	7	235
2000	358	24	0	10	392
2001	352	26	0	10	388
2002	379	19	0	13	411
2003	387	31	0	15	433
2004	399	31	0	15	445
2005	407	33	1	16	457
CAGR (2000-2005)	**2.60%**	**5.25%**	**N/A**	**9.86%**	**3.12%**
CAGR (1990-2005)	**4.61%**	**3.39%**	**N/A**	**5.67%**	**4.53%**

CAGR: Compound Annual Growth Rate
SOURCE: FAA Form 5010 and Airport Management records
PREPARED: February 2006

Historically the number of based aircraft in all categories has increased since 1990. Helicopters based at the Airport have had the largest average annual rate of growth with the vast majority of helicopters being associated with flight training operators based at Chandler Municipal Airport. The total number of based aircraft at Chandler Municipal Airport has grown at an average annual rate of 4.53 percent increasing from 235 in 1990 to 457 in 2005. Between 2000 and 2005 based aircraft increase at a slower average annual rate of 3.12 percent.

Annual operations represent the number of aircraft takeoffs and landings occurring at the Airport during a calendar year. The historic operations data includes operations conducted by both based aircraft as well as operations conducted by itinerant aircraft stored at other airports arriving at Chandler Municipal Airport for a variety of reasons including business, recreation, or flight training purposes. Historic aircraft operations data for Chandler Municipal Airport are summarized in **Table 2.5**.

Table 2.5
HISTORIC AIRCRAFT OPERATIONS

	ITINERANT OPERATIONS				LOCAL OPERATIONS		
Year	Air Carrier[1]	Air Taxi[2]	General Aviation	Military	General Aviation	Military	Total Operations
1996	0	1,043	59,847	91	95,204	27	156,212
1997	0	1,594	66,863	39	115,624	19	184,139
1998	0	904	67,429	46	128,108	24	196,511
1999	0	1,434	71,467	49	148,020	48	221,018
2000	0	1,771	75,713	25	172,281	21	249,811
2001	0	2,237	64,675	20	165,472	45	232,449
2002	0	1,828	67,302	12	161,377	19	230,538
2003	0	1,939	64,780	10	152,929	13	219,671
2004	0	2,530	61,626	41	168,850	32	233,079
2005	0	2,740	62,826	40	169,489	16	235,111

SOURCE: FAA Air Traffic Activity System
PREPARED: February 2006
[1]This category represents scheduled/non-scheduled charter service
[2]This category represents non-scheduled or for-hire service on aircraft with 60 seats or less

Historically general aviation operations have comprised over 98 percent of total operations at Chandler Municipal Airport. It is important to note the very low level of military activity at the Airport. Local and itinerant general aviation operations have increased continuously since 1996. The data presented from 1996 through 2005 represents full-year actual data as reported by the air traffic control tower. Total operations at Chandler Municipal Airport increased at an average annual rate of 4.65 percent from 1996 through 2005.

NATIONAL AVIATION TRENDS

In preparing the Master Plan for Chandler Municipal Airport, it is important to have a general understanding of recent and anticipated trends in the aviation industry. National trends provide insight for the development of aviation activity projections for the Airport. Some trends in the aviation industry will undoubtedly have a greater impact on Chandler Municipal Airport than others. Since almost all of the activity at Chandler Municipal Airport is associated with general aviation, this section focuses on past and anticipated trends in the general aviation industry.

The aviation industry and general aviation have experienced significant changes over the last 20 years. At the national level, fluctuating levels of general aviation usage caused by economic upturns/downturns resulting from the nation's business cycle have all impacted general aviation demand. At the local level, the explosive population growth in the Phoenix metropolitan area, coupled with solid economic conditions has greatly impacted general aviation demand in the region. This section examines general aviation trends, and the numerous factors that have influenced those trends in the U.S.

Recent trends, both national and local, are important considerations in the development of projections of aviation demand for Chandler Municipal Airport. National trends can provide insight into the potential future of aviation activity and anticipated facility needs. Data sources that were examined and used to support this analysis of national general aviation trends included the following:

- *Federal Aviation Administration, Aerospace Forecasts, Fiscal Years 2006-2017*
- *National Business Aircraft Association (NBAA), NBAA Business Aviation Fact Book, 2004*
- NetJets, Inc.
- *Honeywell Corporation, 2005 Business Aviation Outlook*

General Aviation Overview

General aviation aircraft are defined as all aircraft not flown by commercial airlines or the military. General aviation activity is divided into six use categories, as defined by the FAA. There are more than 18,300 public and private airports located throughout the United States, as reported by the FAA. More than 3,300 of these airports are included in the National Plan for Integrated Airport Systems (NPIAS), indicating their eligibility for federal funding assistance. Commercial service airports, those that accommodate scheduled airline service, represent a relatively small portion (538 or roughly 16 percent) of the airports in the NPIAS. General aviation airports, including relievers such as Chandler Municipal, comprise more than 2,800 facilities within the NPIAS. More than 15,000 additional airports, both private and public use, supplement those airports that are included in the NPIAS.

General Aviation Industry

A pronounced decline in the general aviation industry began in 1978, and lasted throughout most of the 1980s and into the mid-1990s. This decline resulted in the loss of over 100,000 manufacturing jobs and a drop in aircraft production from about 18,000 aircraft annually to only 928 aircraft in 1994. Contributing to the decline in general aviation during this period was the increasing number of liability claims against aircraft manufacturers, the loss of Veterans Benefits that covered many costs associated with student pilot training, and the recessionary economy. Product liability lawsuits arising from aircraft accidents resulted in dramatic increases in aircraft manufacturing costs.

Enactment of the General Aviation Revitalization Act (GARA) of 1994 provided significant relief to the aviation industry. This Act established an 18-year Statute of Repose on liability related to the manufacture of all general aviation aircraft and their components where no time limit was previously established. GARA spurred manufacturers including Cessna and Piper Aircraft to resume production of single-engine piston aircraft. Since 1994, statistics indicate an increase in general aviation activity, an increase in the active general aviation aircraft fleet, and an increase in shipments of fixed-wing general aviation aircraft.

More recently, the terrorist attacks of September 11th, 2001, and the recessionary national economy have had a dampening impact on these positive general aviation industry trends. Significant restrictions were placed on general aviation flying following September 11th, which resulted in severe limitations being placed on general aviation activity in many areas of the country. With the exception of the Washington, D.C. area, most of these restrictions have now been lifted. Business and corporate general aviation have experienced some positive gains resulting from additional use of general aviation aircraft for travel tied in part to new security measures implemented at commercial service airports and the increased personal travel times that have resulted.

Shipments and billings for general aviation aircraft in 2005 indicate that the downturn in general aviation aircraft deliveries from 2001 has clearly reversed. Shipments in 2005 were up 20.8 percent from 2004, with 3,580 aircraft shipped. Billings in 2005 increased 27.2 percent from 2004 to $15.1 billion. Even more notable was that aircraft deliveries and total billings exceeded for the first time levels seen prior to 2001, when 2,999 general aircraft were shipped with total billings of $14.0 billion.

Business Use of General Aviation

Business aviation is one of the fastest growing facets of general aviation. Companies and individuals use aircraft as a tool to improve their businesses efficiency and productivity. The terms business and corporate aircraft are often used interchangeably, as they both refer to aircraft used to support a business enterprise. FAA defines business use as “any use of an aircraft (not for compensation or hire) by an individual for transportation required by the business in which the individual is engaged.” The FAA estimates that business aircraft usage currently comprises more than 11 percent of all aviation activity. The FAA defines corporate transportation as “any use of an aircraft by a corporation, company or other organization (not for compensation or hire) for the purposes of transporting its employees and/or property, and employing professional pilots for the operation of the aircraft.” An additional 12 percent of the nation’s general aviation activity is considered corporate. Regardless of the terminology used, the business/corporate component of general aviation use is one that has experienced significant recent growth.

Increased personnel productivity is one of the most important benefits of using business aircraft. Companies flying general aviation aircraft for business have control of their travel. Itineraries can be changed as needed, and the aircraft can fly into destinations not served by scheduled airlines.

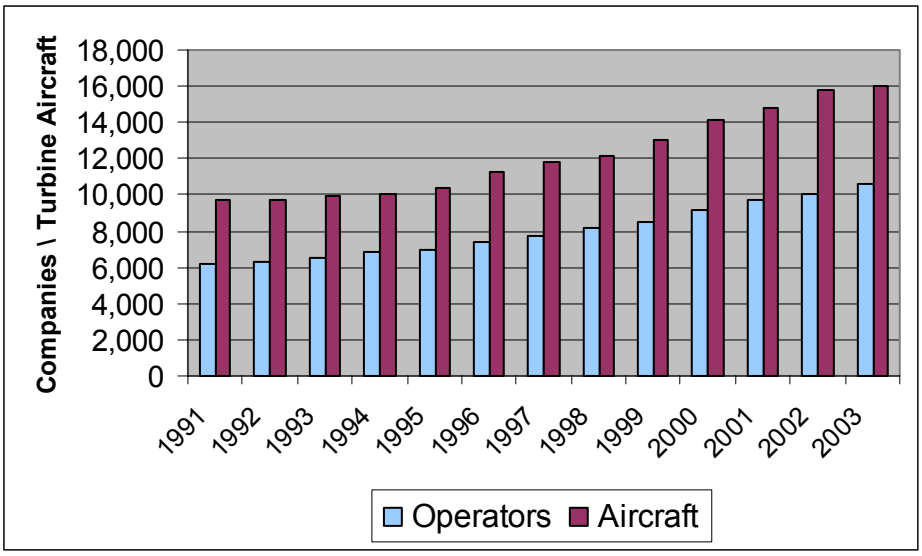
Business aircraft usage provides:

- Employee time savings
- Increased enroute productivity
- Minimized time away from home
- Enhanced industrial security

- Enhanced personal safety
- Management control over scheduling

Many of the nation's employers who use general aviation are members of the National Business Aircraft Association (NBAA). The NBAA's Business Aviation Fact Book 2004 (the latest available in March 2006) indicates that approximately 75 percent of all Fortune 500 businesses operate general aviation aircraft and 92 of the Fortune 100 companies operate general aviation aircraft. Business use of general aviation aircraft ranges from small, single-engine aircraft rentals to multiple aircraft corporate fleets supported by dedicated flight crews and mechanics. General aviation aircraft use allows employers to transport personnel and air cargo efficiently. Businesses often use general aviation aircraft to link multiple office locations and reach existing and potential customers. Business aircraft use by smaller companies has escalated as various chartering, leasing, time-sharing, interchange agreements, partnerships, and management contracts have emerged. Businesses and corporations have increasingly employed business aircraft in their operations. NBAA statistics depicted in **Exhibit 2.1** show the growth in the number of companies operating turbine powered general aviation aircraft and the number of aircraft operated by them for business use.

EXHIBIT 2.1
BUSINESS USE OF GENERAL AVIATION TURBINE AIRCRAFT



SOURCE: National Business Aircraft Association
PREPARED: February 2006

Fractional ownership arrangements have also experienced rapid growth. A fractional ownership arrangement is one in which an individual or corporation purchases at least 1/16th share of an airplane. The aircraft is then placed in a "pool" to share with other owners of aircraft. The pooled aircraft are managed by a company that provides aviation expertise including furnishing and training flight crews, and management services for those owners. NBAA estimated that 2,591 companies used fractional ownership arrangements in 1999; by 2004 that number had grown to 6,217 companies, more than

doubling over the five-year period. In addition, statistics indicate that the number of airplanes in the fractional aircraft fleet has also experienced strong growth over recent years. The principal operators in the fractional jet ownership market include CitationShares, NetJets, Bombardier Flexjet and the Flight Options/Travel Air operations. NetJets, the industry leader in fractional aircraft ownership, has purchased aircraft totaling more than $19 billion in value in the last six years alone. As of February 2006, the company managed a fleet of 624 aircraft with additional aircraft on order.

Other new and growing segments of the business aircraft fleet mix include business liners and a new generation of five to six-seat jets called very light jets (VLJs). Business liners are large business jets, such as the Boeing Business Jet and Airbus ACJ, which are reconfigured versions of passenger aircraft flown by large commercial airlines. VLJs are a relatively new category of aircraft that includes the Adam A-700, Eclipse 500, and Cessna Mustang. These small jets typically cost up to 75 percent less than typical business jet aircraft in terms of acquisition and up to 50 percent less in direct operating costs. The first VLJs are anticipated to be delivered to launch customers in the fall of 2006.

The anticipated changes in the nation's active general aviation fleet, including projected increases in the number of active jet aircraft have the potential to significantly impact aviation activity at Chandler Municipal Airport over the 20-year forecast period. Recent general aviation trends and projected changes in the nation's active general aviation fleet are considered in the projections of aviation demand developed for the Airport.

FAA ACTIVITY FORECASTS

The FAA publishes forecasts on an annual basis that summarize anticipated trends in most components of civil aviation activity. Each published forecast revisits previous activity forecasts and updates them after examining the previous year's trends in aviation and economic activity. Many factors are considered in the FAA's development of forecasts, some of the most important of which are U.S. and international economic growth and anticipated trends in fuel costs. FAA forecasts generally provide one of the most detailed analyses of historic and forecasted aviation trends and provide the general framework for examining future levels of regional and national aviation activity.

Examples of measures of national general aviation activity that are monitored and forecast by the FAA on an annual basis in the FAA Aerospace Forecasts include active pilots, active aircraft fleet, and active hours flown. Historic and projected activity in each of these categories is examined in the following sections. The data presented is based on the most recent available information, contained in *FAA Aerospace Forecasts, Fiscal Years 2006-2017*.

Active Pilots

Active pilots are defined by the FAA as those persons with a pilot certificate and a valid medical certificate. **Table 2.6** summarizes historic and projected U.S. active pilots by certificate type.

Table 2.6
HISTORIC AND PROJECTED U.S. ACTIVE PILOTS
BY TYPE OF CERTIFICATE

Certificate Type	2000	2005	2017 Projection	CAGR 2000 - 2005	CAGR 2005-2017
Students	99,110	87,213	106,164	-2.53%	1.65%
Recreational	340	278	260	-3.95%	-0.56%
Sport Pilot	NA	134	13,600	NA	NA
Private	251,561	228,619	223,750	-1.89%	-0.18%
Commercial	121,858	120,614	154,000	-0.21%	2.06%
Airline Transport	141,598	141,992	144,500	0.06%	0.15%
Rotorcraft only	7,775	9,518	14,700	4.13%	3.69%
Glider only[1]	9,387	21,369	22,440	17.88%	0.41%
Total	**631,629**	**609,603**	**679,414**	**-0.71%**	**0.91%**
Instrument Rated[2]	***315,100***	***311,500***	***390,683***	***-0.23%***	***1.91%***

CAGR: Compound Annual Growth Rate
SOURCE: FAA Aerospace Forecasts, Fiscal Years 2006-2017
PREPARED: February 2006
[1] In March 2001, the FAA Registry changed the definition of this pilot category. It added approximately 13,000 to this category.
[2] Instrument rated pilots should not be added to other categories in deriving total.

As shown in Table 2.6, the FAA projects steady growth in the active pilot population through 2017. Total active pilots are projected to increase from approximately 609,603 in 2005 to 679,414 by 2017, representing a CAGR of approximately 0.91 percent. Of the instrument-rated pilots, an even higher growth rate is anticipated over the same period, at 1.91 percent.

Active Aircraft Fleet

The FAA tracks the number of active general aviation aircraft in the U.S. fleet annually. Active aircraft are those aircraft currently registered and flying at least one hour during the year. **Table 2.7** summarizes recent active aircraft trends as well as FAA projections of future active aircraft, by aircraft type.

Table 2.7
HISTORIC AND PROJECTED U.S. ACTIVE GENERAL AVIATION FLEET MIX

Aircraft Type	2000	2005	2017 Projection	CAGR 2000 - 2005	CAGR 2005-2017
Single-engine Piston	149,422	144,530	149,670	-0.66%	0.29%
Multi-engine Piston	21,091	17,481	17,690	-3.69%	0.10%
Turboprop	5,762	8,030	10,430	6.86%	2.20%
Jet	7,001	8,628	17,270	4.27%	5.95%
Rotorcraft	7,150	7,595	12,685	1.21%	4.37%
Experimental	20,407	22,300	25,730	1.79%	1.20%
Sport Aircraft	N/A	N/A	13,625	N/A	N/A
Other	6,700	6,027	5,675	-2.09%	-0.50%
Total	**217,533**	**214,591**	**252,775**	**-0.27%**	**1.37%**

CAGR: Compound Annual Growth Rate
SOURCE: FAA Aerospace Forecasts, Fiscal Years 2006-2017 and Wilbur Smith Associates
PREPARED: February 2006

General aviation active aircraft trended downward between 2000 and 2005, although there was some evidence of positive growth in certain segments. The number of jet aircraft increased by more than 4 percent, while turboprop aircraft increase by almost 7 percent annually between 2000 and 2005. However, due of the relatively small number of jet and turboprop aircraft in the overall general aviation fleet, the growth in these aircraft could not make up for the overall decline of the active general aviation fleet. Total active aircraft decreased 0.27 percent annually over the last five years, with multi-engine piston aircraft leading the decline. Still, the growth of turboprops and jets is an important trend. The growing numbers or these aircraft indicate a movement in the general aviation community toward higher-performing, more demanding aircraft. The Honeywell Business Aviation Outlook 2005 projects that more than 9,900 new business aircraft will be delivered between 2005 and 2015, excluding business liners. Demand for VLJs is projected to be as high as 4,500 – 5,500 aircraft over the 10-year period. Growth in jet aircraft is projected to significantly outpace growth in all other segments of the general aviation aircraft fleet throughout the planning period.

The other aircraft category expected to experience large growth is sport aircraft. This category of aircraft, created by the FAA in September 2004 through its rulemaking process, targets the recreational segment of aviation, including a sizeable portion of the already existing ultralight community. A major part of the growth of this aircraft category is expected to come from already existing – but not registered – recreational aircraft that register under the new rule.

Active Hours Flown

Hours flown is another statistic used by the FAA to measure and project general aviation activity. Hours flown is a valuable measure because it captures a number of activity-related data including aircraft utilization, frequency of use, and duration of use. Total hours flown in general aviation aircraft have declined from 2000 to 2005 by an

annual average of 1.31 percent, as shown in **Table 2.8**. Part of this decline is a result of the grounding of general aviation following September 11th and follow-on restrictions imposed by the federal government.

Table 2.8
ACTIVE GENERAL AVIATION AND AIR TAXI HOURS FLOWN
(in thousands)

Aircraft Type	2000	2005	2017 Projection	CAGR 2000 - 2005	CAGR 2005-2017
Single-engine Piston	18,089	16,794	19,471	-1.47%	1.24%
Multi-engine Piston	3,400	2,363	2,696	-7.02%	1.10%
Turboprop	1,986	1,967	2,265	-0.19%	1.18%
Jet	2,755	3,008	9,606	1.77%	10.16%
Rotorcraft	2,308	2,440	3,875	1.12%	3.93%
Experimental	1,307	1,417	1,736	1.63%	1.71%
Sport Aircraft	N/A	N/A	1,101	N/A	N/A
Other	374	304	304	-4.06%	0.00%
Total	**30,219**	**28,293**	**41,054**	**-1.31%**	**3.15%**

CAGR: Compound Annual Growth Rate
SOURCE: FAA Aerospace Forecasts, Fiscal Years 2006-2017
PREPARED: February 2006

The FAA projects that hours flown will increase at a compound annual growth rate of 3.15 percent over their 12-year projection period. Compared to the projected average annual growth rate of the general aviation active fleet, approximately 1.37 percent, the projected increase in hours flown represents anticipated increases in aircraft utilization. Hours flown by general aviation aircraft are estimated to reach approximately 41 million by 2017, compared to 28 million in 2005. Part of this activity increase is expected from the introduction of VLJs, the first of which is planned for certification in late 2006. These jets will likely see high rates of utilization as air taxis and by fractional ownership companies.

Summary of FAA Forecasts

The cyclical nature of general aviation activity is illustrated in the historic data presented in this analysis. While general aviation activity experienced rebounded growth during the mid and late-1990s, the terrorist attacks of 2001 and the economic downturn dampened activity over the last several years. FAA projections of general aviation activity, including active pilots, active aircraft, and hours flown, all show varied growth through the FAA's forecast horizon of 2017. Following stalled growth and some declines during 2001 and 2002, most components of general aviation activity are projected to rebound and surpass previous activity levels. An important national trend that has the potential to impact general aviation activity at Chandler Municipal Airport is the growing proportion of small and business jet aircraft in the active general aviation fleet. The ability of Chandler Municipal Airport to accommodate increased activity by general aviation jet aircraft will be an important consideration in the Master Plan.

Another important consideration in the forecasting of aviation demand is the recent dramatic increase in the cost of aviation fuel. The *FAA Aerospace Forecasts, Fiscal Years 2006-2017* indicates that fuel prices are forecast to rise by 21.3 percent in 2005, decline by 9.6 percent in 2006 and then increase at an average annual rate of 0.9 percent over the remainder of the forecast period. In real terms, oil prices are expected to decline at a 1.0 percent annual rate over the forecast period of 2006 – 2017. Currently the record high fuel costs appear to have had little effect on the level of activity at the Chandler Municipal Airport. However continued fuel price increases could significantly reduce future levels of aviation activity particularly that of general aviation both nationally and at Chandler Municipal Airport.

PROJECTIONS OF AVIATION DEMAND

Projections of aviation demand at Chandler Municipal Airport for the forecast period are presented in the following sections:

- Based Aircraft Projections
- Aircraft Operations Projections

Various methodologies were examined and used to develop projections of based aircraft and aircraft operations at Chandler Municipal Airport. The results of these different methodologies are compared and a preferred projection of each is selected.

Based Aircraft Projections

Based aircraft are those aircraft that are permanently stored at an airport. Estimating the number and types of aircraft expected to be based at Chandler Municipal Airport over the forecast period impacts the planning for future Airport facility and infrastructure requirements. As the number of aircraft based at an airport increases, so too does the aircraft storage required at the facility. Based aircraft at the Airport were projected using several different methodologies. Each methodology is summarized and the results presented in following sections. These results are then compared and a preferred based aircraft projection is selected. Additionally the types of aircraft that will be based at the Airport are also included in this forecast. The preferred based aircraft projection for Chandler Municipal Airport will be carried forward in the master planning process for use in the demand/capacity analysis in which the adequacy of existing airfield facilities is evaluated to determine if capacity enhancing projects may be required to accommodate the projected number and types of based aircraft at the Airport.

Projections of based aircraft at Chandler Municipal Airport are discussed in the following sections:

- FAA Projected Growth Rate Methodology
- Regression Methodology
- Trendline Methodology
- Comparison of Based Aircraft Projections
- Projected Fleet Mix

The result of each projection methodology is compared and a preferred projection methodology is selected. Following the selection of the preferred based aircraft projection for the Airport, the based aircraft fleet mix at the Airport is also identified.

FAA Projected Growth Rate Methodology

This based aircraft projection methodology projects based aircraft at Chandler Municipal Airport by assuming that the growth of based aircraft at Chandler Municipal Airport will be equal to the rate forecast in the *FAA Aerospace Forecasts, Fiscal Years 2006-2017* for active general aviation aircraft.

The results of this methodology are summarized in **Table 2.9**.

Table 2.9
BASED AIRCRAFT PROJECTION
FAA PROJECTED GROWTH IN ACTIVE GA AIRCRAFT METHODOLOGY

	Year	Total Based Aircraft
Historic	2005	457
Active GA Aircraft CAGR 2005-2017		**1.37%**
Projected	2010	489
	2015	524
	2020	560
	2025	600

CAGR: Compound Annual Growth Rate
SOURCE: FAA Aerospace Forecasts, FY 2006-2017 Airport Records and Wilbur Smith Associates
PREPARED: March 2006

This methodology projects total based aircraft at Chandler Municipal Airport to grow at an average annual rate of 1.37 percent increasing from 457 in 2005 to 600 in 2025.

Regression Methodology

This methodology uses a mathematical formula to identify a relationship between the number of based aircraft at Chandler Municipal Airport and the population of the City of Chandler. In regression analysis, the value being forecast, the dependent variable is related to an independent or explanatory variable, in this case population. The relationship is estimated using historic data for the independent and dependent variables. The correlation between the variables used in a regression analysis is

measured by the R^2 value called the coefficient of determination. An R^2 value of 0 indicates there is no relationship between changes in the independent and dependent variables. R^2 values near 1.0 indicate a very strong relationship between the variables. The R^2 value derived in this analysis using historic based aircraft and population values is approximately 0.94 indicating a very close relationship between the two historical values. The results of this methodology are presented in **Table 2.10**.

Table 2.10
BASED AIRCRAFT PROJECTION
REGRESSION METHODOLOGY

	Year	Chandler Population	Total Based Aircraft
Historic	1998	161,097	354
	1999	171,047	350
	2000	176,581	392
	2001	190,019	388
	2002	201,262	411
	2003	211,984	433
	2004	224,644	445
	2005	236,601	457
Projected	2010	274,978	512
	2015	282,680	522
	2020	285,048	526
	2025	286,293	527

SOURCE: City of Chandler Long Range Planning Division (April 2005), Airport Records and Wilbur Smith Associates
PREPARED: March 2006

This methodology projects total based aircraft at Chandler Municipal Airport to grow at an average annual rate of 0.72 percent increasing from 457 in 2005 to 527 in 2025. This relatively low growth rate is a result of two periods of decline in the number of based aircraft at the Airport, which occurred during years when the total population of the City of Chandler continued to grow. This projection method assumes that during the forecast period the overall number of based aircraft will increase similar to growth in population.

It is important to note that a regression analysis evaluating the correlation of based aircraft to employment was also reviewed. This correlation was not as good, with the R^2 value of approximately 0.86, indicating less of a correlation than population.

Trendline Methodology

This methodology assumes based aircraft will continue to follow similar patterns of past change either in growth or decline. Based aircraft at Chandler Municipal Airport grew at an average annual rate of approximately 4.53 percent between 1990 and 2005, but only at 3.12 percent from 2000 to 2005. Based on the more recent trend, the average annual growth rate of 3.12 percent was applied to the 2005 base year number to derive

projected based aircraft for the Airport. Using this trendline methodology, total based aircraft at Chandler Municipal Airport are projected to reach 845 by 2025. **Table 2.11** presents detailed results of this methodology.

Table 2.11
BASED AIRCRAFT PROJECTION
TRENDLINE METHODOLOGY

	Year	Total Based Aircraft
Historic	1990	235
	2000	392
	2001	388
	2002	411
	2003	433
	2004	445
	2005	457
Historic Based Aircraft CAGR 2000 – 2005		**3.12%**
Projected	2010	533
	2015	621
	2020	725
	2025	845

CAGR: Compound Annual Growth Rate
SOURCE: Airport Records and Wilbur Smith Associates
PREPARED: February 2006

Due to the strong growth in based aircraft that occurred in the past at Chandler Municipal Airport, this methodology projects that the total number of based aircraft will almost double over the forecast period.

Comparison of Based Aircraft Projections

Table 2.12 shows the three based aircraft projection methodology results and compares them to the FAA's TAF projections for Chandler Municipal Airport and the 2005 Maricopa Association of Governments' Regional Aviation System Plan (RASP) Update. Average annual growth rates of the based aircraft projections from the Master Plan ranged from 0.72 percent to 3.12 percent. The FAA TAF forecasts based aircraft at Chandler Municipal Airport to grow at an average annual rate of 2.44 percent between 2005 and 2025. Population and employment for Chandler and the surrounding area are projected to experience continued robust growth. This coupled with forecast national trends of increased utilization of general aviation aircraft for business purposes point to continued strong growth in the number of aircraft based at Chandler Municipal Airport.

To develop the preferred based aircraft projection, the FAA's TAF growth rate of 2.44 percent was applied to the actual 2005 based aircraft. This approach yields a 20-year projection of 740 based aircraft. These results are consistent with historical growth

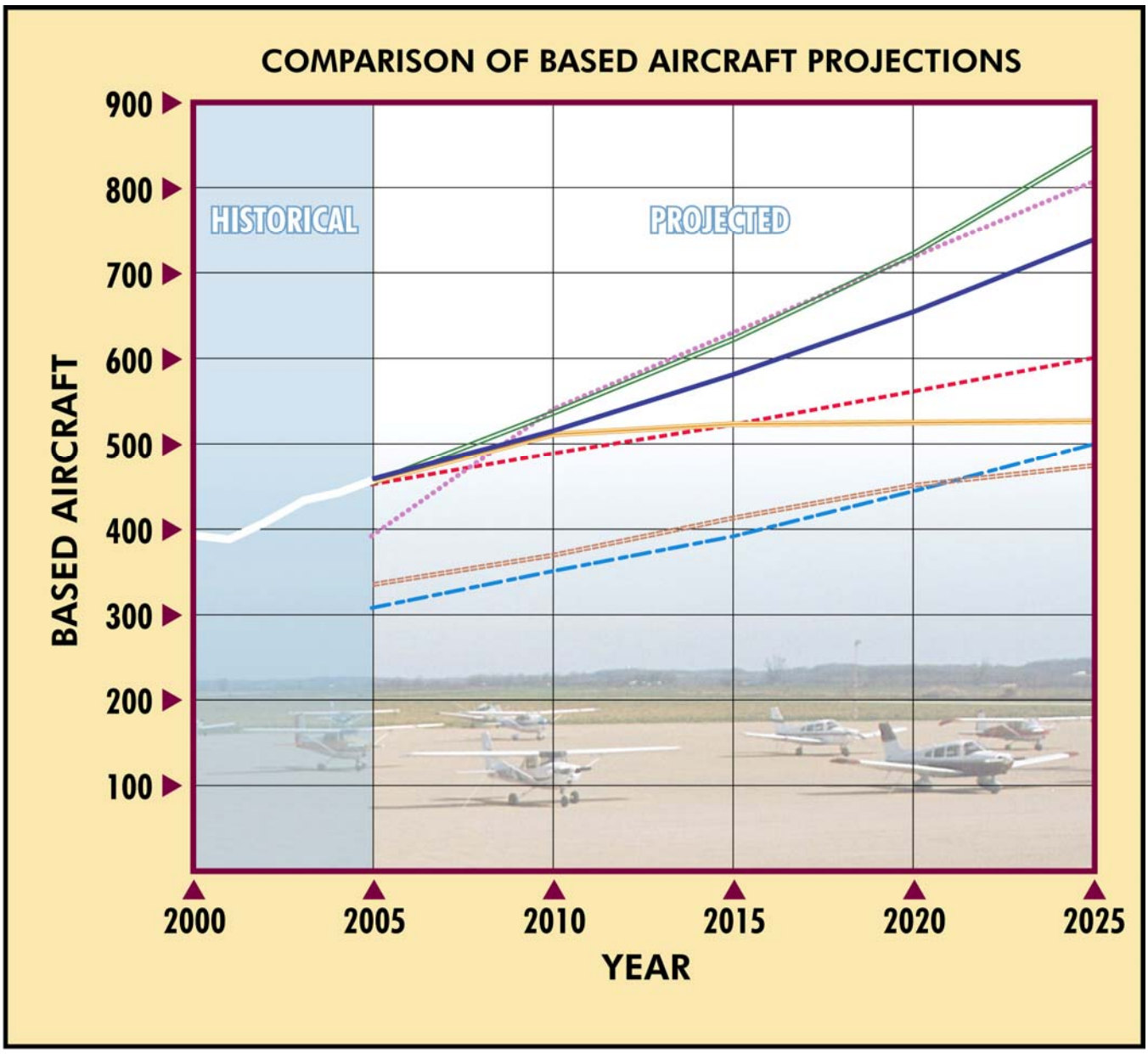
patterns at the Airport, growth projected as part of a regional analysis, and the FAA's projected rate of growth for Chandler Municipal Airport.

Table 2.12
COMPARISON OF BASED AIRCRAFT PROJECTIONS

	Year	FAA Projected Growth Rate Methodology	Regression Methodology	Trendline Methodology	FAA TAF Forecast[1]	MAG RASP[2]	1998 Master Plan Forecast[3]	Preferred Projection
Historic	2005	457	457	457	308	392	330	457
Projected	2010	489	512	533	349	539	370	515
	2015	524	522	621	392	629	410	581
	2020	560	526	725	444	718	450	656
	2025	600	527	845	499	807	480	740
CAGR		**1.37%**	**0.72%**	**3.12%**	**2.44%**	**2.93%**	**1.89%**	**2.44%**

CAGR: Compound Annual Growth Rate
SOURCE: Airport Records, Wilbur Smith Associates, FAA TAF, Maricopa Association of Governments
PREPARED: March 2006
[1] The FAA's TAF issued February 2006 uses a 2005 based aircraft figure of 308.
[2] The MAG RASP base year was 2000 when the Airport had 392 aircraft; the MAG RASP projected 450 based aircraft in 2005.
[3] The 1998 Master Plan update forecast base year was 1996 when the Airport had 254 based aircraft; the forecast projected 450 based aircraft in 2020.

The results of these based aircraft projection methodologies are depicted in **Exhibit 2.2**.



Legend

- FAA Projected Growth Rate Methodology
- Regression Methodology
- Trendline Methodology
- FAA TAF Forecast
- MAG RASP
- 1998 Master Plan Forecast
- Preferred Projection

EXHIBIT 2.2
Based Aircraft Projections

Wilbur Smith Associates

Projected Fleet Mix

To develop a projection of the Airport's based aircraft fleet mix, the preferred based aircraft forecast for Chandler Municipal Airport was allocated to five aircraft categories – single-engine, multi-engine, jet, helicopter, and other. The fleet mix projections were developed based on the fleet mix percentages exhibited at the Airport in 2005 and the *FAA Aerospace Forecast FY 2006-2017* projection of active general aviation aircraft. The 2005 based aircraft fleet mix at Chandler Municipal Airport is summarized below:

- Single-engine aircraft – 89.1 percent of total based aircraft
- Multi-engine aircraft – 7.2 percent of total based aircraft
- Jet aircraft – 0.2 percent of total based aircraft
- Helicopters – 3.5 percent of total based aircraft
- Other – 0 percent of total based aircraft

The projected general aviation fleet mix from the *FAA Aerospace Forecast FY 2006-2017* is presented in **Table 2.13**. The projection indicates that single-engine and multi-engine piston aircraft will make up a smaller percentage of the overall fleet declining by 8.14 percent and 1.15 percent, respectively. Jet aircraft are expected to comprise a larger portion of the general aviation fleet increasing from 4.02 percent to 6.83 percent of the overall active general aviation fleet.

Table 2.13
PROJECTED CHANGE IN U.S. ACTIVE GENERAL AVIATION FLEET MIX

Aircraft Type	2005	2017 Projection	2005 Percent of Total	2017 Percent of Total	2005 - 2017 Percent Change
Single-engine Piston	144,530	149,670	67.35%	59.21%	**-8.14%**
Multi-engine Piston	17,481	17,690	8.15%	7.00%	**-1.15%**
Turboprop	8,030	10,430	3.74%	4.13%	**0.38%**
Jet	8,628	17,270	4.02%	6.83%	**2.81%**
Rotorcraft	7,595	12,685	3.54%	5.02%	**1.48%**
Experimental	22,300	25,730	10.39%	10.18%	**-0.21%**
Sport Aircraft	N/A	13,625	N/A	5.39%	**N/A**
Other	6,027	5,675	2.81%	2.25%	**-0.56%**
Total	**214,591**	**252,775**			

SOURCE: FAA Aerospace Forecasts, Fiscal Years 2006-2017 and Wilbur Smith Associates
PREPARED: February 2006

Based on the FAA projections presented above, projected regional aviation trends, and recent changes at the Chandler Municipal Airport, small business jet aircraft are expected to make up a larger percentage of the total based aircraft. With the introduction of VLJs and the many large corporations based in the Chandler area, this trend is expected to increase the number of based small business jets at the Airport. The preferred based aircraft fleet mix projections are presented in **Table 2.14**.

Table 2.14
PREFERED BASED AIRCRAFT FLEET MIX PROJECTION

	Year	Total Based Aircraft	Single-engine	Multi-engine	Jet	Helicopter	Other[1]
Historic	2005	457	407	33	1	16	0
Projected	2010	515	453	37	3	18	4
	2015	581	506	42	6	20	7
	2020	656	565	47	10	23	11
	2025	740	630	53	15	26	16
2005 – 2025 CAGR		**2.44%**	**2.21%**	**2.44%**	**14.50%**	**2.44%**	**N/A**

CAGR: Compound Annual Growth Rate
SOURCE: Airport Records and Wilbur Smith Associates
PREPARED: March 2006
[1] Includes aircraft in the Sport Aviation Category

Aircraft Operations Projections

Many different factors impact the number of aircraft operations at an airport, including but not limited to, total based aircraft, area demographics, activity and policies at neighboring airports, and national aviation trends. These factors are considered in the following methodologies used to develop projections of future aircraft operations at Chandler Municipal Airport.

Projections of future operations at Chandler Municipal Airport are discussed in the following sections:

- Operations Per Based Aircraft Methodology
- Market Share Methodology
- Population Growth Methodology
- Comparison of Aircraft Operations Projections
- Preferred Aircraft Operations Projection
- Projected Local/Itinerant Split
- Projected Fleet Mix

The result of each projection methodology is compared and a preferred projection methodology is selected. Following the selection of the preferred operations projection for the Airport, the local/itinerant split at the Airport is also identified. Due to the low level of military activity at the Airport (typically less than 100, and more recently a five-year average of 50, military operations have not been separated for this analysis. The preferred aircraft operations projection for Chandler Municipal Airport will be used to

conduct a demand/capacity analysis in which the adequacy of existing airfield facilities will be evaluated to determine if capacity enhancing projects may be required to support future levels of aircraft operations at the Airport.

Operations Per Based Aircraft Methodology

The operations per based aircraft (OPBA) methodology is recognized by the FAA as an accepted means for relating the total number of aircraft operations to a known variable, in this case, based aircraft. OPBA is calculated by dividing the number of total general aviation operations that occur at an airport by the number of aircraft based at the airport. Total operations at Chandler Municipal Airport are projected by applying the Airport's OPBA ratio to the preferred projection of based aircraft. The OBPA ratio for this analysis was determined by averaging the historic OPBA ratios from 1998 through 2005. The details of this calculation are presented in **Table 2.15**. The results of this projection methodology are presented in **Table 2.16**.

Table 2.15
AVERAGE OPBA

Year	Based Aircraft	Aircraft Operations	OPBA
1998	354	196,511	555
1999	350	221,018	631
2000	392	249,811	637
2001	388	232,449	599
2002	411	230,538	561
2003	433	219,671	507
2004	445	233,079	524
2005	457	235,111	514
Average Operation Per Based Aircraft			**566**

SOURCE: FAA Air Traffic Activity System, February 2006 Airport Records and Wilbur Smith Associates
PREPARED: March 2006

Table 2.16
AIRCRAFT OPERATIONS PROJECTION
OPBA METHODOLOGY

	Year	Based Aircraft	OPBA	Aircraft Operations[1]
Historic	2005	457		235,111
Projected	2010	515	500	257,500
	2015	581	485	281,800
	2020	656	470	308,300
	2025	740	460	340,400

SOURCE: Airport Records and Wilbur Smith Associates
PREPARED: March 2006
[1] All aircraft operations forecasts have been rounded to the nearest hundred.

With a declining OPBA over the 1998 through 2005 period, a similar decline was projected to occur as the rate of based aircraft increases at the Airport. The Airport's OPBA was projected to decline at half of the rate that has been experienced over the

period due to the FAA's projection of a significant increase in the number of hours flown. The OPBAs were multiplied by the preferred based aircraft projection to obtain the projection of aircraft operations. Using this methodology, aircraft operations grow at an average annual rate of 1.87 percent increasing from 235,111 in 2005 to 340,400 in 2025.

Market Share of FAA Hours Flown Methodology

This aircraft operations projection methodology was based on the FAA's forecast of active general aviation and air taxi hours flown. The FAA Aerospace Forecasts, FY 2006-2017 estimates general aviation hours flown will grow at an average annual rate of 3.15 percent between 2005 and 2017. To identify general aviation hours flown through 2025, the 2017 value forecast by the FAA was grown at an annual rate of 3.15 percent. It was assumed that Chandler Municipal Airport would maintain its ratio of operations to the number of hours flown nationally by general aviation and air taxi aircraft. In 2005, that ratio was approximately 0.83 percent. The average ratio between 2000 and 2005 was 0.84 percent. Operations at Chandler Municipal Airport are projected by maintaining the average ratio of national hours flown and operations at Chandler Municipal Airport throughout the forecast period. Detailed results of this methodology are shown in **Table 2.17**.

Table 2.17
PROJECTED AIRCRAFT OPERATIONS
MARKET SHARE OF FAA HOURS FLOWN METHODOLOGY

	Year	FAA Active General Aviation and Air Taxi Hours Flown	Chandler Municipal Airport Operations	CHD's Share of FAA Active General Aviation and Air Taxi Hours Flown
Historic	2000	30,219,000	249,811	0.83%
	2001	27,016,000	232,449	0.86%
	2002	27,039,000	230,538	0.85%
	2003	27,483,000	219,671	0.80%
	2004	27,255,000	233,079	0.86%
	2005	28,293,000	235,111	0.83%
Average				**0.84%**
Projected	2010	33,315,000	279,800	0.84%
	2015	38,977,000	327,400	0.84%
	2020	45,057,000	378,500	0.84%
	2025	52,614,000	442,000	0.84%

SOURCE: FAA Air Traffic Activity System, February 2006, FAA Aerospace Forecasts, FY 2006-2017 and Wilbur Smith Associates
PREPARED: March 2006

This methodology projects total operations at Chandler Municipal Airport to grow at a compound average annual rate of 3.21 percent increasing from 235,111 in 2005 to 442,000 in 2025.

Population Growth Methodology

This methodology assumes that operations at Chandler Municipal Airport will grow at the same rate projected for the population of the City of Chandler. An aircraft operations projection was developed for Chandler Municipal Airport based on long range population projections prepared by City of Chandler Long Range Planning Division. This projection indicates the population of the City of Chandler will grow at an average annual rate of 1.29 percent from 2004 through 2025. The results of the population methodology are summarized in **Table 2.18**.

Table 2.18
AIRCRAFT OPERATIONS PROJECTION
POPULATION GROWTH METHODOLOGY

	Year	Total Aircraft Operations
Historic	2005	235,111
Projected Population Growth Rate 2004-2025		**1.29%**
Projected	2010	250,700
	2015	267,200
	2020	284,900
	2025	303,800

SOURCE: City and Chandler Long Range Planning Division April 2005, FAA Air Traffic Activity System, February 2006 and Wilbur Smith Associates
PREPARED: March 2006

The results of this methodology indicate that as the population of the City of Chandler grows during the forecast period, total aircraft operations at Chandler Municipal Airport will increase at the same rate reaching a total of 303,800 operations in 2025, representing a CAGR of 1.29 percent.

Comparison of Aircraft Operations Projections

Table 2.19 presents the results of the different aircraft operations projection scenarios examined in this analysis, as well as summarizes and compares with forecasts for Chandler Municipal Airport from the FAA TAF and the MAG Regional Aviation System Plan (RASP) Update. The compound average annual growth rates from the methodologies ranges from 1.29 percent based on the City of Chandler's projected population growth to 3.21 percent based on the FAA's projection of hours flown.

Table 2.19
COMPARISON OF AIRCRAFT OPERATIONS PROJECTIONS

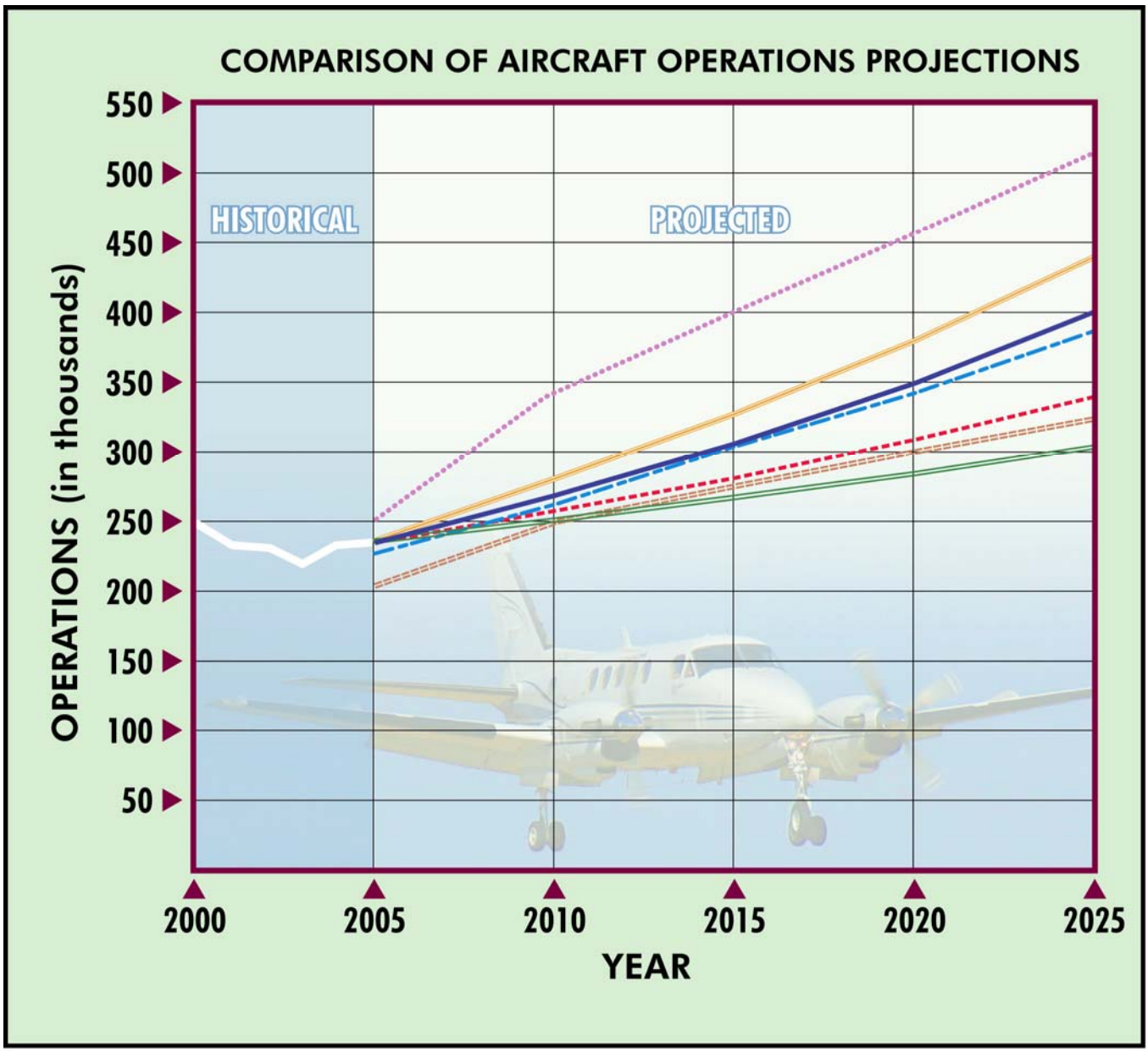
	Year	OPBA	Share of FAA Hours Flown Forecast	Population Growth	FAA TAF	MAG RASP	1998 Master Plan Forecast	Preferred Projection
Historic	2005	235,111	235,111	235,111	227,150	249,811	205,000	235,111
Projected	2010	257,500	279,800	250,700	263,183	343,700	250,000	268,600
	2015	281,800	327,400	267,200	302,364	400,600	275,000	306,900
	2020	308,300	378,500	284,900	342,026	457,600	300,000	350,600
	2025	340,400	442,000	303,800	387,126	514,400	325,000	400,600
CAGR 2005-2025		**1.87%**	**3.21%**	**1.29%**	**2.70%**	**2.93%**	**2.33%**	**2.70%**

CAGR: Compound Annual Growth Rate
SOURCE: Airport Records, FAA Air Traffic Activity System, February 2006 and Wilbur Smith Associates
PREPARED: March 2006

The results of these aircraft operations projections are depicted in **Exhibit 2.3**.

Similar to the projections developed by the FAA in the TAF for based aircraft, the FAA's projections for aircraft operations were not developed based on up-to-date aircraft operations information as provided by the air traffic control tower. The FAA TAF forecasts aircraft operations at Chandler Municipal Airport to grow at an average annual rate of 2.70 percent between 2005 and 2025. As previously noted, the area surrounding Chandler is projected to experience continued robust growth. This coupled with forecast national trends of increased utilization of general aviation aircraft for business purposes point to continued strong growth in aircraft operations at Chandler Municipal Airport.

To develop the preferred operations projection, the FAA's TAF growth rate of 2.44 percent was applied to the actual 2005 annual operations. This approach yields a 20-year projection of 400,600 annual operations. These results are consistent with historical growth patterns at the Airport, growth projected as part of a regional analysis, and the FAA's projected rate of growth for Chandler Municipal Airport.



Legend

- OPBA
- Share of FAA Hours Flown Forecast
- Population Growth
- FAA TAF Forecast
- MAG RASP
- 1998 Master Plan Forecast
- Preferred Projection

EXHIBIT 2.3
Aircraft Operations Projections

Wilbur Smith Associates

Projected Local/Itinerant Split

An important consideration when examining historic and projected Airport operations is whether they are local or itinerant. Local operations are those operations conducted by aircraft remaining in the Airport's traffic pattern. It should be noted that almost all local operations are training-related, whether it is primary flight training or proficiency training that is occurring. Itinerant operations are those conducted by aircraft coming from outside the traffic pattern. Changes in the local/itinerant operations split at an airport are an indicator of changes in the nature of activity occurring at the facility. **Table 2.20** shows the percentage split between itinerant and local traffic at Chandler Municipal Airport from 1996 to 2005, as well as the overall average for all years.

Table 2.20
HISTORIC LOCAL AND ITINERANT OPERATIONS

Year	Itinerant Operations	Local Operations	Total Operations	Itinerant Percent	Local Percent
1996	60,981	95,231	156,212	39.04%	60.96%
1997	68,496	115,643	184,139	37.20%	62.80%
1998	68,379	128,132	196,511	34.80%	65.20%
1999	72,950	148,068	221,018	33.01%	66.99%
2000	77,509	172,302	249,811	31.03%	68.97%
2001	66,932	165,517	232,449	28.79%	71.21%
2002	69,142	161,396	230,538	29.99%	70.01%
2003	66,729	152,942	219,671	30.38%	69.62%
2004	64,197	168,882	233,079	27.54%	72.46%
2005	65,606	169,505	235,111	27.90%	72.10%
Average	**53,383**	**159,716**	**213,098**	**31.97%**	**68.03%**

SOURCE: FAA Air Traffic Activity System, February 2006
PREPARED: March 2006

Since 1996 the percentage of local flights has fluctuated from a high of 72.46 percent to a low of 60.96 percent, and overall has grown significantly each year, reflecting an increase in flight training and proficiency flights at the Airport. Local operations have increased from 60.96 percent in 1996 to 72.10 percent in 2005.

For the projection of itinerant and local traffic, it was assumed that the current ratio recorded for 2005 would continue throughout the planning period. This was based on the fact that the average is relatively close to the current split between local and itinerant operations, and that training a proficiency flights are forecast to remain a large component of the overall operations at the Chandler Municipal Airport. The results of these projections are shown in **Table 2.21**.

Table 2.21
LOCAL AND ITINERANT OPERATION PROJECTIONS

	Year	Itinerant Operations	Local Operations	Total Operations	Itinerant Percent	Local Percent
Historic	2005	65,606	169,505	235,111	27.90%	72.10%
Projected	2010	74,939	193,661	268,600	27.90%	72.10%
	2015	85,625	221,275	306,900	27.90%	72.10%
	2020	97,817	252,783	350,600	27.90%	72.10%
	2025	111,767	288,833	400,600	27.90%	72.10%

SOURCE: FAA Air Traffic Activity System, February 2006 and Wilbur Smith Associates
PREPARED: February 2006

CRITICAL AIRCRAFT

The development of airport facilities is impacted by both the demand for those facilities, typically represented by total based aircraft and operations at an airport, as well as the type of aircraft that are expected make use of those facilities. In general, airport infrastructure components are designed to accommodate the most demanding aircraft, referred to as the critical aircraft, which will utilize the infrastructure on a regular basis. The factors used to determine an airport's critical aircraft are the approach speed and wing span of the most demanding class of aircraft that is anticipated to perform at least 500 annual operations at the airport during the planning period.

The FAA groups aircraft into Aircraft Categories and Airplane Design Groups based on their approach speed and wingspan, respectively. The criteria for these categories are presented in **Table 2.22**.

Table 2.22
AIRCRAFT CATEGORIES AND DESIGN GROUPS

Aircraft Category	Approach Speed	Example
A	< 91 knots	Cessna 172
B	91 to < 121 knots	King Air 200
C	121 to < 141 knots	B737
D	141 to < 166 knots	B767
E	166 knots or more	SR-71
Airplane Design Group	**Wingspan**	**Example**
I	< 49 feet	Cessna 172
II	49 to < 79 feet	King Air 200
III	79 to < 118 feet	B737
IV	118 to < 171 feet	B767
V	171 to < 197 feet	B747
VI	197 to < 262 feet	A380

SOURCE: FAA
PREPARED: March 2006

Specific aircraft within these aircraft categories and airplane design groups are depicted in **Exhibit 2.4**.

After identifying an airport's critical aircraft, it is then possible to determine the facility's Airport Reference Code (ARC). The ARC is a coding system that relates airport design criteria to the operational and physical characteristics of the airplanes that are intended to operate at an airport. An airport's ARC is a composite designation based on the Aircraft Category and Airplane Design Group of that airport's critical aircraft.

For Chandler Municipal Airport, the most recent airport layout plan (ALP) completed in May 2000 lists the existing critical aircraft to be the Beech King Air. The most demanding aircraft in this series is the King Air 350, which has an approach speed of 109 knots and a wing span of 57.9 feet. These measurements produce an ARC of B-II.

Based on available operating data at the Airport and through discussions with Airport operators and personnel, larger aircraft are operating at the Airport on a more frequent basis, especially during the winter season. These aircraft include Learjets (24, 25A, and 45), Gulfstream IVs, and Canadair CL-600s. These aircraft have approach speeds that equate to the C and D category and airplane design groups II and III. It is highly likely that as business in and around Chandler continue to grow that the Airport will experience more operations from larger and faster aircraft. The critical aircraft selected for purposes of the Master Plan for Chandler Municipal Airport is the Cessna Citation X, which falls in the C-II category. It should be noted, however, that larger aircraft such as the Gulfstream IV (ARC D-II) could utilize the Airport on a regular basis, defined by the FAA as 500 annual operations. Analysis of the facility differences between C-II and D-II will be conducted in a subsequent chapter.

PEAKING ANALYSIS

Another primary consideration for facility planning at airports relates to the peak hour, also referred to as design level, activity. This operational characteristic is important to understand because some facilities should be sized to accommodate the peaks in activity, for example, the aircraft apron or terminal areas. Standard airport planning practices use the peak hour of the average day of the peak month (ADPM) as the peak level to plan for instead of the absolute peak level that occurs throughout the entire year.

Historical operations data available from the FAA Air Traffic Activity Systems (ATADS) database was used to identify the peak month of activity at Chandler Municipal Airport. Based on monthly data for federal fiscal years 1996 to 2005, the peak month averages 9.7 percent of the annual operations. The actual month with the peak has included both March and May, both of which have 31 days in them. Therefore, to determine the average or design day of the peak month (ADPM) the peak month value was divided by 31. In addition to average day, a busy day calculation was conducted. The busy day occurs during a typical week in the peak month. Through discussions with air traffic

control tower staff and review of daily operations during typical months, it was determined that the busy day typically represented approximately 33 percent higher operations than the average day. This rate of increase for the busy day was assumed to continue throughout the planning period. The peak or design hour was assumed to equal 15 percent of the ADPM based upon observation and consultant experience at airports with similar activity levels and roles. **Table 2.23** presents the results of this peaking analysis.

Table 2.23
PEAK ACTIVITY FORECAST

	Year	Annual Operations	Peak Month	Average Day	Busy Day	Peak Hour
Historic	2005	235,111	20,730	669	891	100
Projected	2010	268,600	26,054	840	1,120	126
	2015	306,900	29,769	960	1,280	144
	2020	350,600	34,008	1,097	1,460	165
	2025	400,600	38,858	1,253	1,660	188

SOURCE: 1995 – 2005 FAA Air Traffic Activity System and Wilbur Smith Associates
PREPARED: March 2006

INSTRUMENT APPROACH FORECASTS

Forecasts of annual instrument approaches are used by the FAA in evaluating an airport's requirements for navigational aid facilities. The FAA defines an instrument approach as an approach to an airport with the intent to land by an aircraft in accordance with an instrument flight rule (IFR) flight plan, when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

Historical data on instrument approaches at Chandler Municipal Airport were gathered from the FAA ATADS database from 1996 through 2005 (calendar year). **Table 2.24** presents this historical data as well as the projection of annual instrument operations through 2025. To project future annual instrument operations, the ratio of instrument operations to total operations was considered. Since 1996, this ratio has increased from 0.25 percent to 0.75 percent, a compound annual growth rate of 4.41 percent. To project future instrument operations, a similar increase was anticipated over the 20-year planning period, increasing the percentage of total operations that are instrument approaches from 0.75 percent in 2005 to 1.00 percent in 2025.

AIRCRAFT WINGSPAN (Airplane Design Group)
I
Less than 49'
II
49' to 79'
III
80' to 118'
IV
119' to 170'
V
171' to 214'
AIRCRAFT APPROACH SPEED (Aircraft Approach Category)
A
Less than 91 kts
B
91 to 120 kts
Weigh less than 12,500 lbs.
Weigh greater than 12,500 lbs.
C & D
121 to 166 kts
Beech Bonanza
Cessna 150
Cessna 177
Embraer-820
Beech E18S
Britten-Norman BN-2A
Pilatus PC-6
Raytheon E-18
Fairchild C-121
DHC-7
Douglas DC-3
Cessna 402
Cessna Citation I
Piper 31-310 Navajo
Rockwell International 690A
Beech King Air C90-1
Cessna-441 Conquest
Rockwell 840
Dassault Falcon 10
Gates Learjet 28/29
Mitsubishi MU 300
Rockwell Sabre 60
Cessna Bravo, Encore, Excel
Dassault Falcon 200, 900
Grumman Gulfstream I
Saab SF 340
BAE 146-100
Convair 240, 340, 440
Dassault Mercure
Saab 2000
Bombardier 60
Gates Learjet 25, 35A, 55
Israeli Westwind
Rockwell Sabre 75A
Canadair CL-600
Cessna Citation X
Grumman Gulfstream II, III
Rockwell Sabre 80
Boeing 737-100,200,300,400
Bombardier Global Express
DC-9
Hawker Siddeley 121-3B
Boeing 757
Boeing 767-100, 200
Rockwell B-1
Airbus A340-200
Boeing 747 Series
Boeing 777-200, 300
EXHIBIT 2.4
Aircraft Categories & Design Groups
Reference Codes for aircraft that will not operate at Chandler Municipal Airport
*Bold font depicts aircraft shown

Table 2.24
INSTRUMENT OPERATIONS FORECAST

	Year	Instrument Operations	Total Operations	Instrument Ops Percentage
Historical	1996	386	156,212	0.25%
	1997	622	184,139	0.34%
	1998	926	196,511	0.47%
	1999	1,117	221,018	0.51%
	2000	1,430	249,811	0.57%
	2001	1,842	232,449	0.79%
	2002	1,467	230,538	0.64%
	2003	1,222	219,671	0.56%
	2004	1,595	233,079	0.68%
	2005	1,774	235,111	0.75%
Projected	2010	2,149	268,600	0.80%
	2015	2,609	306,900	0.85%
	2020	3,155	350,600	0.90%
	2025	4,006	400,600	1.00%

SOURCE: 1996 – 2005 FAA Air Traffic Activity System and Wilbur Smith Associates
PREPARED: March 2006

SUMMARY

Based on the data presented in this chapter, it is anticipated that the Chandler Municipal Airport will experience continued strong growth in activity indicators throughout the 20-year planning period. Market area demographic trends indicate that the Airport is likely to meet or exceed projected growth in general aviation nationally. Based aircraft are expected to increase from approximately 457 aircraft to 740 aircraft by 2025. The Airport will also see a substantial increase in aircraft operations. By the end of the planning period, more than 400,600 operations could be expected. It is important to note that this is an unconstrained projection. Following sections of the Master Plan will explore the facility implications of accommodating the projected demand. **Table 2.25** summarizes the preferred forecasts selected in this chapter.

Table 2.25
SUMMARY OF PROJECTIONS

	Year	Based Aircraft	Itinerant Operations	Local Operations	Total Operations	Instrument Approaches
Historic	2005	457	65,606	169,505	235,111	1,774
Projected	2010	515	74,939	193,661	268,600	2,149
	2015	581	85,625	221,275	306,900	2,609
	2020	656	97,817	252,783	350,600	3,155
	2025	740	111,767	288,833	400,600	4,006

SOURCE: FAA Air Traffic Activity System, February 2006, Airport records, and Wilbur Smith Associates
PREPARED: March 2006

The next chapters will focus on existing capacity and future demands that may impact the operations of the Airport and facilities that will be required to meet the demands of the future.