SCOTTSDALE AIRPORT
SDL

Chapter Two

FORECASTS

An important factor in facility planning begins with defining the expected needs of the airport over the specified planning period. In airport master planning this involves projecting potential aviation activity for a 20-year timeframe. For Scottsdale Airport, forecasts of based aircraft and annual general aviation operations (takeoffs and landings) serve as the basis for facility planning and needs of the airport through the year 2032.

The objective of forecasting is to predict the magnitude of change expected over the next two decades. Aviation activity can be affected by many influences on the local, regional, and national levels, making it virtually impossible to predict year-to-year fluctuations of activity over 20 years with any certainty. Therefore, it is important to remember that forecasts serve as guidelines and planning must remain flexible enough to respond to a range of unforeseen developments.

The Federal Aviation Administration (FAA) has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. The FAA reviews individual airport forecasts with the objective of comparing them to its *Terminal Area Forecast* (TAF) and the *National Plan of Integrated Airport Systems* (NPIAS). In addition, aviation activity forecasts provide important input to the benefit-cost analyses associated with airport development and FAA reviews these analyses when federal funding requests are submitted.

Only two components of a Master Plan are actually approved by the FAA: the aviation demand forecasts and the Airport Layout Plan (ALP). The ALP will be updated later in this study.

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*, dated December 4, 2004, states that forecasts should be:

- Realistic
- Based on the latest available data
- Reflective of current conditions at the airport
- Supported by information in the study
- Able to provide adequate justification for airport planning and development

The forecast process for an Airport Master Plan consists of a series of basic steps that vary in complexity depending upon the issues to be addressed and the type of airport being studied. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and evaluation and documentation of the results. FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, outlines seven standard steps involved in the forecast process, including:

1) **Identify Aviation Activity Measures**: The level and type of aviation activities likely to impact facility needs. For general aviation, this typically includes based aircraft and operations.

2) **Review Previous Airport Forecasts**: May include the FAA *Terminal Area Forecast*, state or regional system plans, and previous master plans.

3) **Gather Data**: Determine what data is required to prepare the forecasts, identify data sources, and collect historical and forecast data.

4) **Select Forecast Methods**: There are several appropriate methodologies and techniques available, including regression analysis, trend analysis, market share or ratio analysis, exponential smoothing, econometric modeling, comparison with other airports, survey techniques, cohort analysis, choice and distribution models, range projections, and professional judgment.

5) **Apply Forecast Methods and Evaluate Results**: Prepare the actual forecasts and evaluate for reasonableness.

6) **Summarize and Document Results**: Provide supporting text and tables as necessary.

7) **Compare Forecast Results with FAA's TAF**: Follow guidance in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*. In part, the Order indicates that forecasts should not vary significantly (more than 10 percent) from the TAF. When there is a greater than 10 percent variance, supporting documentation should be supplied to the FAA.

The aviation demand forecasts are then submitted to the FAA for their approval. Master Plan forecasts for operations and based aircraft for general aviation airports are considered to be consistent with the TAF if they meet the following criteria:

Where the 5- or 10-year forecasts exceed 100,000 total annual operations or 100 based aircraft:

a) Forecasts differ by less than 10 percent in the 5-year forecast and 15 percent in the 10-year period, or
b) Forecasts do not affect the timing or scale of an airport project, or
c) Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.3C.

Aviation activity can be affected by many influences on the local, regional, and national levels, making it virtually impossible to predict year-to-year fluctuations of activity over 20 years with any certainty. Therefore, it is important to remember that forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to a range of unforeseen developments.

The following forecast analysis for Scottsdale Airport was produced following these basic guidelines. Existing forecasts are examined and compared against current and historic activity. The historical aviation activity is then examined along with other factors and trends that can affect demand. The intent is to provide an updated set of aviation demand projections for Scottsdale Airport that will permit airport management to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

The aviation demand forecasts for Scottsdale Airport were recently updated in 2010 and approved by the FAA in 2011 as part of the *Scottsdale Airport Preliminary Draft Environmental Assessment for Proposed Strengthening of Runway 3-21*. As such, this forecast analysis will update the forecasts developed in the preliminary draft environmental assessment (EA) based upon trends in aviation activity and socioeconomics in recent years.

NATIONAL AVIATION TRENDS AND FORECASTS

The forecasts developed for the airport must consider national, regional, and local aviation trends. The following section describes the trends in aviation. This information is utilized both in statistical analysis and to aid the forecast preparer in making any manual adjustments to the forecasts as necessary. The national aviation forecast information is primarily sourced from the *FAA Aerospace Forecast: Fiscal Years 2013-2033*.

NATIONAL TRENDS

The aviation industry in the United States has experienced an event-filled decade. Since the turn of the century, the industry has faced impacts from the events of September 11, 2001, scares from pandemics such as severe acute respiratory syndrome (SARS), the bankruptcy of five network air carriers, all-time high fuel prices, and a serious economic downturn with global ramifications. The Bureau of Economic Research has determined that the worst economic recession in the post-World War II era began in December 2007 and lasted until mid-2009. Eight of the world's top 10 economies were in recession by January 2009.

As the recession began, unemployment in the United States was at 5.0 percent. It continued to rise through 2008 and intensified in 2009 until peaking at 10.1 percent in October, although the recession officially ended in June of that year. At the end of 2011, unemployment stood at 8.7 percent and by the end of 2012, the unemployment rate was still high at 7.7 percent.

This recession did not face the high inflationary environment of the recession in the early 1980s or the high-energy costs of the mid-1970s recession. While recessions during the post-war era have averaged 10 months in duration, this one lasted 19 months. Continued levels of high debt, a weak housing market, and tight credit are expected to keep the recovery modest by most standards. The resolution of those factors will determine the future path of the recovery.

The nation's gross domestic product (GDP) is the primary measure of overall economic growth. GDP growth rate in fiscal year 2012 was 2.2 percent, reassuring concerns about the possibility of a double-dip recession. GDP growth did, however, soften in the 4th quarter of 2012 as uncertainty over the "fiscal cliff" reduced demand. The FAA forecasts were based upon a 2.5 percent annual average growth in GDP from federal fiscal year 2012 through 2033.

Economic growth on the global scale is expected to be higher, with emerging markets in Asia/Pacific and Latin America leading the way. The global GDP was projected to grow at an average of 3.2 percent over the 20-year forecast period.

GENERAL AVIATION TRENDS

Following more than a decade of decline, the general aviation industry was revitalized with the passage of the *General Aviation Revitalization Act* in 1994, which limits the liability on general aviation aircraft to 18 years from the date of manufacture. This legislation sparked an interest to renew the manufacture of general aviation aircraft due to the reduction in product liability, as well as renewed optimism for the industry. The high cost of product liability insurance had been a major factor in the decision by many American aircraft manufacturers to slow or discontinue the production of general aviation aircraft. As a result, general aviation aircraft production experienced significant gains over the next 10-plus years, hitting a high of nearly 4,300 shipments in 2007.

General aviation activity trends tend to closely match national economic trends. From 2008 through 2012, total general aviation aircraft operations and shipments have declined annually. The FAA forecasts a return to general aviation operations growth in 2013 with an average annual growth rate of 0.5 percent through 2033.

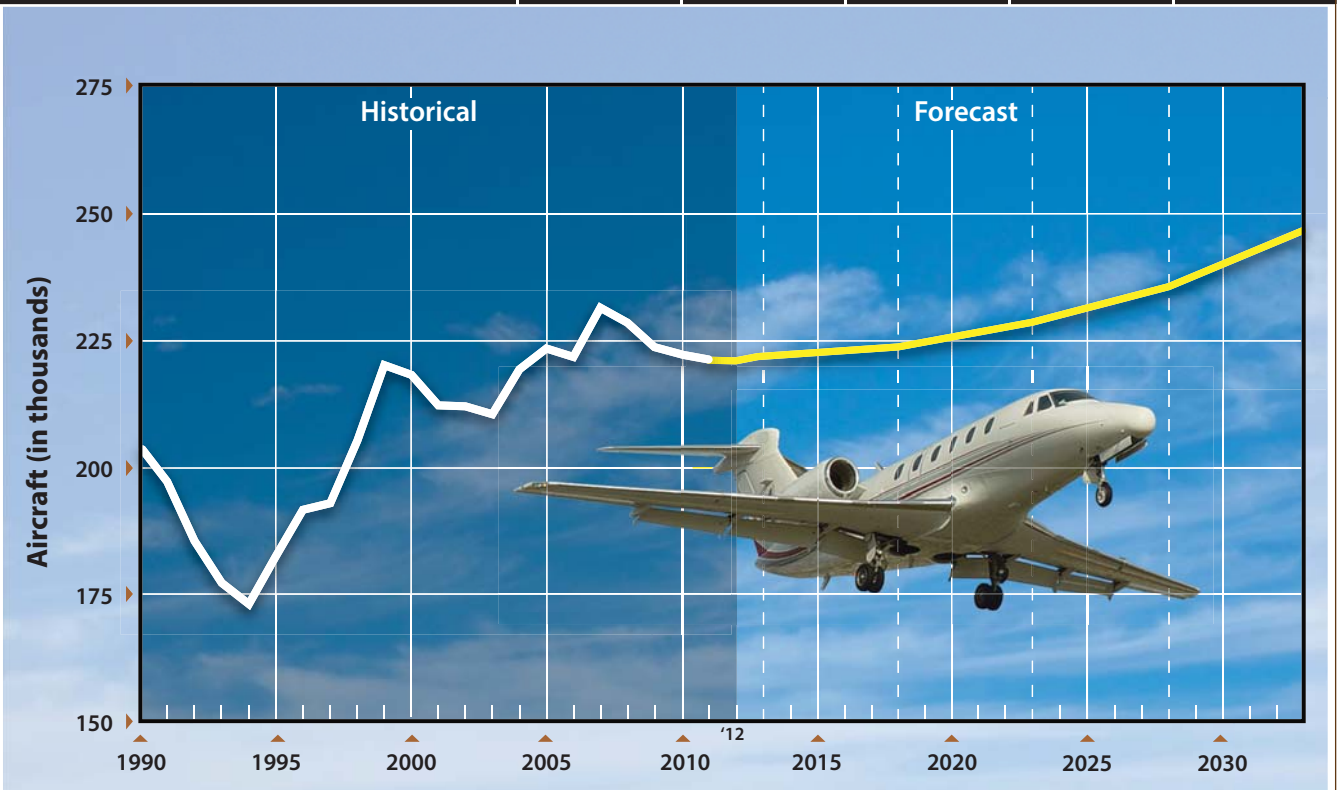
The FAA forecasts the fleet and hours flown for single-engine piston aircraft, multi-engine piston aircraft, turboprops, business jets, piston and turbine helicopters, light sport, experimental, and others (gliders and balloons). The FAA forecasts "active aircraft," not total aircraft. An active aircraft is one that is flown at least one hour during the year. **Exhibit 2A** presents the historical and forecast U.S. active general aviation aircraft.

After growing rapidly for most of the decade, the demand for business jet aircraft has slowed over the past few years as the industry has been hard hit by the economic recession. However, recent shipment activity indicates a cautiously optimistic outlook. The FAA forecast calls for robust growth in the long-term, driven by higher corporate profits and continued concerns about safety, security, and flight delays. Overall, business aviation is projected to outpace personal/recreational use.

The active general aviation fleet is projected to increase at an average annual rate of 0.5 percent through 2033, growing from a 2012 estimate of 220,670 to

U.S. Active General Aviation Aircraft

	2013	2018	2023	2028	2033
FIXED WING					
Piston					
Single Engine	135,005	131,095	128,200	127,115	129,040
Multi-Engine	15,530	15,165	14,605	14,085	13,650
Turbine					
Turboprop	9,830	10,650	11,595	12,665	13,740
Turbojet	12,230	14,420	16,895	20,285	24,620
ROTORCRAFT					
Piston	3,865	4,400	4,885	5,415	5,970
Turbine	7,130	8,415	9,705	11,110	12,585
EXPERIMENTAL					
	24,750	26,250	27,745	29,370	30,980
SPORT AIRCRAFT					
	7,075	7,890	8,680	9,460	10,245
OTHER					
	5,670	5,635	5,605	5,575	5,545
TOTAL	**221,085**	**223,920**	**227,915**	**235,080**	**246,375**



Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033.

Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

246,375 in 2033. The turbine fleet, including helicopters, is forecast to grow annually at 2.8 percent, with the jet portion increasing at 3.5 percent annually.

GENERAL AVIATION AIRCRAFT SHIPMENTS AND REVENUE

The economic recession beginning in late 2007 has had a negative impact on general aviation aircraft production, and the industry has been slow to recover. Aircraft manufacturing declined for three straight years from 2008 through 2010. According to the General Aviation Manufacturers Association (GAMA), there is optimism that aircraft manufacturing will stabilize and return to growth, which has been evidenced in 2011 and 2012. **Table 2A** presents historical data related to general aviation aircraft shipments.

TABLE 2A
Annual General Aviation Airplane Shipments
Manufactured Worldwide and Factory Net Billings

Year	Total	SEP	MEP	TP	J	Net Billings ($millions)
1994	1,132	544	77	233	278	3,749
1995	1,251	605	61	285	300	4,294
1996	1,437	731	70	320	316	4,936
1997	1,840	1043	80	279	438	7,170
1998	2,457	1508	98	336	515	8,604
1999	2,808	1689	112	340	667	11,560
2000	3,147	1,877	103	415	752	13,496
2001	2,998	1,645	147	422	784	13,868
2002	2,677	1,591	130	280	676	11,778
2003	2,686	1,825	71	272	518	9,998
2004	2,963	1,999	52	321	591	11,918
2005	3,590	2,326	139	375	750	15,156
2006	4,053	2,513	242	412	886	18,815
2007	4,276	2,417	258	465	1,136	21,837
2008	3,970	1,943	176	538	1,313	24,772
2009	2,279	893	70	446	870	19,474
2010	2,020	781	108	368	763	19,715
2011	2,120	761	137	526	696	19,097
2012	2,133	790	91	580	672	18,873

SEP - Single Engine Piston; MEP - Multi-Engine Piston; TP - Turboprop; J - Turbofan/Turbojet

Source: General Aviation Manufacturers Association 2012 Statbook

Worldwide shipments of general aviation airplanes increased slightly for the second year in a row in 2012. A total of 2,133 units were delivered around the globe, as compared to 2,120 units in 2011. Worldwide general aviation billings were slightly lower than the previous year. Billings have remained fairly steady, around $19 billion, since experiencing a steep decline in 2009.

Business Jets: General aviation manufacturers delivered 672 business jets in 2012, as compared to 696 units in 2011, a 3.4 percent decline for equivalent reporting companies. Demand was much stronger in 2012 for large-cabin business

jets, driven more heavily by emerging markets than it was for medium and light business jets. In addition, the relatively high number of airplanes on the used market over the past couple of years continued to have a dampening effect on business jet shipments this year.

Turboprops: In 2012, 580 turboprop airplanes were delivered to customers around the world, an increase of approximately 10 percent from the previous year's figure of 526 for equivalent reporting companies.

Pistons: Piston deliveries fell slightly from 898 units shipped from equivalent reporting companies in 2011 to 881 during 2012. The piston segment fared best for unit deliveries among the three segments by which GAMA tracks the airplane manufacturing industry. This is due in part by deliveries to flight schools in emerging markets.

Most industry observers believe that the general aviation market, particularly the business aviation market, is in a position for sustained growth. Industry net orders are back to positive and most leading indicators continue to improve. The large jet category of the market is expected to expand faster than the other categories.

AIRPORT SERVICE AREA

The initial step in determining the aviation demand for an airport is to define its generalized service area for various segments of aviation. The airport service area is determined primarily by evaluating the location of competing airports, their capabilities, their services, and their relative attraction and convenience. In determining the aviation demand for an airport, it is necessary to identify the role of that airport as well as the specific areas of aviation demand the airport is intended to serve. The primary role of Scottsdale Airport is to serve general aviation demand in the area.

The airport service area is a geographical area where there is a potential market for airport services. Access to general aviation airports and transportation networks enter into the equation in determining the size of a service area. Also factored in are subjective criteria, such as the quality of aviation facilities and services.

As in any business enterprise, the more attractive the facility is in terms of services and capabilities, the more competitive it will be in the market. If an airport's attractiveness increases in relation to nearby airports, so will the size of the service area. Scottsdale Airport can draw some level of aviation activity from other locales by keeping facilities attractive and rates and fees competitive.

A defined service area is developed for the purposes of identifying a geographic area from which to further develop aviation demand projections. The service area generally represents where most based aircraft come from. It is not unusual for some based aircraft to be registered outside the region or even outside the state. Most pilots base their aircraft at an airport because of the convenience of the airport to their residence or place of business. However, some aircraft owners have other priorities, such as runway length, specific services, hangar availability, airport congestion, etc.

Typically the general aviation service area for more rural and regionalized airports can extend up to 30 miles. In regions where there are many airports, as is the case for Scottsdale Airport, the definition

of the service area is not as simple. Aircraft owners in areas with more airports have more choices when it comes to basing their aircraft. The proximity and level of general aviation services are largely the defining factors when describing the general aviation service area. A description of airports within an approximate 30-nautical mile radius of Scottsdale Airport was discussed in Chapter One.

The service area for Scottsdale Airport is primarily bounded to the west by Phoenix Deer Valley Airport and Glendale Airport. Each facility offers an array of general aviation services including aircraft fuel, aircraft maintenance, hangar storage, etc. It is estimated that approximately 1,300 aircraft are based at these two airports. In addition, both facilities offer a runway length of at least 7,150 feet, which can accommodate a large majority of general aviation aircraft.

To the southeast, Mesa-Falcon Field Airport, Chandler Airport, and Phoenix-Mesa Gateway Airport cater to general aviation demands serving the eastern and southern Phoenix metropolitan area. All three airports provide multiple services that attract general aviation activities. In recent years, Phoenix-Mesa Gateway Airport has focused heavily on scheduled commercial airline activities and has experienced a significant increase in annual passenger enplanements. Mesa-Falcon Field Airport and Chandler Airport are somewhat limited in the types of larger business aircraft they can accommodate given their primary runway lengths of 5,101 feet and 4,870 feet, respectively. Over 1,000 based aircraft are estimated at these three facilities combined. These facilities will continue to play a role in limiting Scottsdale Airport's service area to the southeast. Situated only 12 nautical miles to the southwest is Phoenix Sky Harbor International Airport. Although it primarily caters to scheduled commercial airline service, the airport does accommodate a significant mix of business jet activity. As a result, it will play a role in limiting Scottsdale Airport's service area to the south.

The previously mentioned airports' available levels of service and facilities will play a role in determining the airport's service area. Scottsdale Airport has remained a very important facility meeting the needs of general aviation operators in the region. The airport is a hub for business and recreational aircraft activity. In addition, Scottsdale Airport is a designated reliever airport. In this capacity, the airport should be maintained to accommodate a full range of general aviation aircraft.

Scottsdale Airport's general service area can also be determined through an examination of its based aircraft owners. **Exhibit 2B** depicts the locations of current based aircraft owners according to airport records. This data shows that the majority of Scottsdale based aircraft owners reside or do business in close proximity to the airport. As depicted, approximately 90 percent of based aircraft owners reside or work within 20 miles of Scottsdale Airport.

Considering all previous factors, a primary service area has been determined and illustrated on **Exhibit 2C**. The primary service area encompasses Scottsdale, Carefree, Cave Creek, Fountain Hills, Paradise Valley, as well as portions of northeast Phoenix, unincorporated areas of northeast Maricopa County, and the Salt River Pima-Maricopa Indian Community.

SOCIOECONOMIC PROJECTIONS

Socioeconomic conditions also provide an important baseline for preparing aviation demand forecasts. Local socioeconomic variables such as population and employment are indicators for understanding the dynamics of the community and can relate to local trends in aviation activity. Analysis of the demographics of the airport service area will give a more comprehensive understanding of the socioeconomic situations affecting the region which support Scottsdale Airport.

A variety of historical and forecast socioeconomic data has been collected for use in this study. The Maricopa Association of Governments (MAG) has prepared the *Extension of MAG 2007 Socioeconomic Projections to 2035 for Population, Housing, and Employment by Municipal Planning Area and Regional Analysis Zone*, which was adopted in 2009. These projections are an update to the forecasts for population, housing, and employment that the MAG conducted in 2007 and better account for the recent economic recession. The original 2007 MAG forecasts were utilized in the aviation forecast update conducted for Scottsdale Airport as part of the EA study previously mentioned.

A summary of population and employment data within the Scottsdale Airport service area is presented in the following sections. This information will be analyzed to develop forecasts of future aviation demand.

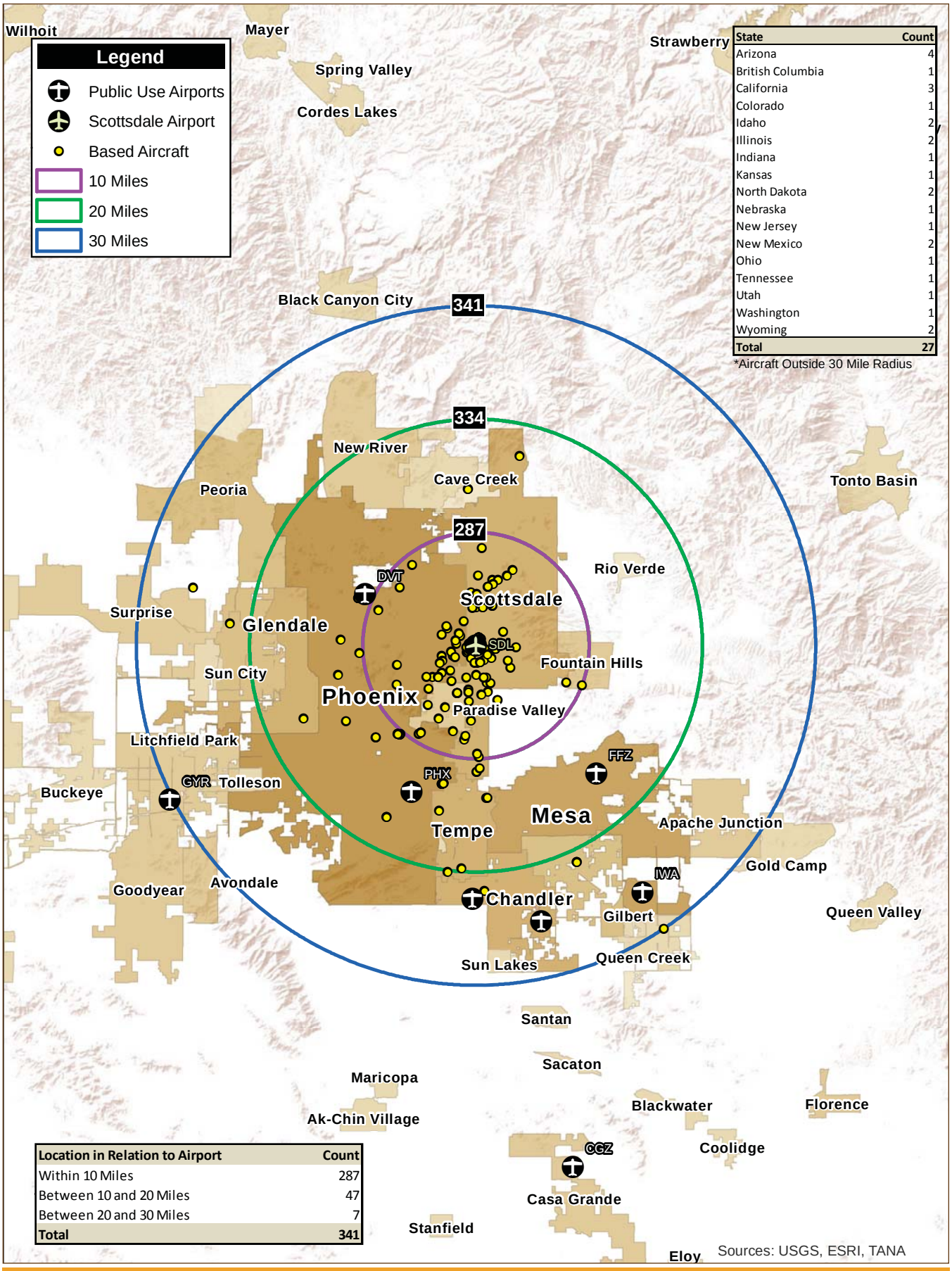
POPULATION

Population is one of the most important elements to consider when planning for the future needs of the airport. **Table 2B** summarizes forecast population estimates for those cities and unincorporated areas within Maricopa County that constitute the primary service area for Scottsdale Airport. Also included is the projected Maricopa County population through the planning period of this study.

TABLE 2B
Population Projections
Scottsdale Airport - Primary Service Area

		Projections			
	2012	**2017**	**2022**	**2027**	**2032**
Scottsdale	219,713	233,286	247,698	263,000	279,247
Carefree	3,388	3,850	4,374	4,970	5,647
Cave Creek	5,110	5,928	6,876	7,976	9,252
Fountain Hills	22,695	24,827	27,159	29,710	32,501
Fort McDowell	976	1,043	1,114	1,191	1,272
Paradise Valley	13,106	13,565	14,041	14,533	15,042
Salt River Indian Community	6,437	6,648	6,866	7,091	7,323
Northeast Phoenix	177,510	183,665	190,034	196,623	203,442
Unincorporated County	8,090	10,104	12,621	15,764	19,690
Primary Service Area Total	**457,025**	**482,916**	**510,783**	**540,858**	**573,416**
Average Annual Growth Rate	---	1.11%	1.12%	1.13%	1.14%
Maricopa County Total	3,884,705	4,351,198	4,873,710	5,458,967	6,114,504
Service Area % of County	11.8%	11.1%	10.5%	9.9%	9.4%

Source: U.S. Census Bureau; Extension of MAG 2007 Socioeconomic Projections to 2035, Maricopa Association of Governments (2009)

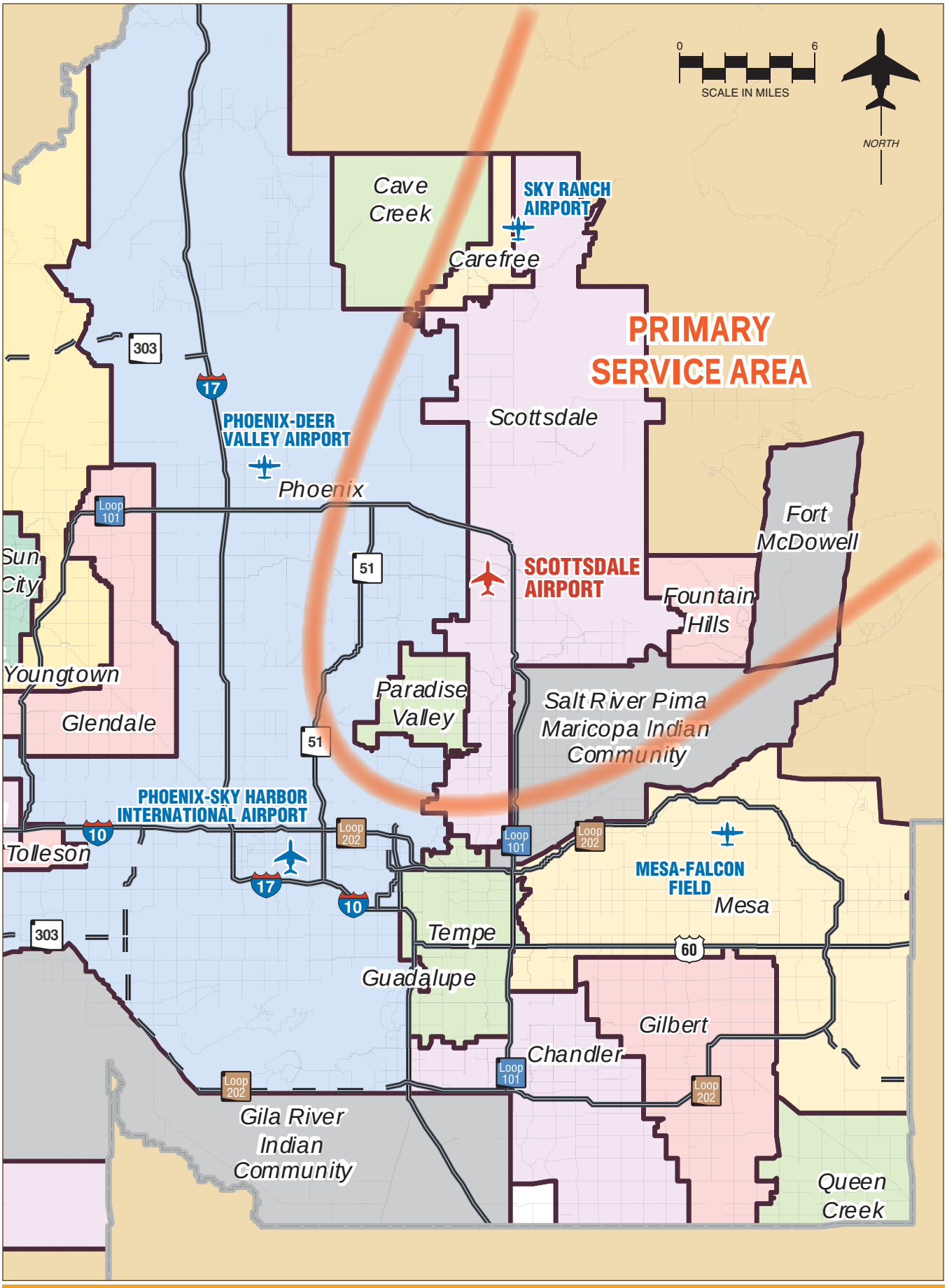


State	Count
Arizona	4
British Columbia	1
California	3
Colorado	1
Idaho	2
Illinois	2
Indiana	1
Kansas	1
North Dakota	2
Nebraska	1
New Jersey	1
New Mexico	2
Ohio	1
Tennessee	1
Utah	1
Washington	1
Wyoming	2
Total	**27**

*Aircraft Outside 30 Mile Radius

Location in Relation to Airport	Count
Within 10 Miles	287
Between 10 and 20 Miles	47
Between 20 and 30 Miles	7
Total	**341**

Sources: USGS, ESRI, TANA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6
SCALE IN MILES
NORTH
Cave Creek
SKY RANCH AIRPORT
Carefree
PRIMARY SERVICE AREA
303
17
PHOENIX-DEER VALLEY AIRPORT
Scottsdale
Phoenix
Loop 101
Fort McDowell
Sun City
51
SCOTTSDALE AIRPORT
Fountain Hills
Youngtown
Glendale
Paradise Valley
Salt River Pima Maricopa Indian Community
PHOENIX-SKY HARBOR INTERNATIONAL AIRPORT
10
Loop 202
Tolleson
MESA-FALCON FIELD
Mesa
Tempe
60
Guadalupe
Gilbert
Chandler
Gila River Indian Community
Queen Creek

According to the table, the population of the primary service area totaled 457,025 in 2012, which represented 11.8 percent of the population of Maricopa County. According to the updated MAG forecasts, population is projected to increase through 2017 at an average annual growth rate (AAGR) of 1.11 percent. Between 2017 and 2022, the AAGR increases slightly to 1.12 percent. During the long term planning horizon, the AAGR increases even further to 1.14 percent. This represents an overall population increase within the primary service area of nearly 116,400 residents over the next 20 years.

The percentage of the county population in the airport's service area is projected to decline, even though growth rates are relatively strong, over the 20-year forecast period. This is not an uncommon trend for cities and areas that have experienced strong historical growth, as the amount of developable space decreases and areas must be redeveloped to accommodate additional demand. It is projected that south and west areas of Maricopa County will experience a larger percentage of population growth in the future when compared to areas on the north and east side of the Phoenix metropolitan area. As previously discussed, the economic recession has had an effect on the current and future state of the economy in the region. Although MAG has updated its original 2007 socioeconomic forecasts in 2009 to better reflect the downturn in the economy, the recession was still ongoing. As a result, for comparison purposes an alternative set of county population forecasts have also been examined.

The alternate set of population forecasts, which were completed in 2013 by Woods & Poole Complete Economic and Demographic Data (CEDDS), is presented in **Table 2C**. Woods & Poole is an independent firm that specializes in long term socioeconomic and demographic projections for metropolitan areas, counties, and states. The county's population was estimated at 3,884,705 by the U.S. Census Bureau in 2012. Woods & Poole forecasts the county's population to grow at an AAGR of 1.96 percent over the planning period, resulting in 5,725,927 county residents in 2032. This results in approximately 388,600 fewer residents than MAG is forecasting.

TABLE 2C
Alternate Population Forecasts
Maricopa County

	2012	2017	2022	2027	2032	Average Annual Growth Rate
Woods & Poole CEDDS	3,884,705	4,401,968	4,839,737	5,283,662	5,725,927	1.96%
Maricopa Association of Governments	3,884,705	4,351,198	4,873,710	5,458,967	6,114,504	2.29%

Source: U.S. Census Bureau; Woods & Poole Complete Economic and Demographic Data (2013); Maricopa Association of Governments (2009)

EMPLOYMENT

Forecast employment data for the Scottsdale Airport primary service area and Maricopa County as a whole are presented in **Table 2D**. People employed in the airport's service area totaled 333,858 in 2012, which represented 15.5 percent of the total employment in Maricopa County. MAG projected the county's employment

to increase through 2017 at an AAGR of 1.04 percent. After that, the growth rate gradually increases, similar to population, to an AAGR of 1.19 percent by 2032. This represents an overall employment increase within the primary service area of 89,240 jobs over the next 20 years.

TABLE 2D
Employment Projections
Scottsdale Airport - Primary Service Area

		Projections			
	2012	2017	2022	2027	2032
Scottsdale	212,804	221,233	229,998	239,108	248,580
Carefree	3,403	3,585	3,778	3,981	4,195
Cave Creek	3,761	4,204	4,701	5,256	5,876
Fountain Hills	10,257	10,533	10,861	11,107	11,406
Fort McDowell	1,382	1,505	1,639	1,786	1,945
Paradise Valley	6,904	7,362	7,851	8,372	8,927
Salt River Indian Community	13,147	18,067	24,829	34,120	46,890
Northeast Phoenix	80,095	82,472	84,921	87,442	90,038
Unincorporated County	2,105	2,644	3,321	4,172	5,241
Primary Service Area Total	**333,858**	**351,605**	**371,899**	**395,344**	**423,098**
Average Annual Growth Rate	---	1.04%	1.08%	1.13%	1.19%
Maricopa County Total	2,156,330	2,510,141	2,774,511	3,066,724	3,389,715
Service Area % of County	15.5%	14.0%	13.4%	12.9%	12.5%

Source: Socioeconomic Projections of Population, Housing, and Employment, Maricopa Association of Governments (2007); Extension of MAG 2007 Socioeconomic Projections to 2035, Maricopa Association of Governments (2009)

Similar to population growth rates, the average employment growth rate percentage within the airport's service area is projected to decline within Maricopa County through the next 20 years. This can be attributed to the projected development within areas to the south and west of the greater Phoenix metropolitan area.

An alternate set of employment statistics were analyzed from the Woods & Poole CEDDS and are included in **Table 2E**. Woods & Poole projects the county's employment to grow at 1.95 percent annually through 2032, resulting in approximately 20,000 more jobs than what the MAG is projecting.

TABLE 2E
Alternative Employment Forecasts
Maricopa County

	2012	2017	2022	2027	2032	Average Annual Growth Rate
Woods & Poole CEDDS	2,156,330	2,637,657	2,686,699	2,951,443	3,237,040	1.95%
Maricopa Association of Governments	2,156,330	2,510,141	2,774,511	2,914,621	3,218,868	2.02%

Source: Bureau of Economic Analysis; Woods & Poole Complete Economic and Demographic Data (2013); Maricopa Association of Governments (2009)

FORECASTING APPROACH

The development of aviation forecasts includes both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation is important in the final determination of the preferred forecast.

The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line projections, correlation/regression analysis, and market share analysis. By developing several projections for each aviation demand indicator, a reasonable planning envelope, or range of forecasts, will emerge. The selected forecast may be one of the individual projections or a combination of several projections based on local conditions. The selected forecast will almost always fall within the planning envelope. Some combination of the following forecasting techniques is utilized to develop the planning envelope for each demand indicator.

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

Correlation analysis provides a measure of the direct relationship between two separate sets of historic data. If there is a reasonable correlation between the data, further evaluation using regression analysis may be employed.

Regression analysis is a statistical technique used to measure the relationship between variables. This technique yields an r-squared (r^2) value which shows the level of correlation between the variables. If the r^2 value is greater than 0.95, it indicates a strong predictive reliability.

Market share analysis involves a historical review of aviation activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined, providing an expected market share for the future. These shares are then multiplied by the forecasts of the larger geographical area to produce a market share projection. This method has the same limitations as trend line projections, but can provide a useful check on the validity of other forecasting techniques.

It is important to note that forecast projections are most beneficial for short-term planning (five to seven years) due to a wide range of factors known to influence the aviation industry. One consideration is that facility and financial planning usually requires at least a 10-year view and it often takes more than five years to complete a major facility development program and results of capital improvement projects can take several years.

Another consideration is technological advances in aviation have historically altered and will continue to change the growth rates in aviation demand over time. The most obvious example is the impact of jet aircraft on the aviation in-

dustry, which resulted in a growth rate that far exceeded expectations. Such changes are difficult, if not impossible, to predict and there is no mathematical way to estimate their impacts. It is important to use forecasts which do not overestimate revenue-generating capabilities or under state demand for facilities needed to meet public (user) needs.

Forecasts of aviation demand for Scottsdale Airport have been developed by utilizing statistical methods, available existing forecasts, and analyst expertise. The following section presents the aviation demand forecasts and includes activity in two broad categories: based aircraft and annual operations.

AVIATION FORECASTS

The following forecasts analysis examines each of the aviation demand categories expected at Scottsdale Airport over the next 20 years. Each segment will be examined individually, and then collectively, to provide an understanding of the overall aviation activity at the airport through 2032.

The need for airport facilities at Scottsdale Airport can best be determined by accounting for forecasts of future aviation demand. Forecasts for airport activities include the following:

- Registered Aircraft
- Based Aircraft
- Based Aircraft Fleet Mix
- General Aviation Operations
- Air Taxi and Military Operations
- Annual Instrument Approaches

The remainder of this chapter will examine historical trends with regard to these areas of general aviation and project future demand for these segments of general aviation activity at the airport. These forecasts, once approved by the FAA, will become the basis for planning future facilities, both airside and landside, at the airport.

REGISTERED AIRCRAFT FORECAST

The number of based aircraft is the most basic indicator of general aviation demand at an airport. By first developing a forecast of based aircraft, other demand segments can be projected utilizing the forecast trend in based aircraft. One method of forecasting based aircraft is to first examine local aircraft ownership by reviewing aircraft registrations in the region. **Table 2F** presents historical data regarding aircraft registered in Maricopa County since 1993.

The trend in registered aircraft in Maricopa County since 1993, to a large degree, reflects the fact that general aviation activity often trends with national economic trends. The number of registered aircraft in the county increased to a high of 5,504 in 2008. With the onset of the national recession, registered aircraft declined to 4,714 in 2012. In fact, between 2011 and 2012 registered aircraft in the county decreased by 9.7 percent. This is a reflection of what has occurred nationwide, as the total registered aircraft count in the United States decreased from 367,857 in 2011 to 338,783 in 2012, constituting an approximate eight percent decrease.

The current number of registered aircraft in Maricopa County is similar to what was experienced in the early 2000s. Nonetheless, the historical trend shows that the number of registered aircraft has increased in the past and these increases have typically coincided with periods of sustained economic growth nationally.

TABLE 2F
Historical Registered Aircraft
Maricopa County

Year	Registered Aircraft	Annual % Change
1993	3,650	---
1994	3,720	1.9%
1995	3,807	2.3%
1996	3,945	3.6%
1997	4,074	3.3%
1998	4,189	2.8%
1999	4,346	3.7%
2000	4,668	7.4%
2001	4,850	3.9%
2002	4,875	0.5%
2003	5,129	5.2%
2004	5,148	0.4%
2005	5,205	1.1%
2006	5,299	1.8%
2007	5,476	3.3%
2008	5,504	0.5%
2009	5,413	-1.7%
2010	5,306	-2.0%
2011	5,218	-1.7%
2012	4,714	-9.7%

Source: FAA Aircraft Registry Database

Several forecasts of registered aircraft for Maricopa County have been developed and are presented in **Table 2G**. The first two forecasts consider the relationship between historical registered aircraft in the county and the active U.S. general aviation fleet as forecast by the FAA. As evidenced, the county's market share of U.S. active general aviation aircraft has been somewhat consistent leading up to 2012, fluctuating between a low of 2.15 percent and a high of 2.45 percent. In 2012, the Maricopa County registered aircraft represented 2.14 percent of the total general aviation fleet of 220,670 due to the noticeable decrease in registered aircraft as previously discussed. This was the lowest percentage over the past 12 years and is likely influenced by a slow economic recovery.

When applying a constant market share projection of 2.14 percent, 5,215 registered aircraft are projected in Maricopa County by 2032. Since 2012 was the lowest percentage of the last 12 years, it is likely that this projection represents the low-end forecast. A second market share forecast considers the historical average market share of 2.33 percent since 2000. This forecast projects 5,678 registered aircraft in Maricopa County by 2032.

Two additional forecasts have been developed that consider the relationship between historical registered aircraft and the population. By maintaining the same ratio of aircraft per 1,000 people, a long term forecast emerges. In 2012, the Maricopa County registered aircraft represented 1.21 aircraft per 1,000 people. Projecting this ratio through the long

term planning period yields 6,928 registered aircraft by 2032. The second forecast considers the historical average ratio of registered aircraft per 1,000 people, which is 1.43. In this case, 8,188 registered aircraft are projected in Maricopa County by 2032.

TABLE 2G
Registered Aircraft Forecasts
Maricopa County

Year	Maricopa County Registered Aircraft	U.S. Active Aircraft	Market Share of U.S. Active Aircraft	Maricopa County Population	Aircraft per 1,000 Population
2000	4,668	217,533	2.15%	3,072,100	1.52
2001	4,850	211,446	2.29%	3,165,600	1.53
2002	4,875	211,244	2.31%	3,261,900	1.49
2003	5,129	209,606	2.45%	3,361,100	1.53
2004	5,148	219,319	2.35%	3,463,400	1.49
2005	5,205	224,257	2.32%	3,568,800	1.46
2006	5,299	221,942	2.39%	3,677,300	1.44
2007	5,476	231,606	2.36%	3,789,200	1.45
2008	5,504	228,664	2.41%	3,904,500	1.41
2009	5,413	223,876	2.42%	4,023,300	1.35
2010	5,306	223,370	2.38%	3,824,800	1.39
2011	5,218	220,770	2.36%	3,880,200	1.34
2012	4,714	220,670	2.14%	3,884,705	1.21
Constant Market Share Projection of U.S. Active Aircraft (AAGR – 0.51%)					
2017	4,779	223,315	2.14%	4,401,968	1.09
2022	4,857	226,970	2.14%	4,839,737	1.00
2027	4,994	233,355	2.14%	5,283,662	0.95
2032	5,215	243,670	2.14%	5,725,927	0.91
Historical Average Market Share Projection of U.S. Active Aircraft (AAGR – 0.93%)					
2017	5,203	223,315	2.33%	4,401,968	1.18
2022	5,288	226,970	2.33%	4,839,737	1.09
2027	5,437	233,355	2.33%	5,283,662	1.03
2032	5,678	243,670	2.33%	5,725,927	0.99
Constant Ratio Projection per 1,000 County Residents (AAGR – 1.94%)					
2017	5,326	223,315	2.39%	4,401,968	1.21
2022	5,856	226,970	2.58%	4,839,737	1.21
2027	6,393	233,355	2.74%	5,283,662	1.21
2032	6,928	243,670	2.84%	5,725,927	1.21
Historical Average Ratio Projection per 1,000 County Residents (AAGR – 2.80%)					
2017	6,295	223,315	2.82%	4,401,968	1.43
2022	6,921	226,970	3.05%	4,839,737	1.43
2027	7,556	233,355	3.24%	5,283,662	1.43
2032	8,188	243,670	3.36%	5,725,927	1.43

Source: FAA Aircraft Registration Database; FAA Aerospace Forecasts – Fiscal Years 2013-2033; U.S. Census Bureau; Woods & Poole Complete Economic and Demographic Data (2013); Coffman Associates analysis

Several statistical trends and regressions were also considered in developing forecasts of registered aircraft. For this type of analysis, a statistical model was used to predict future outcomes. This value measures the statistical reliability of the analysis. Generally, r^2-values greater than 0.95 percent indicate a strong correlation between variables and, therefore, a greater statistical reliability.

A series of single and multiple variable correlation analyses were run to examine the relationship between historic registered aircraft and independent variables including population, employment, and U.S. active general aviation aircraft. The separate regression analyses project aircraft in Maricopa County to increase roughly between 6,953 and 7,457 aircraft through 2032 with r^2-values ranging from 0.90 to 0.92.

Table 2H and **Exhibit 2D** summarize the registered aircraft forecasts for Maricopa County, which present a reasonable planning envelope. Since the precise nature of the future economy cannot be known, a generalized average of the forecasts is generated for this analysis. This results in the number of registered aircraft increasing from 4,714 to 6,800 in 20 years, equating to a 1.85 percent AAGR. This registered aircraft projection will be a major element considered in the based aircraft forecast to follow.

TABLE 2H
Summary of Registered Aircraft Forecasts
Maricopa County

	2012	2017	2022	2027	2032
Constant Market Share of U.S. Active Aircraft		4,779	4,857	4,994	5,215
Historical Average Market Share of U.S. Active Aircraft		5,203	5,288	5,437	5,678
Constant Ratio Projection per 1,000 County Residents		5,326	5,856	6,393	6,928
Historical Average Ratio Projection per 1,000 County Residents		6,295	6,921	7,556	8,188
Employment Regression Analysis (r^2 = 0.92)		6,198	6,300	6,847	7,437
Population and Employment Regression Analysis (r^2 = 0.92)		6,182	6,330	6,875	7,457
Employment and U.S. Active Aircraft Regression Analysis (r^2 = 0.92)		6,143	6,247	6,777	7,355
Population and U.S. Active Aircraft Regression Analysis (r^2 = 0.90)		5,717	6,085	6,494	6,953
Selected Forecast (AAGR - 1.85%)	**4,714**	**5,400**	**5,800**	**6,300**	**6,800**

Source: Coffman Associates analysis

BASED AIRCRAFT FORECAST

The based aircraft forecast for Scottsdale Airport correlates with the registered aircraft forecast completed in the previous section. Determining the number of based aircraft at an airport can be a challenging task because of the transient nature of based aircraft due to the availability and cost of aircraft storage. Scottsdale Airport staff has kept a detailed record of based aircraft over the past several years.

In 2012, there were a total of 368 aircraft based at the airport. Of this total, 239 aircraft are located on airport property and 129 aircraft are located within the Scottsdale Airpark, private property that has access to the airfield. **Table 2J** presents historical based aircraft totals for Scottsdale Airport. Over the past 20 years, based aircraft have fluctuated between a high of 471 in 2006 and a low of 368 in 2012. Note: Historical based aircraft reported at Scottsdale Airport for years 2009, 2010, and 2011 may not be an accurate reflection of actual activity based upon recent improvements the airport has made to its internal database. As a result, the based aircraft counts for these

three years have been taken from the Scottsdale Airport Preliminary Draft EA and the FAA TAF and are considered sufficient for planning purposes related to this Master Plan.

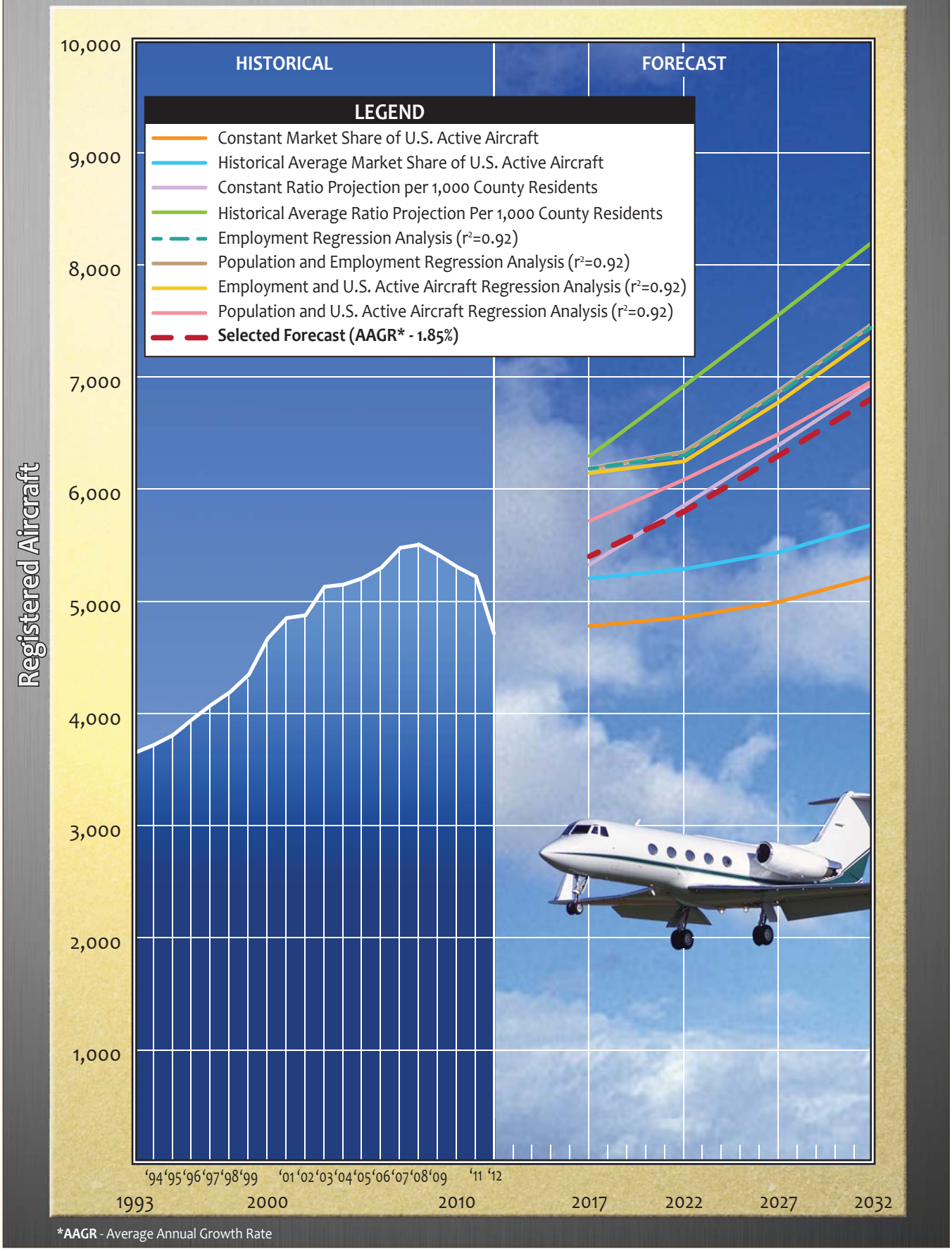
TABLE 2J
Historical Based Aircraft
Scottsdale Airport

Year	Based Aircraft	Annual % Change
1993	420	---
1994	393	-6.4%
1995	403	2.5%
1996	403	0.0%
1997	400	-0.7%
1998	401	0.2%
1999	424	5.7%
2000	425	0.2%
2001	439	3.3%
2002	446	1.6%
2003	460	3.1%
2004	439	-4.6%
2005	439	0.0%
2006	471	7.3%
2007	447	-5.1%
2008	392	-12.3%
2009	423	7.9%
2010	424	0.2%
2011	424	0.0%
2012	368	-13.2%

Source: 2011 Scottsdale Airport Preliminary Draft Environmental Assessment (1993-2010), Airport Records (2011-2012)

As shown in **Table 2K**, the based aircraft market share percentage of registered aircraft in Maricopa County has generally trended downward since 2000. Two market share forecasts of registered aircraft have been developed for based aircraft based on this data. The first market share forecast considers the airport maintaining its 2012 market share of registered aircraft in the county (7.81 percent). This forecast results in 420 based aircraft in 2017, 453 in 2022, 492 in 2027, and 531 aircraft by 2032.

The based aircraft forecast also considers a decreasing market share of registered aircraft. This forecast presents a projection based on the overall decreasing market shares that have been realized by the airport in the past. This forecast results in 483 based aircraft by 2032.



***AAGR** - Average Annual Growth Rate

Source: Coffman Associates Analysis

TABLE 2K
Based Aircraft Forecasts
Scottsdale Airport

Year	Scottsdale Airport Based Aircraft	Maricopa County Registered Aircraft	Market Share of Registered Aircraft
2000	425	4,668	9.10%
2001	439	4,850	9.05%
2002	446	4,875	9.15%
2003	460	5,129	8.97%
2004	439	5,148	8.53%
2005	439	5,205	8.43%
2006	471	5,299	8.89%
2007	447	5,476	8.16%
2008	392	5,504	7.12%
2009	423	5,413	7.81%
2010	424	5,306	7.99%
2011	424	5,218	8.13%
2012	368	4,714	7.81%
Constant Market Share Projection of Registered Aircraft (AAGR – 1.85%)			
2017	420	5,400	7.81%
2022	453	5,800	7.81%
2027	492	6,300	7.81%
2032	531	6,800	7.81%
Decreasing Market Share Projection of Registered Aircraft (AAGR – 1.37%)			
2017	410	5,400	7.65%
2022	435	5,800	7.50%
2027	460	6,300	7.30%
2032	483	6,800	7.10%

Source: Scottsdale Airport Preliminary Draft Environmental Assessment; Airport Records; FAA Aircraft Registration Database; Coffman Associates analysis

Existing Based Aircraft Forecasts

There are several forecasts of based aircraft for Scottsdale Airport that were completed in previous studies and reports as shown in **Table 2L.** The FAA TAF is a generalized annual forecast of airport activity produced by the FAA. The TAF estimates that in 2012 there were 346 based aircraft at the airport. It projects an AAGR of 1.72 percent, which results in a long term forecast of 487 based aircraft. As previously discussed, the airport is currently reporting 368 based aircraft, which are 22 more than the TAF base year estimate.

A second existing forecast is from the *2008 Arizona State Airports System Plan* (SASP). The SASP has a base year of 2007 and it identified 447 based aircraft at that time. The SASP reflected an annual growth rate of 1.36 percent, leading to 626 based aircraft by 2032. It should be noted that the SASP produced a low, medium, and high forecast for based aircraft. For purposes of this study, the medium (average) forecast was utilized for comparison purposes.

TABLE 2L
Existing Based Aircraft Forecasts
Scottsdale Airport

		Projections Adjusted to Plan Years of this Master Plan					
	Base Year of Study	**2012**	**2017**	**2022**	**2027**	**2032**	**AAGR (2012-2032)**
2013 FAA *Terminal Area Forecast*	346 (2012)	346	376	408	447	487	1.72%
2008 *Arizona State Airports System Plan* – Medium	447 (2007)	478	511	547	585	626	1.36%
2011 Scottsdale Airport Preliminary Draft Environmental Assessment Approved Forecasts	424 (2010)	434	458	478	498	518	0.89%

Source: FAA TAF; *2008 Arizona State Airports System Plan*; Scottsdale Airport Preliminary Draft Environmental Assessment

A third existing forecast is from the 2011 Scottsdale Airport Preliminary Draft EA. The forecasts done for this study were approved by the FAA in March 2011. The base year for this study was 2010, when a total of 424 based aircraft were identified. Using the 0.89 percent AAGR that was being projected, this study would have projected 518 based aircraft in 2032.

These three forecasts have been interpolated and extrapolated to the plan years of this Master Plan as shown in the table. The previous forecasts can serve as a comparison to the selected based aircraft forecast to emerge from this Master Plan.

Selected Based Aircraft Forecast

Future aircraft basing at Scottsdale Airport will depend on several factors, including the state of the economy, fuel costs, available facilities both on airport property and within the Scottsdale Airpark, competing airports, and adjacent development potential. Forecasts assume a reasonably stable and growing economy, as well as reasonable development of airport facilities necessary to accommodate aviation demand. Competing airports will play a role in deciding demand; however, Scottsdale Airport should fare well in this competition as it is served by a runway capable of handling the majority of general aviation aircraft and capable of being expanded to meet future demand.

Deciding what forecast or combination of forecasts to use in order to arrive at a final based aircraft forecast involves more than just statistical analysis. Consideration must be given to the current and future aviation conditions at the airport. Scottsdale Airport provides an array of aviation services, including aircraft fueling, maintenance, flight training, aircraft charter, aircraft management, and U.S. Customs and Border Protection. In addition, it has a runway that offers instrument approach capabilities which makes the facility accessible during poor weather conditions.

Table 2M provides a summary of all based aircraft forecasts. Note: The three existing comparative forecasts previously discussed have been updated by applying their respective AAGRs to the actual current based aircraft figure of 368. This results in growth rates that are the same as the previous forecasts but the new based aircraft figures are relative to the plan years of this Master Plan.

TABLE 2M
Based Aircraft Forecast Summary
Scottsdale Airport

Projections	Base Year (2012)	2017	2022	2027	2032
Market Share of Maricopa County Registered Aircraft					
Constant Market Share Projection (AAGR - 1.85%)	368	420	453	492	531
Decreasing Market Share Projection (AAGR - 1.37%)	368	410	435	460	483
Updated Existing Forecasts (utilizing current based aircraft)					
2013 FAA *Terminal Area Forecast* (AAGR - 1.72%)	368	400	437	476	518
2008 *Arizona State Airports System Plan* - Medium (AAGR - 1.36%)	368	394	421	451	482
2011 Scottsdale Airport Preliminary Draft Environmental Assessment Approved Forecasts (AAGR - 0.89%)	368	385	402	421	440
Selected Forecast (AAGR - 1.54%)	***368***	***400***	***430***	***465***	***500***

Source: Coffman Associates analysis

The TAF annual growth rate of 1.72 percent, when applied to the current based aircraft count of 368, results in a long term forecast of 518 based aircraft. This likely represents the higher end of the planning envelope. The Scottsdale Airport Preliminary Draft EA has a low growth rate of 0.89 percent, but this growth rate was developed in the middle of the economic recession in a different aviation environment. This planning forecast will serve as the low end of the planning envelope.

The City of Scottsdale has given every indication that it plans to continue strong support of Scottsdale Airport. During the past several years, significant investments have been made to the facility. As such, Scottsdale Airport should be able to continue to meet the needs of aircraft in the regional aviation system.

The based aircraft forecasts for Scottsdale Airport to be used for this Airport Master Plan are:

Year 2017 – 400
Year 2022 – 430
Year 2027 – 465
Year 2032 – 500

The selected forecast falls within the planning envelope and is considered reasonable when compared to other existing forecasts. The selected projection yields a 1.54 percent AAGR over the next 20 years. **Exhibit 2E** presents all based aircraft forecasts, including the selected forecast.

BASED AIRCRAFT FLEET MIX

The fleet mix of based aircraft is oftentimes more important to airport planning and design than the total number of aircraft. For example, the presence of one or a few business jets can impact the design standards more than a large number of smaller, single engine piston-powered aircraft.

Knowing the aircraft fleet mix expected to utilize Scottsdale Airport is necessary to properly plan for facilities that will best serve the level of activity and the type of activities occurring at the airport. The existing fleet mix of aircraft based at Scottsdale Airport and the Scottsdale Airpark is comprised of 191 single engine piston aircraft, 27 multi-engine piston aircraft, 31 turboprops, 105 jets, and 14 helicopters. Approximately 130 of these aircraft are based in the Airpark.

The based aircraft fleet mix, as presented on **Table 2N**, was compared to the existing and forecast U.S. general aviation fleet mix trends as presented in *FAA Aerospace Forecast: Fiscal Years 2013-2033*. The national trend in general aviation continues to be toward a greater percentage of larger, more sophisticated aircraft as part of the national fleet. While single engine piston-powered aircraft will continue to account for the largest share of based aircraft at the airport, these aircraft are forecast to drop as a percentage of the fleet mix. Multi-engine aircraft can be expected to drop in number and percentage during the planning period of the Master Plan. Consistent with national aviation trends, the number and percentage of turboprops, jets, and helicopters are all expected to increase at the airport during the 20-year timeframe. Jets are projected to experience the greatest increase of any category of aircraft.

TABLE 2N
Based Aircraft Fleet Mix
Scottsdale Airport

	Existing		Forecast								
Aircraft Type	**2012**	**%**	**2017**	**%**	**2022**	**%**	**2027**	**%**	**2032**	**%**	**Net Change**
Single Engine	191	51.9%	195	48.8%	200	46.5%	205	44.1%	210	42.0%	+19
Multi-Engine	27	7.3%	27	6.8%	26	6.0%	26	5.6%	25	5.0%	-2
Turbo-prop	31	8.4%	38	9.5%	45	10.5%	54	11.6%	62	12.4%	+31
Jet	105	28.5%	122	30.5%	138	32.1%	155	33.3%	173	34.6%	+68
Heli-copter	14	3.8%	18	4.5%	21	4.9%	25	5.4%	30	6.0%	+16
Totals	**368**	**100.0%**	**400**	**100.0%**	**430**	**100.0%**	**465**	**100.0%**	**500**	**100.0%**	**+132**

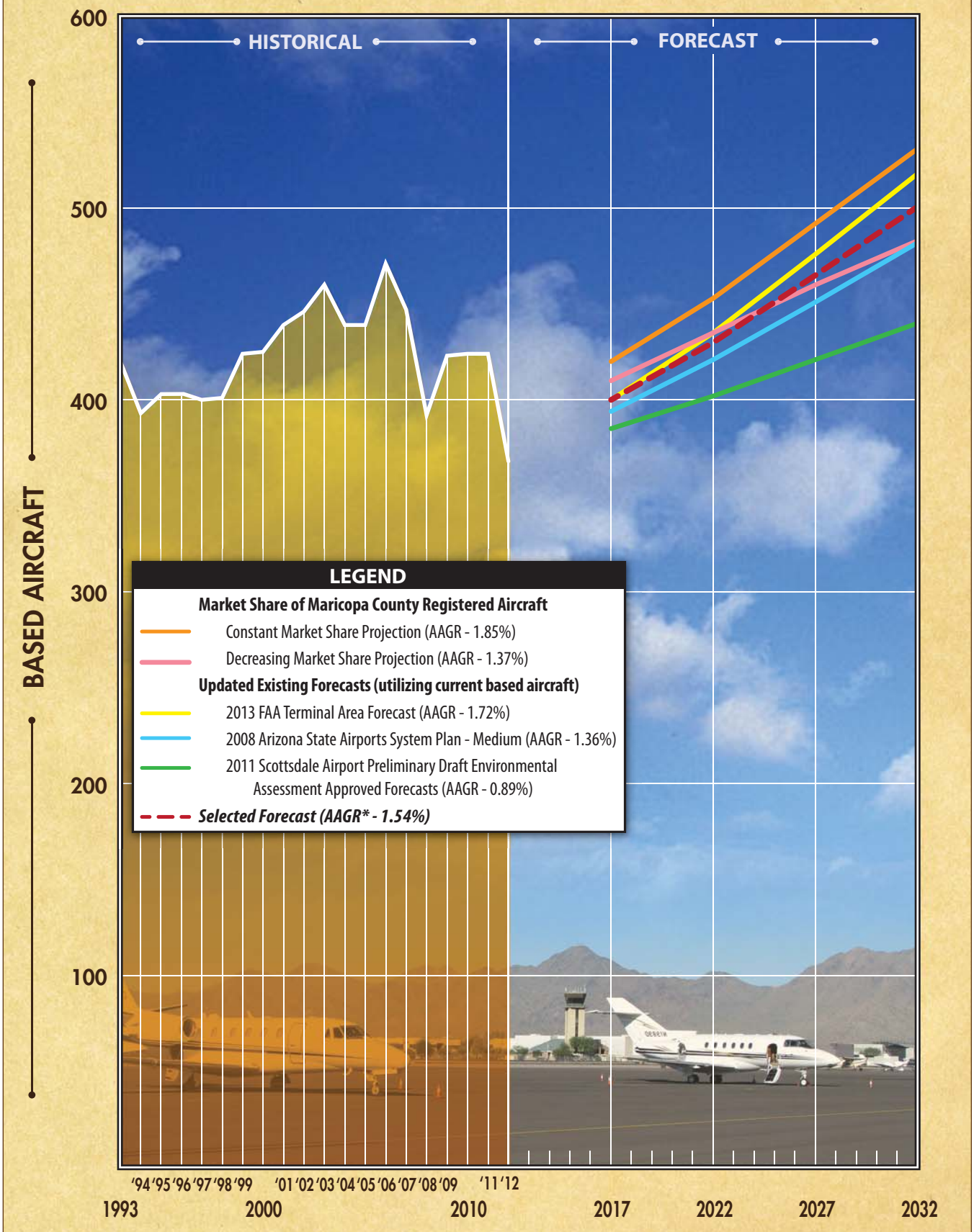
Source: Airport Records; Coffman Associates analysis

GENERAL AVIATION OPERATIONS

General aviation operations are classified by the airport traffic control tower (ATCT) as either local or itinerant. A local operation is a takeoff or landing performed by an aircraft that operates within sight of the airport or which executes simulated approaches or touch-and-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations. Typically, itinerant operations increase with business use.

Airport operations can be further broken down into distinct groups. For facilities such as Scottsdale Airport, operations typically include general aviation, air taxi, and military. General aviation operations are those conducted by private individuals or companies that are not associated with scheduled passenger services or non-scheduled transport services for hire. Air taxi refers to those operators that are certified in accordance with Title 14 Code of Federal Regulations (CFR) Part 135 and are authorized to provide on-demand public transportation of persons and property by aircraft. Military operations are those conducted by military personnel and aircraft.

Table 2P depicts the history of all aircraft operations at Scottsdale Airport since 2000, as counted by the ATCT. Itinerant operations have fluctuated during the timeframe, but have generally been on the



***AAGR:** Average Annual Growth Rate

Source: Coffman Associates Analysis

SCOTTSDALE AIRPORT SDL

BASED AIRCRAFT FORECASTS Exhibit 2E

decrease in recent years. In 2005, the airport experienced 136,877 itinerant operations, which represents the highest count for a calendar year since 2000. The lowest count was experienced in 2010, as the ATCT logged 82,382 itinerant operations. Local operations have also fluctuated at the airport since 2000. The highest number of local operations was experienced in 2000, when the airport logged 85,457 operations. Similar to itinerant operations, local operations have generally decreased over the years, and 2010 marked the lowest number of local operations at 51,133. Since this time, the airport has experienced two years of positive growth in local operations. Overall, 2005 marked the highest number of total aircraft operations since 2000 when the airport experienced 212,429 operations. Conversely, the airport experienced its lowest operational activity in 2010, when 133,515 aircraft operations were logged.

TABLE 2P
Historical Aircraft Operations
Scottsdale Airport

	Itinerant Operations				Local Operations			
Year	Air Taxi/ Commuter	General Aviation	Military	Total Itinerant	General Aviation	Military	Total Local	Total Operations
2000	7,955	113,203	417	121,575	85,298	159	85,457	207,032
2001	8,477	106,654	447	115,578	68,894	96	68,990	184,568
2002	10,253	110,331	520	121,104	74,398	62	74,460	195,564
2003	10,223	112,700	394	123,317	71,121	34	71,155	194,472
2004	11,063	115,900	423	127,386	75,264	31	75,295	202,681
2005	11,816	124,783	278	136,877	75,544	8	75,552	212,429
2006	12,389	120,366	198	132,953	63,166	179	63,345	196,298
2007	13,390	119,984	363	133,737	58,129	116	58,245	191,982
2008	11,232	107,351	359	118,942	72,268	201	72,469	191,411
2009	8,177	90,933	278	99,388	67,029	27	67,056	166,444
2010	12,250	69,767	365	82,382	51,055	78	51,133	133,515
2011	12,974	73,304	580	86,858	54,620	162	54,782	141,640
2012	14,531	70,719	530	85,780	60,234	78	60,312	146,092

Source: FAA Air Traffic Activity System

These operational statistics are the actual ATCT counts conducted when the tower is open and do not reflect operations that occur while the tower is closed. An adjustment will be added to the final operations forecast later in this chapter to account for operations that occur when the tower is closed.

Scottsdale Airport has realized approximately 63 percent of the total operations as itinerant and 37 percent as local since 2000. These findings point to the fact that the airport has long been considered as an important destination for businesses as well as recreational activities.

General Aviation Itinerant Operations

Table 2Q outlines the history of itinerant general aviation operations in relation to the total general aviation itinerant operations at towered airports in the U.S. The Scottsdale Airport market share, as a percentage of general aviation itinerant operations at towered airports across the country, has averaged 0.56 percent since

2000. The airport experienced an overall increase in its market share from 2000 through 2005. The market share held steady from 2005 through 2007, before noticing a decline beginning in 2008, coinciding with the nation's economic recession. Since 2010, the airport's market share has averaged approximately 0.50 percent.

TABLE 2Q
Itinerant General Aviation Operations Forecasts
Scottsdale Airport

Year	Scottsdale Itinerant GA Operations	U.S. ATCT Itinerant GA Operations	Scottsdale Market Share	Scottsdale Based Aircraft	Itinerant Operations per Based Aircraft
2000	113,203	22,844,100	0.50%	425	266
2001	106,654	21,433,300	0.50%	439	243
2002	110,331	21,450,500	0.51%	446	247
2003	112,700	20,231,300	0.56%	460	245
2004	115,900	20,007,200	0.58%	439	264
2005	124,783	19,315,100	0.65%	439	284
2006	120,366	18,707,100	0.64%	471	256
2007	119,984	18,575,200	0.65%	447	268
2008	107,351	17,492,700	0.61%	392	274
2009	90,933	15,571,100	0.58%	423	215
2010	69,767	14,863,900	0.47%	424	165
2011	73,304	14,527,900	0.50%	424	173
2012	70,719	14,521,700	0.49%	368	192
Constant Market Share Projection					
2017	71,709	14,634,400	0.49%	400	179
2022	73,285	14,956,200	0.49%	430	170
2027	74,937	15,293,300	0.49%	465	161
2032	76,669	15,646,800	0.49%	500	153
Constant Operations per Based Aircraft Projection					
2017	76,800	14,634,400	0.52%	400	192
2022	82,560	14,956,200	0.55%	430	192
2027	89,280	15,293,300	0.58%	465	192
2032	96,000	15,646,800	0.61%	500	192
FAA TAF Projection					
2017	66,183	14,634,400	0.45%	400	165
2022	66,253	14,956,200	0.44%	430	154
2027	66,323	15,293,300	0.43%	465	143
2032	66,393	15,646,800	0.42%	500	133
Selected Planning Forecast					
2017	74,500	14,634,400	0.51%	400	186
2022	79,000	14,956,200	0.53%	430	184
2027	84,000	15,293,300	0.55%	465	181
2032	90,000	15,646,800	0.58%	500	180

Source: Airport Records; FAA Aerospace Forecasts FY 2013-2033; Coffman Associates analysis

The table also indicates a declining trend in itinerant operations per based aircraft since 2000. This ratio has fluctuated from a high of 284 in 2005 to a low of 165 in 2010. Since the turn of the century, the average has been 238 operations per based aircraft.

Table 2Q presents a pair of projections based upon maintaining a constant market share of the U.S. towered traffic and the constant ratio of operations per based aircraft. The constant market share projection would result in a decrease in operations per based aircraft, decreasing from 179 in 2017 to 153 in 2032. Although the operations per based aircraft ratio has fluctuated at Scottsdale Airport over the past several years, it has maintained an average of well over 200 since 2000. A constant operations per based aircraft forecast was also determined that yields a slightly increasing market share through the long term planning period.

For comparison, the FAA TAF projections are presented in the table. With this forecast, the market share further declines and operations per based aircraft reach very low numbers when compared to what the airport has experienced in the past. The TAF will likely serve as the low end of the planning envelope for itinerant operations.

General aviation itinerant operations at Scottsdale Airport have remained steady the last few years, and as the economy is forecast to improve, the selected forecast shows a return to positive growth. Continued development potential in the region that further supports aviation activity can attribute to this projected growth as well. The selected forecast for itinerant operations at Scottsdale Airport would account for an increased market share as a percentage of total U.S. itinerant operations and a slight decrease in aircraft utilization per based aircraft. The selected forecast equates to an AAGR of 1.21 percent through the planning period. **Exhibit 2F** further presents the general aviation itinerant operations forecasts.

General Aviation Local Operations

Table 2R outlines local general aviation operations in relation to the total general aviation local operations at towered airports in the United States. The Scottsdale Airport market share, as a percentage of total general aviation local operations at towered airports, increased from 0.50 percent in 2000 to 0.52 percent in 2012. In between these years, the market share fluctuated from a low of 0.40 percent in 2007 to a high of 0.54 percent in 2009. The market share has experienced a gradual increase since 2010.

Also depicted in the table are the local operations per based aircraft ratios. This number has fluctuated since 2000, experiencing a high of 201 in 2000 and a low of 120 in 2010. Since 2010, the ratio has increased to 164 local operations per based aircraft most recently in 2012.

As presented in the table, projections similar to what were made for itinerant operations at Scottsdale Airport are depicted. The first forecast considers maintaining a constant 0.52 percent market share of national local operations, yielding local annual operations projection of approximately 66,400 by 2032. A second forecast for constant operations per based aircraft was also performed, which results in 82,000 local operations annually by 2032.

The FAA TAF projections are also presented in the table. Similar to itinerant operations, the TAF shows a decline in

market share and operations per based aircraft through the planning period. As such, this forecast will serve as the low end of the planning envelope since it accounts for very minimal growth.

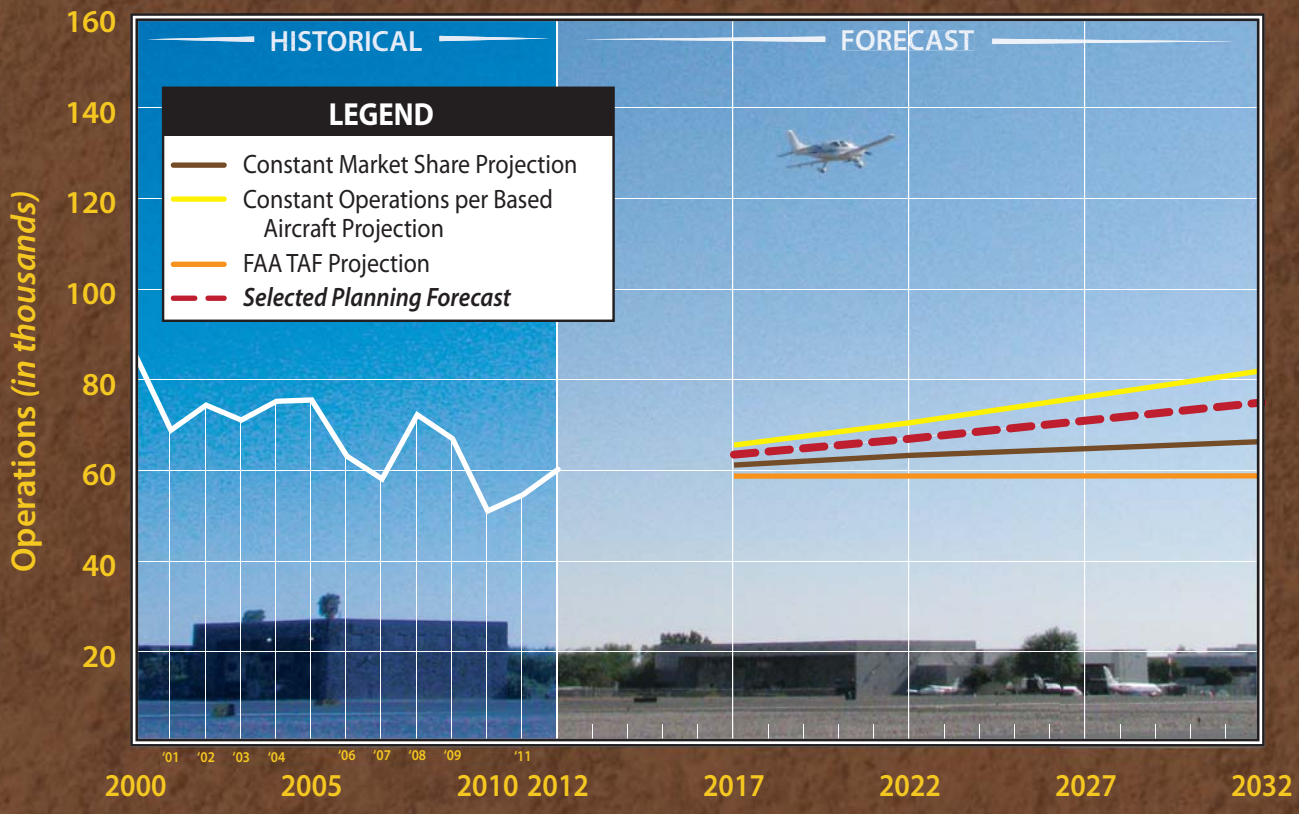
TABLE 2R
Local General Aviation Operations Forecasts
Scottsdale Airport

Year	Scottsdale Local GA Operations	U.S. ATCT Local GA Operations	Scottsdale Market Share	Scottsdale Based Aircraft	Local Operations per Based Aircraft
2000	85,298	17,034,400	0.50%	425	201
2001	68,894	16,193,700	0.43%	439	157
2002	74,398	16,172,800	0.46%	446	167
2003	71,121	15,292,100	0.47%	460	155
2004	75,264	14,960,400	0.50%	439	171
2005	75,544	14,845,900	0.51%	439	172
2006	63,166	14,365,400	0.44%	471	134
2007	58,129	14,556,800	0.40%	447	130
2008	72,268	14,081,200	0.51%	392	184
2009	67,029	12,448,000	0.54%	423	158
2010	51,055	11,716,300	0.44%	424	120
2011	54,620	11,437,000	0.48%	424	129
2012	60,234	11,608,300	0.52%	368	164
Constant Market Share Projection					
2017	61,913	11,906,400	0.52%	400	155
2022	63,327	12,178,200	0.52%	430	147
2027	64,810	12,463,400	0.52%	465	139
2032	66,368	12,763,100	0.52%	500	133
Constant Operations per Based Aircraft Projection					
2017	65,600	11,906,400	0.55%	400	164
2022	70,520	12,178,200	0.58%	430	164
2027	76,260	12,463,400	0.61%	465	164
2032	82,000	12,763,100	0.64%	500	164
FAA TAF Projection					
2017	58,756	11,906,400	0.49%	400	147
2022	58,776	12,178,200	0.48%	430	137
2027	58,796	12,463,400	0.47%	465	126
2032	58,816	12,763,100	0.46%	500	118
Selected Planning Forecast					
2017	63,500	11,906,400	0.53%	400	159
2022	67,000	12,178,200	0.55%	430	156
2027	71,000	12,463,400	0.57%	465	153
2032	75,000	12,763,100	0.59%	500	150

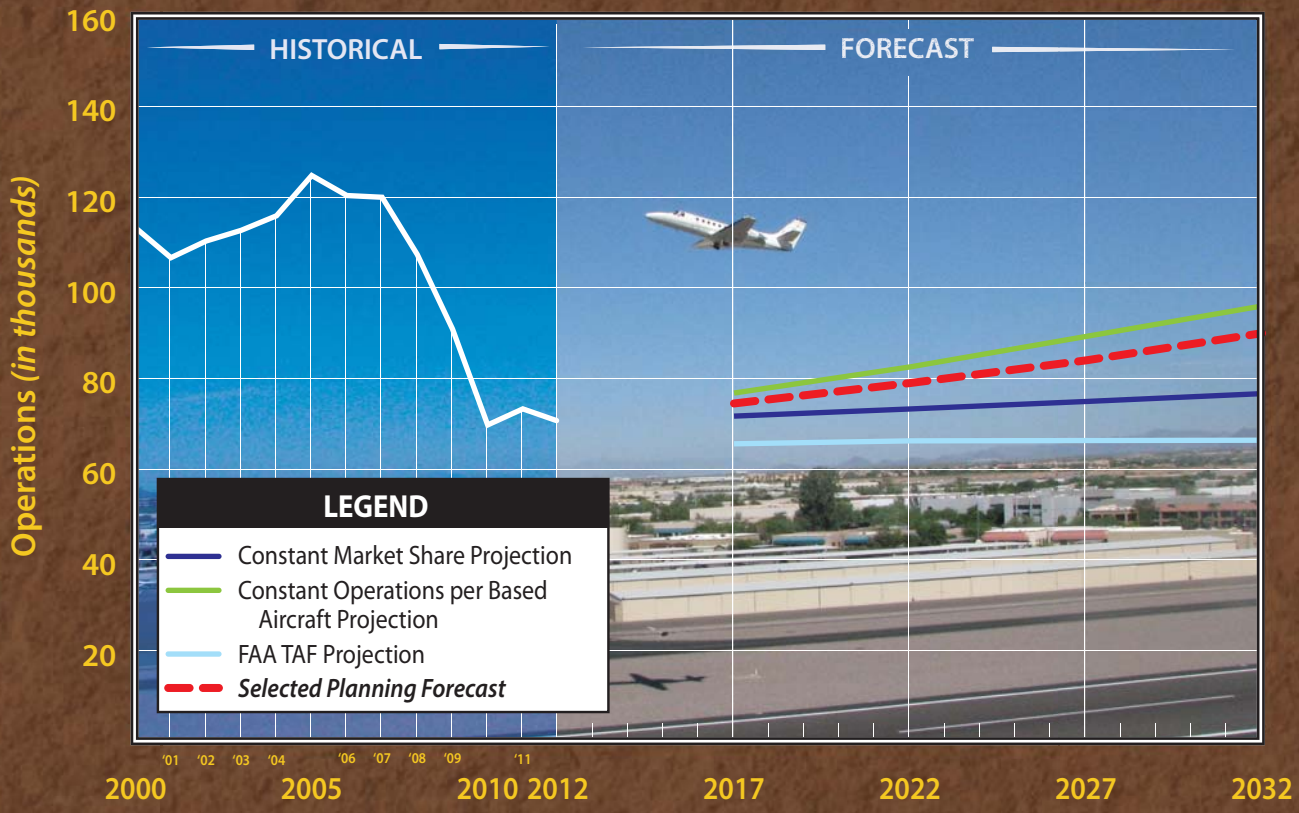
Source: Airport Records; FAA Aerospace Forecasts FY 2013-2033; Coffman Associates analysis

The selected forecast for local general aviation operations at Scottsdale Airport is depicted on **Exhibit 2F** and at the bottom of **Table 2R**. Local general aviation operations are projected to increase through the master planning period, at 1.10 percent annually, following gains in the economy and in total local general aviation operations per the *FAA Aerospace Forecast: Fiscal Years 2013-2033*. The level of local activity will continue to be dependent upon the operations of flight

LOCAL GENERAL AVIATION OPERATIONS FORECASTS



ITINERANT GENERAL AVIATION OPERATIONS FORECASTS



training, as well as aircraft basing at the airport.

Existing General Aviation Operations Forecasts

Table 2S compares the newly developed general aviation forecasts for Scottsdale Airport to forecasts from previous studies. The selected planning forecast for itinerant and local general aviation operations combined yields 138,000 total general aviation operations by 2017 and 165,000 operations by 2032.

TABLE 2S
Existing General Aviation Operations Forecasts
Scottsdale Airport

	2012	2017	2022	2027	2032
ITINERANT OPERATIONS					
Selected Planning Forecast	***70,719***	***74,500***	***79,000***	***84,000***	***90,000***
2013 FAA *Terminal Area Forecast*		66,183	66,253	66,323	66,393
2008 Arizona State Airports System Plan		161,900	178,400	196,600	216,700
2011 Scottsdale Airport Preliminary Draft Environmental Assessment Approved Forecasts		78,800	85,300	92,500	100,200
LOCAL OPERATIONS					
Selected Planning Forecast	***60,234***	***63,500***	***67,000***	***71,000***	***75,000***
2013 FAA *Terminal Area Forecast*		58,756	58,776	58,796	58,816
2008 Arizona State Airports System Plan		70,600	77,800	85,700	94,400
2011 Scottsdale Airport Preliminary Draft Environmental Assessment Approved Forecasts		58,800	64,000	69,700	75,800
TOTAL OPERATIONS					
Selected Planning Forecast	***130,953***	***138,000***	***146,000***	***155,000***	***165,000***
2013 FAA *Terminal Area Forecast*		124,939	125,029	125,119	125,209
2008 Arizona State Airports System Plan		232,500	256,200	282,300	311,100
2011 Scottsdale Airport Preliminary Draft Environmental Assessment Approved Forecasts		137,600	149,300	162,200	176,000

Source: FAA TAF; 2008 *Arizona State Airports System Plan*; Scottsdale Airport Preliminary Draft Environmental Assessment; Coffman Associates analysis

AIR TAXI OPERATIONS

The air taxi category includes aircraft involved in on-demand passenger, small parcel transport, and air ambulance activity. The FAA ATCT counts air taxi in the same category as commuter airlines, but since there is no commuter airline service at Scottsdale Airport, the air taxi count is entirely made up of air taxi activity.

The history of air taxi operations at Scottsdale Airport is presented in **Table 2T**. Air taxi operations have fluctuated over the years, with a low of 7,955 operations experienced in 2000 to a high of 14,531 operations in 2012. The trend has indicated overall positive growth in air taxi activity over the past several years. The FAA TAF projects air taxi activity to remain level at 14,306 annual operations through the planning period.

TABLE 2T
Air Taxi Operations Forecasts
Scottsdale Airport

Year	Air Taxi Operations	Itinerant GA Operations	Scottsdale Market Share
2000	7,955	113,203	7.03%
2001	8,477	106,654	7.95%
2002	10,253	110,331	9.29%
2003	10,223	112,700	9.07%
2004	11,063	115,900	9.55%
2005	11,816	124,783	9.47%
2006	12,389	120,366	10.29%
2007	13,390	119,984	11.16%
2008	11,232	107,351	10.46%
2009	8,177	90,933	8.99%
2010	12,250	69,767	17.56%
2011	12,974	73,304	17.70%
2012	14,531	70,719	20.55%
Selected Forecast			
2017	14,900	74,500	20.00%
2022	15,800	79,000	20.00%
2027	16,800	84,000	20.00%
2032	18,000	90,000	20.00%

Source: ATCT Records; Coffman Associates analysis

Many general aviation airports have experienced increases in air taxi activity in previous years. This can be primarily attributed to the increased popularity of on-demand air travel for time savings and due to scheduled airline security procedures. In 2009, however, air taxi operations dipped to their lowest in several years, due mainly to the economic downturn. This was evidenced at Scottsdale Airport, as air taxi operations declined noticeably in 2009. However, since this time, air taxi activity has increased substantially.

Air taxi operations have been forecast to increase through the master planning period, constituting 20 percent market share of the itinerant general aviation operations at the airport. This operational level is conducive of a reliever airport surrounded by a variety of industrial and commercial business activities as currently exists, and is forecast to continue for areas adjacent to Scottsdale Airport.

MILITARY OPERATIONS

Table 2U presents the history of military operations at Scottsdale Airport since 2000. Over that time period, military activity has averaged approximately 500 annual operations. Of these operations, approximately 80 percent were itinerant and 20 percent were local.

Forecasting for military activity is particularly challenging when there are no based military aircraft. In addition, the mission of the military can change rapidly, affecting the potential for military ac-

tivity. Due to this unpredictability, military activity is forecast as a constant of 600 total operations annually for each planning period. This constant is slightly higher than the approximate average of the activity experienced since 2000.

TABLE 2U
Military Operations Forecast
Scottsdale Airport

Year	Total Operations	Itinerant Operations	Local Operations
2000	576	417	159
2001	543	447	96
2002	582	520	62
2003	428	394	34
2004	454	423	31
2005	286	278	8
2006	377	198	179
2007	479	363	116
2008	560	359	201
2009	305	278	27
2010	443	365	78
2011	742	580	162
2012	608	530	78
Selected Forecast			
2017	600	500	100
2022	600	500	100
2027	600	500	100
2032	600	500	100

Source: ATCT Records; Coffman Associates analysis

ATCT COUNT ADJUSTMENT

Since the Scottsdale Airport ATCT is not a 24-hour tower, its air traffic counts are not all-inclusive of aircraft operations at the airport. Some aspects of the Master Plan require that all airport activity be considered. For these evaluations, it is necessary to estimate and adjust for operations that occur when the tower is closed. The Scottsdale Airport ATCT operates from 6:00 a.m. to 9:00 p.m. daily.

Previous studies to include the *Scottsdale Airport 14 CFR Part 150 Noise Compatibility Study Update* and Scottsdale Airport Preliminary Draft EA adjusted annual ATCT counts between 2.5 percent and 6.5 percent, respectively. For planning purposes within this Master Plan, operations after the tower has closed are estimated at five percent of total operations. This estimate is consistent with other facilities similar to Scottsdale Airport where after-hours operational counts have been conducted.

Table 2V presents a summary of the ATCT operations, as well as the adjusted operations, when considering the five percent increase for after-hours activity. When considering the five percent adjustment, base year operations for 2012 were 153,397. Through the long term planning period, annual operations are forecast to be 192,780. This equates to a 1.20 percent AAGR.

TABLE 2V
Forecast Adjustment for ATCT After-Hours Operations
Scottsdale Airport

	2012	2017	2022	2027	2032
ATCT OPERATIONS					
General Aviation					
Itinerant	70,719	74,500	79,000	84,000	90,000
Local	60,234	63,500	67,000	71,000	75,000
Total General Aviation Operations	130,953	138,000	146,000	155,000	165,000
Air Taxi	14,531	14,900	15,800	16,800	18,000
Military	608	600	600	600	600
Total ATCT Operations	***146,092***	***153,500***	***162,400***	***172,400***	***183,600***
ADJUSTED OPERATIONS					
General Aviation					
Itinerant	74,255	78,225	82,950	88,200	94,500
Local	63,246	66,675	70,350	74,550	78,750
Total General Aviation Operations	137,501	144,900	153,300	162,750	173,250
Air Taxi	15,258	15,645	16,590	17,640	18,900
Military	638	630	630	630	630
Total Adjusted Operations	***153,397***	***161,175***	***170,520***	***181,020***	***192,780***

Adjustment accounts for the hours (9:00 p.m. - 6:00 a.m.) when the ATCT is closed

ANNUAL INSTRUMENT APPROACHES

An instrument approach, as defined by the FAA, is "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." To qualify as an instrument approach, aircraft must land at the airport after following one of the published instrument approach procedures in less than visual conditions. Forecasts of annual instrument approaches (AIAs) provide guidance in determining an airport's requirements for navigational aid facilities such as an instrument landing system. It should be noted that practice or training approaches do not count as annual AIAs, nor do instrument approaches conducted in visual conditions.

During poor weather conditions, pilots are less likely to fly and rarely would perform training operations. As a result, an estimate of the total number of AIAs can be made based on a percentage of itinerant operations regardless of the frequency of poor weather conditions. An estimate of one percent of total itinerant (general aviation, air taxi, and military) operations is utilized to forecast AIAs at Scottsdale Airport, as presented in **Table 2W**.

TABLE 2W
Annual Instrument Approaches
Scottsdale Airport

	AIAs	Itinerant Operations	Ratio
2017	945	94,500	1.0%
2022	1,002	100,170	1.0%
2027	1,065	106,470	1.0%
2032	1,140	114,030	1.0%

Source: Coffman Associates analysis

COMPARISON TO THE FAA TAF

The FAA will review the forecasts of this Master Plan and compare them to the TAF. Where the 5- and 10-year forecasts exceed 100,000 total annual operations or 100 based aircraft, the FAA prefers that the forecasts differ by less than 10 percent in the 5-year period and 15 percent in the 10-year period. Where the forecasts do differ, supporting documentation should be provided.

Table 2X presents a direct comparison of the 2013 FAA TAF to the forecasts in this Master Plan. Regarding based aircraft, the forecast for the five-year timeframe is 6.4 percent higher than the TAF and the forecast for the 10-year timeframe is 5.4 percent higher than the TAF. During the long range (2032), the Master Plan is only 2.7 percent higher than what the TAF is projecting. The primary reason for the difference is because the TAF has a 2012 base year of 346 based aircraft, when actual airport records indicate 368 based aircraft in 2012. During the long range planning period, the Master Plan and TAF forecasts draw closer. This is due to the TAF exhibiting a slightly higher annual growth rate (1.72 percent) versus the Master Plan (1.54 percent).

TABLE 2X
Master Plan Forecast Comparison to the Terminal Area Forecast
Scottsdale Airport

Year	Airport Activity	FAA TAF	Percent Difference
BASED AIRCRAFT			
2012	368	346	6.4%
2017	400	376	6.4%
2022	430	408	5.4%
2027	465	447	4.0%
2032	500	487	2.7%
AAGR	1.54%	1.72%	
ANNUAL OPERATIONS			
2012	153,397	145,741	5.3%
2017	161,175	139,865	15.2%
2022	170,520	139,955	21.8%
2027	181,020	140,045	29.3%
2032	192,780	140,135	37.6%
AAGR	1.20%	-0.20%	

Source: FAA TAF (2013); Coffman Associates analysis

The total annual operations forecast in the Master Plan is 15.2 percent higher than the TAF in the 5-year timeframe. The 10-year forecast is 21.8 percent higher than the TAF. The primary reason for this is that the TAF has a lower 2012 operations number than what was actually realized by the Scottsdale Airport ATCT. Furthermore, the TAF actually presents a decline in operations through the long term planning period of this study when compared to 2012. The Master Plan accounts for modest growth in aircraft operations through 2032.

PEAKING CHARACTERISTICS

Many airport facility needs are related to the levels of activity during peak periods (busy times). The periods used in developing facility requirements for this study are as follows:

- **Peak Month** – The calendar month when peak aircraft operations occur.
- **Design Day** – The average day in the peak month. This indicator is derived by dividing the peak month operations by the number of days in the month.
- **Busy Day** – The busy day of a typical week in the peak month.
- **Design Hour** – The peak hour within the design day.

The peak month is an absolute peak within a given year. All other peak periods will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without overbuilding or being too restrictive. The peak periods forecast has been determined utilizing operations reports by the Scottsdale Airport ATCT to the FAA.

Since 2000, the peak month average has accounted for 9.7 percent of the annual operations. In 2012, the peak month was January with 14,300 operations. The design day operations were calculated by dividing the peak month (January) by the number of days in the month (31).

Daily operational counts from the ATCT were utilized to determine a busy day peaking factor for general aviation activity. During the peak month in 2012, the peak day of each week averaged 18 percent of weekly operations. Thus, to determine the typical busy day, the design day is multiplied by 1.26, which represents 18 percent of the days in a week (7 x 0.18). Design hour operations were determined to be approximately 13 percent of the design day operations. The peaking characteristics are summarized in **Table 2Y** for each planning year period.

TABLE 2Y
Peak Operations Forecast
Scottsdale Airport

	2012	2017	2022	2027	2032
Annual Operations	153,397	161,175	170,520	181,020	192,780
Peak Month	14,300	15,634	16,540	17,559	18,700
Design Day	461	504	534	566	603
Busy Day	581	635	672	714	760
Design Hour	60	66	69	74	78

Source: ATCT Records; Coffman Associates analysis

DESIGN AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using or are expected to use the airport. FAA AC 150/5300-13A, *Airport Design*, was published on September 28, 2012. It is intended to replace AC 150/5300-13, *Airport Design*, which was dated September 29, 1989. The previous Airport Design AC established the design standards based primarily on the Airport Reference Code (ARC). Paragraph 4 defined the ARC as "*a coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport.*"

The critical design aircraft is used to define the design parameters for the airport. In most cases, the design aircraft is a composite aircraft representing a collection of aircraft classified by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). In the case of an airport with multiple runways, a design aircraft is selected for each runway. The first consideration is the safe operation of aircraft likely to use the airport. Any operation of an aircraft that exceeds design criteria of the airport may result in either an unsafe operation or a lesser safety margin; however, it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently.

RUNWAY DESIGN CODE

The AAC, ADG, and approach visibility minimums are combined to form the Runway Design Code (RDC) of a particular runway. The RDC provides the information needed to determine certain design standards that apply. The first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the visibility minimums expressed by runway visual range (RVR) values in feet of 1,200, 1,600, 2,400, 4,000, and 5,000. The third component should read "VIS" for runways designed for visual approach use only. Generally, runway standards are related to aircraft approach speed, aircraft wingspan, and designated for planned approach visibility minimums. **Table 2Z** presents the RDC parameters.

Exhibit 2G summarizes representative design aircraft categories. As shown on the exhibit, the airport does not currently, nor is it expected to, regularly serve larger transport aircraft, such as Boeing 737, 747, 757, or 767 weighing more than 100,000 pounds. Large transport aircraft are used by commercial carriers which do not currently use, nor are they expected to use, the airport through the planning period. However, some of the largest business jets, such as the Gulfstream V, do operate at the airport.

TABLE 2Z
Runway Design Code Parameters

Aircraft Approach Category (AAC)		
Category	**Approach Speed**	
A	less than 91 knots	
B	91 knots or more but less than 121 knots	
C	121 knots or more but less than 141 knots	
D	141 knots or more but less than 166 knots	
E	166 knots or more	
Airplane Design Group (ADG)		
Group #	**Tail Height (ft)**	**Wingspan (ft)**
I	<20	<49
II	20-<30	49-<79
III	30-<45	70-<118
IV	45-<60	118-<171
V	60-<66	171-<214
VI	66-<80	214-<262
Visibility Minimums		
RVR (ft)	**Flight Visibility Category (statute miles)**	
VIS	3-mile or greater visibility minimums	
5,000	Lower than 3 miles but not lower than 1-mile	
4,000	Lower than 1-mile but not lower than ¾-mile (APV ≥ ¾ but < 1-mile)	
2,400	Lower than ¾-mile but not lower than ½-mile (CAT-I PA)	
1,600	Lower than ½-mile but not lower than ¼-mile (CAT-II PA)	
1,200	Lower than ¼-mile (CAT-III PA)	

RVR: Runway Visual Range
APV: Approach Procedure with Vertical Guidance
PA: Precision Approach
Source: FAA AC 150/5300-13A, *Airport Design*

TAXIWAY DESIGN CODE

The TDG relates to the undercarriage dimensions of the design aircraft. Taxiway/taxilane width and fillet standards, and, in some instances, runway to taxiway and taxiway/taxilane separation requirements are determined by TDG. It is appropriate for taxiways to be planned and built to different TDG standards based on expected use.

The TDG standards are based on the Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance. The taxiway design elements determined by the application of the TDG include the taxiway width, taxiway edge safety margin, taxiway shoulder width, taxiway fillet dimensions, and, in some cases, the separation distance between parallel taxiways/ taxilanes. Other taxiway elements, such as the taxiway safety area (TSA), taxiway/taxilane object free area (TOFA), taxiway/taxilane separation to parallel taxiway/taxilanes or fixed or movable objects, and taxiway/taxilane wingtip clearances are determined solely based on the wingspan (ADG) of the design aircraft utilizing those surfaces.

CURRENT DESIGN AIRCRAFT

The critical design aircraft is defined as the most demanding category of aircraft which conduct 500 or more itinerant operations at the airport each year. In some

A-I

- Beech Baron 55
- **Beech Bonanza**
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- Eclipse 500/550
- Piper Archer
- Piper Seneca

B-I

- Beech King Air 100
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I (525/526)
- Falcon 10
- Beechjet 400
- Raytheon Premier 390

B-II

- Super King Air 200
- Cessna 441
- DHC Twin Otter
- Super King Air 350
- Beech 1900
- Citation Excel (560), Sovereign (680)
- Falcon 50, 900, 2000
- **Citation Bravo (550)**
- Embraer 120

A-III, B-III

- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP
- Falcon 7X

C-I, D-I

- Sabre 75
- **Lear 31, 35,** 45, 60
- Israeli Westwind 1124

C-II, D-II

- **Cessna Citation X (750)**
- Gulfstream 100, 200,300
- Challenger 300/600
- ERJ-135, 140, 145
- CRJ-200/700
- Embraer Regional Jet
- Lockheed JetStar
- Hawker 800

C-III, D-III *less than 100,000 lbs.*

- ERJ-170
- CRJ 705, 900
- **Gulfstream 500**, 550, 650
- Global Express, Global 5000
- Q-400

C-III, D-III *over 100,000 lbs.*

- ERJ-90
- Boeing Business Jet
- B-727
- **B-737**-300, **700,** 800
- MD-80, DC-9
- A319, A320

C-IV, D-IV

- **B-757**
- B-767
- C-130 Hercules
- DC-8-70
- MD-11

D-V

- **B-747-400**
- B-777
- B-787
- A-330, A-340

Note: Aircraft pictured is identified in bold type.

cases, more than one specific make and model of aircraft comprises the airport's critical design aircraft. One category of aircraft may be the most critical in terms of approach speed, while another is most critical in terms of wingspan and/or tail height, which affects runway/taxiway width and separation design standards. The critical design aircraft for a general aviation airport may be a specific aircraft model or it can be a combination of several aircraft within the same design code, that when combined, exceed the 500 operations threshold.

A critical design aircraft will be determined for Runway 3-21 at Scottsdale Airport. The largest design aircraft in terms of approach speed and airplane design group will determine the appropriate design standards for the runway and its associated taxiways.

General aviation aircraft using the airport include a variety of single and multi-engine piston-powered aircraft, turboprops, business jets, and helicopters. While the airport is used by helicopters, they are not included in this determination as they are not assigned an approach speed or an airplane design group.

Based Aircraft

The determination of the design aircraft (or family of aircraft) will first examine the types of based aircraft followed by an analysis of itinerant activity. As previously discussed, the largest category of aircraft at the airport is single engine piston-powered aircraft that fall within AAC A and ADG I. Larger multi-engine piston-powered aircraft and turboprops also constitute a solid percentage of the based aircraft fleet, and these aircraft range from AAC A and B and ADG I and II. The based jets include a variety of aircraft ranging from different models of Cessna Citations, which are designated in design categories B-I and B-II, to Gulfstreams and the Global Express classified in categories C-II, C-III, and D-II. Before making a final determination of the critical aircraft family, an examination of the itinerant business jet aircraft using the airport should be considered.

Itinerant Aircraft

The FAA maintains the *Traffic Flow Management System Counts* (TFMSC) database which documents certain aircraft operations at certain airports. Information is added to the TFMSC database when pilots file flight plans and/or when flights are detected by the National Airspace System, usually via radar. It includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. Due to factors such as incomplete flight plans and limited radar coverage, TFMSC data cannot account for all aircraft activity at an airport. Therefore, it is likely that there are more operations at an airport than are captured by this methodology. Nonetheless, FAA estimates that more than 95 percent of activity is captured. Since business jets are larger and faster, they will typically have a greater impact on airport design standards than smaller aircraft. The following analysis will focus on itinerant activity by jets at Scottsdale Airport.

Exhibit 2H presents the TFMSC jet activity at Scottsdale Airport from 2008 through 2012. As can be seen, most types and sizes of business jets can and do operate at the airport. During this five-year timeframe, the airport has averaged 27,650 annual business jet operations.

The exhibit also shows the breakout of these business jets by AAC and ADG. Over the sample period, the greatest number of operations in any single design family combined was 49,900 in B-II, while C-II registered 32,821 operations. These accounted for approximately 36 percent and 24 percent of logged jet activity, respectively. The most demanding business jets, in terms of design standards, to operate at the airport during the time period are those in design categories C-III (Global 5000, Global Express, and Gulfstream V) and D-II (Gulfstream G150, IAI Galaxy, Gulfstream II, and Gulfstream IV). In addition, the Falcon F7X, categorized as a B-III aircraft, is also a demanding aircraft based upon wingspan.

As previously discussed, critical aircraft design does not require one specific aircraft model to make up the 500 annual itinerant operations. Over the past several years, approach category D has served as the most demanding AAC to exceed 500 annual operations, averaging over 3,000 operations per year. Prior to 2012, design group II constituted the most demanding ADG to exceed the 500 annual operations threshold; however, in 2012, operations by aircraft in ADG III combined for over 500 operations. Based upon these figures, annual operations in 2012 by jet aircraft in AAC D and ADG III combined to exceed the critical aircraft threshold of 500 operations per year to be designated as the current critical design aircraft. Thus, the current critical design aircraft for Scottsdale Airport falls in design category D-III for aircraft with a maximum certified takeoff weight of 100,000 pounds or less.

FUTURE DESIGN AIRCRACT

The aviation demand forecasts indicate the potential for growth in business jet aircraft at the airport. This includes a forecast of 162 based business jets by the long term planning period. The type and size of business jets using the airport regularly can impact the design standards to be applied to the airport system. Therefore, it is important to have an understanding of what type of aircraft may use the airport in the future. Factors such as population and employment growth in the airport service area, the proximity and level of service at other regional airports, and development at the airport can influence future activity.

A trend has emerged where medium and large business jets (approach categories C and D) activity has also increased over time. This is not unexpected as medium and large business jets are representing a greater percentage of business jet deliveries for the past several years. In 2001, approximately 47 percent of business jets manufactured were in approach category B with the remaining 53 percent being larger business jets in approach categories C and D. By 2011, only 40 percent were in approach category B and 60 percent were in approach categories C and D, as shown in **Table 2AA**. Thus, the trend in business jet manufacturing is toward larger aircraft. This trend provides an indication that the airport should continue to plan for large business jets up to design category D-III through the long term planning period.

The trend toward manufacturing of a larger percentage of medium and large business jets, those in approach categories C and D, may lead to even greater utilization of these aircraft at Scottsdale Airport. **Table 2BB** presents a forecast estimate of future business jet operations at Scottsdale Airport.

Business Jet Operations by AAC - ADG (Minimum)

AAC - ADG	Aircraft Type	Annual Operations 2008	2009	2010	2011	2012
A-I	Eclipse 500	288	286	271	387	534
Total A-1 Operations		288	286	271	387	534
B-I	Raytheon Beechjet 400	2,275	1,371	1,638	1,641	1,556
	Cessna 500 - Citation I	49	77	50	44	24
	Cessna 501 - Cessna I	253	201	182	126	192
	Cessna 510 - Citation Mustang	162	225	275	595	580
	Cessna 525 & 526 - Citation Jet I	953	742	679	592	626
	Embraer Phenom 100	0	65	437	789	874
	Dassault Falcon - Mystere 10	187	101	130	284	155
	Bombardier Learjet 28	1	4	2	2	0
	Mitsubishi MU300 - Diamond I	66	33	22	22	16
	Raytheon Premier 390	314	259	208	375	329
	North American Rockwell Sabre 40/60	68	40	11	30	32
Total B-I Operations		4,328	3,118	3,634	4,500	4,384
B-II	Cessna 525 - Citation Jet II	580	464	405	367	247
	Cessna 525 - Citation Jet III	890	606	607	778	907
	Cessna 550 - Citation II/Bravo	1,532	963	877	913	924
	Cessna 551 - Citation II/SP	32	17	16	9	12
	Cessna 560 - Citation V/Ultra/Encore	1,976	1,626	1,502	1,336	1,261
	Cessan 56X - Citation Excel/XLS	2,670	2,058	1,866	2,110	1,938
	Cessna 650 - Citation III/VI/VII	818	481	560	592	445
	Cessna 680 - Citation Sovereign	819	839	888	1,000	916
	Embraer Phenom 300	0	0	3	59	271
	Dassault Falcon 2000	1,271	1,054	999	1,164	1,077
	Dassault Falcon 900	696	493	533	603	555
	Dassault Falcon - Mystere 20	536	312	222	373	411
	Dassault Falcon - Mystere 50	581	384	462	467	527
Total B-II Operations		12,401	9,297	8,940	9,771	9,491
B-III	Dassault Falcon F7X	11	72	98	98	127
Total B-III Operations		11	72	98	98	127
C-I	BAe HS 125 - 1/2/3/400/600	197	36	46	33	28
	Bombardier Learjet 23/24	31	42	18	4	11
	Bombardier Learjet 25	40	32	23	21	33
	Bombardier Learjet 31 A/B	514	533	749	283	125
	Bombardier Learjet 40	540	402	422	416	505
	Bombardier Learjet 45	1,235	649	743	869	664
	Bombardier Learjet 55	568	378	403	369	316
	Bombardier Learjet 60	981	743	661	883	815
	North American Rockwell Sabre 75	0	2	2	2	0
	IAI 1124 Westwind	304	231	314	124	152
Total C-I Operations		4,410	3,048	3,381	3,004	2,649
C-II	IAI Astra 1125	660	407	407	305	201
	Cessna 750 - Citation X	1,705	1,479	1,558	1,434	1,515
	Bombardier Challenger 300	622	592	752	902	891
	Bombardier Challenger 600/601/604	1,464	1,298	1,483	1,632	1,628
	Bombardier CRJ-200	8	0	0	2	16
	Embraer ERJ - 135/140/145/Legacy	135	95	99	108	121
	Gulfstream III - G300	674	338	296	300	295
	BAe HS 125/700-800 / Hawker 800	2,158	1,539	1,751	1,713	1,792
	BAe/Raytheon HS 125-1000 / Hawker 1000	80	52	20	24	36
	Hawker 4000	4	16	32	20	30
	Fairchild Dornier 328 Jet	16	18	12	0	0
	Lockheed L-1329 Jetstar 731	44	26	6	4	6
Total C-II Operations		7,570	5,860	6,416	6,444	6,531

Business Jet Operations by AAC - ADG (Minimum)

AAC - ADG	Aircraft Type	Annual Operations 2008	2009	2010	2011	2012
C-III	Bombardier BD-700 - Global 5000	21	14	24	35	24
	Bombardier BD-700 - Global Express	64	41	49	61	85
	Gulfstream V/G500	224	151	230	257	279
Total C-III Operations		309	206	303	353	388
D-I	Bombardier Learjet 35/36	1,311	835	955	1,070	924
Total D-I Operations		1,311	835	955	1,070	924
D-II	Gulfstream G150	233	180	201	288	210
	IAI 1126 Galaxy / Gulfstream G200	925	696	850	981	874
	Gulfstream II - G200	121	87	43	42	16
	Gulfstream IV - G400	949	725	917	874	1,068
Total D-II Operations		2,228	1,688	2,011	2,185	2,168
Total Operations		32,856	24,410	26,009	27,812	27,196

Total Business Jet Operations by Aircraft Approach Category and Airplane Design Group

	Annual Operations 2008	2009	2010	2011	2012
AAC					
A	288	286	271	387	534
B	16,740	12,487	12,672	14,369	14,002
C	12,289	9,114	10,100	9,801	9,568
D	3,539	2,523	2,966	3,255	3,092
ADG					
I	10,337	7,287	8,241	8,961	8,491
II	22,199	16,845	17,367	18,400	18,190
III	320	278	401	451	515

AAC - Aircraft Approach Category
ADG - Airplane Design Group

Source: Traffic Flow Management System Counts (City Pair) from FAA Database

TABLE 2AA
Business Jet Deliveries by ARC for 2001 and 2011

ARC	2001 Business Jets Manufactured	Percent	2011 Business Jets Manufactured	Percent
B-I	104	13%	92	14%
B-II	265	34%	177	26%
Total B-II and Smaller	**369**	**47%**	**269**	**40%**
C-I	17	2%	5	1%
C-II	185	24%	201	30%
C-III	50	6%	73	11%
D-I	92	12%	43	6%
D-II	36	5%	0	0%
D-III	35	4%	90	13%
Total C-I and Larger	**415**	**53%**	**412**	**60%**
TOTAL	**784**		**681**	

Source: General Aviation Manufacturers Association

TABLE 2BB
Business Jet Operations Mix
Scottsdale Airport

Design Category	2012	2017	2022	2027	2032
Operations					
A-I	534	620	697	705	619
B-I	4,384	5,049	5,714	6,462	7,386
B-II	9,491	10,842	12,263	13,863	15,789
B-III	127	155	209	392	442
C-I	2,649	2,788	2,961	2,937	2,742
C-II	6,531	7,435	8,187	9,007	10,172
C-III	388	558	836	1,136	1,548
D-I	924	929	941	940	885
D-II	2,168	2,602	3,031	3,720	4,644
Total Jet Operations	**27,196**	**30,977**	**34,839**	**39,161**	**44,226**
Total Civilian Itinerant Operations	**89,513**	**93,870**	**99,540**	**105,840**	**113,400**
Percentage					
Jet Operations Percentage	**30.4%**	**33.0%**	**35.0%**	**37.0%**	**39.0%**
A-I	2.0%	2.0%	2.0%	1.8%	1.4%
B-I	16.1%	16.3%	16.4%	16.5%	16.7%
B-II	34.9%	35.0%	35.2%	35.4%	35.7%
B-III	0.5%	0.5%	0.6%	1.0%	1.0%
C-I	9.7%	9.0%	8.5%	7.5%	6.2%
C-II	24.0%	24.0%	23.5%	23.0%	23.0%
C-III	1.4%	1.8%	2.4%	2.9%	3.5%
D-I	3.4%	3.0%	2.7%	2.4%	2.0%
D-II	8.0%	8.4%	8.7%	9.5%	10.5%
Total Percentage	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: TFMSC; Coffman Associates analysis

As presented, approach category D aircraft operations should continue to increase through the long term planning period. In addition, combined ADG III activity is projected to increase to approximately 2,000 operations annually by 2032. As a result, the future critical design aircraft for Runway 3-21 at Scottsdale Airport is projected in RDC D-III.

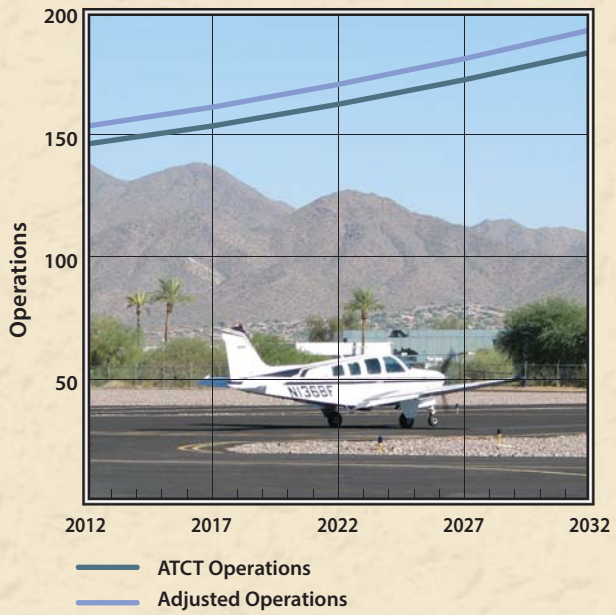
SUMMARY

This chapter has provided demand-based forecasts of aviation activity at Scottsdale Airport over the next 20 years, separated into five-year intervals. Elements such as local socioeconomic indicators, anticipated regional development, and historical aviation data, as well as national aviation trends, were all considered when determining future conditions. A summary of aviation forecasts utilized for the Master Plan is depicted on **Exhibit 2J**.

The next step in the master planning process will be to assess the capacity of existing facilities, their ability to meet forecast demand, and to identify changes to the airside and/or landside facilities which will create a more functional aviation facility.

CATEGORY	2012	2017	2022	2027	2032
ATCT OPERATIONS					
General Aviation					
Itinerant	70,719	74,500	79,000	84,000	90,000
Local	60,234	63,500	67,000	71,000	75,000
Total General Aviation Operations	**130,953**	**138,000**	**146,000**	**155,000**	**165,000**
Air Taxi	14,531	14,900	15,800	16,800	18,000
Military	608	600	600	600	600
Total ATCT Operations	***146,092***	***153,500***	***162,400***	***172,400***	***183,600***
ADJUSTED OPERATIONS *(5% after hour increase)*					
General Aviation					
Itinerant	74,255	78,225	82,950	88,200	94,500
Local	63,246	66,675	70,350	74,550	78,750
Total General Aviation Operations	**137,501**	**144,900**	**153,300**	**162,750**	**173,250**
Air Taxi	15,258	15,645	16,590	17,640	18,900
Military	638	630	630	630	630
Total Adjusted Operations	***153,397***	***161,175***	***170,520***	***181,020***	***192,780***
PEAK OPERATIONS FORECAST					
Peak Month	14,300	15,634	16,540	17,559	18,700
Design Day	461	504	534	566	603
Busy Day	581	635	672	714	760
Design Hour	60	66	69	74	78
ANNUAL INSTRUMENT APPROACHES	N/A	945	1,002	1,065	1,140
BASED AIRCRAFT					
Single Engine Piston	191	195	200	205	210
Multi-Engine Piston	27	27	26	26	25
Turboprop	31	38	45	54	62
Jet	105	122	138	155	173
Helicopter	14	18	21	25	30
Total Based Aircraft	***368***	***400***	***430***	***465***	***500***

OPERATIONS FORECAST



BASED AIRCRAFT FORECAST