
Aviation Activity Forecasts





INTRODUCTION

The Charles M. Schulz–Sonoma County Airport (STS) is one of six public use airports in Sonoma County. It is the only commercial service airport¹ between the San Francisco Bay Area to the south, Sacramento to the east and Arcata-Eureka to the north. The Airport's primary service area has a population of over 1 million people² and includes Sonoma, Lake, and Mendocino counties, and parts of Marin and Napa counties.

Airport Role

The Sonoma County Airport, as the region's principal Airport, serves many roles, including providing facilities for scheduled commuter and air carrier airline services, as well as a growing population of general aviation (GA) activities including corporate and business flying. The *California Aviation System Plan* (CASP) designates the Airport as a *Primary Commercial Service Non-Hub* Airport. There are no *Primary Commercial Service Hub* airports in the region. The closest *Primary Commercial Service Hub* airports are the San Francisco, Oakland, and San Jose International Airports. The Sacramento International Airport is slightly more distant, but at times it can be more convenient for highway travel.

On March 20, 2007, Horizon Air, a subsidiary of Alaska Airlines, instituted non-stop air service between STS and Los Angeles and STS and Seattle using 76-seat Q400 high-speed turboprop aircraft.

In August 2007, the Federal Aviation Administration's (FAA) National Plan of Integrated Airport Systems (NPIAS) reclassified the Airport as a Commercial Service Non-Primary Airport. A strong potential exists for more scheduled airline and commuter air carrier service, particularly in the form of new, quiet technology jet aircraft with up to 135 passenger seats.

The Airport also serves as a base of operations for local pilots, a place to conduct business, and a point of emergency access for the region. These Airport functions are discussed below:

A Base for Sonoma County and Local Area Pilots — With the longest runway of any of the Sonoma County airports and a precision instrument landing system, Sonoma County Airport is

¹ A commercial service airport is a publicly-owned airport providing scheduled passenger service and having at least 2,500 passenger boardings (enplanements) each calendar year. Passenger boardings refer to revenue passenger enplanements on an aircraft in service in air commerce whether or not in scheduled service.

² Sonoma County, "Air Service Market Opportunity with Charles M. Schulz Sonoma County Airport," June 2005. This represents 14 percent of the combined 7.25 million person San Francisco Bay Area and North Coast air passenger markets.

the most convenient and reliable Airport for the majority of GA pilots who live or work in the Sonoma County region.

A Point of Air Access for Visitors to the Community — The Airport is the gateway to Sonoma County and the wine country communities, resorts and businesses in the area. Visitors are attracted to nearby wineries, resorts, golf courses, and other recreational and cultural attractions.

A Place to Conduct Business — The Airport is located reasonably close to local hotels and conference facilities, and has facilities for high end corporate and general aviation aircraft.

A Site for Emergency Community Access — Following such natural disasters as a major earthquake, fire, or flood, airports are often of critical importance as points of access into a community for emergency and disaster relief services. In addition, if local/regional surface access routes (i.e., highways, roads and rail lines) are rendered unusable or blocked, air transportation may be the only means of efficiently getting medical and relief supplies into the affected area. The Sonoma County Airport serves as a base for helicopter emergency medical services (HEMS) operations and for the aeromedical transfer of local hospital patients. One emergency air medical transport service (REACH)³ is based at the Airport. The California Department of Forestry and Fire protection (CDF/CALFIRE) also maintains a fire attack base at the Airport for the suppression of wildland fires.

The Future

The catastrophic events of September 11, 2001, had a serious, albeit temporary impact on the nation's air transportation system. For the first time in U.S. history the entire civil aviation fleet, other than some law enforcement aircraft, was grounded for a period of several days. Over the months, and perhaps years ahead we will see changes in the Country's airport and air transportation systems that could not even have been imagined in the past. What these changes will ultimately entail can only be speculated on at this time, but it can be assumed that more restrictions, not fewer, will be imposed on civil aviation unless the threats to our national security are significantly diminished.

It is anticipated that in the future the Sonoma County Airport will remain as a commercial service Airport and that it will continue to function as it has in the past, i.e., as a nonhub air carrier Airport serving a limited range of scheduled air carrier and commuter airlines and a wide range of general aviation activities. Airport activities will continue to include scheduled passenger and commuter airline operations, small package cargo operations, business/corporate general aviation, and personal general aviation activities. It is also anticipated that the Airport will experience only moderate growth over the long run. This growth will take place both in the numbers of based aircraft and in aircraft operations.

³ REACH = Redwood Empire Air Care Helicopter. REACH Air Medical Services is headquartered in Santa Rosa and provides helicopter and airplane patient transportation for critically ill or injured patients. Since REACH's inception in 1987, the company has performed more than 25,000 air ambulance missions and has developed a specialty in serving pediatric and neonatal patients.

AVIATION INDUSTRY TRENDS

Of the many emerging trends in the aviation industry, two are of particular interest to the development of the Sonoma County Airport Master Plan update project. These are air carrier industry trends and general aviation industry trends.

Air Carrier Industry Trends

The U.S. commercial aviation industry consists of thirty-four mainline air carriers that operate large passenger jets (more than 90 seats) and seventy-nine regional/commuter air carriers that operate smaller piston, turboprop, and regional jet aircraft (of up to 90 seats).⁴ Some of the regional/commuter airlines also fly aircraft with more than 100 passenger seats.⁵ Immediately after the events of September 11, 2001, many mainline airlines grounded large numbers of their older, less fuel-efficient aircraft and delayed delivery of new aircraft. This condition continued through 2005 for many of the mainline carriers. The FAA estimates that there were 7,836 aircraft in the U.S. commercial airline fleet (including regional/commuter airlines) in 2005, an increase of 75 aircraft from 2004.⁶ Included in this number are 3,953 mainline air carrier passenger aircraft (over 90 seats), 2,862 regional/commuter airline aircraft (jets, turboprops and piston-engine), and 1,021 mainline air cargo aircraft.⁷

Three distinct trends have emerged that have helped to shape the commercial air carrier industry since 9/11: (1) major downsizing and restructuring among the mainline legacy carriers;⁸ (2) rapid growth among low-cost carriers,⁹ and (3) phenomenal growth among regional/commuter carriers.¹⁰ In 2005, commercial air carrier enplanements exceeded pre-September 11, 2001 levels by 5.9 percent. Overall, commercial air carriers achieved an all-time high load factor of 77.1 percent in 2005, an increase of 1.9 percentage points since 2004.¹¹ Domestically, mainline air carriers achieved a 77.3 percent load factor in 2005, while the regional/commuter airlines achieved a 69.9 percent load factor. This represents 2.6 and 1.8 percent increases over 2005 levels, respectively.

The combined domestic enplanements of the low-cost carriers and regional/commuters have increased 57.1 percent since 2000, totaling 302.5 million in 2005.¹² This combined passenger count represented 45.3 percent of commercial enplanements in 2005, compared to 30.0 percent in 2000. The growth in the regional/commuter segment of the industry is due in part to the 14.9 percent reduction in domestic capacity by the mainline carriers since 2000. Consequently, the low-cost air carriers have reported capacity increases of 50.8 percent and the regional carriers have increased capacity by 139.3 percent. While low-cost carrier enplanements have increased by

⁴ U.S. Department of Transportation, Federal Aviation Administration, "FAA Aerospace Forecasts, Fiscal Years 2006-2017," March 2006.

⁵ These aircraft include the Embraer 190/195 family of regional jets capable of accommodating 106-118 passengers. JetBlue, for example, has ordered 100 Embraer 190s.

⁶ U.S. Department of Transportation, op. cit.

⁷ Ibid.

⁸ Alaska, American, Continental, Delta, Northwest, United and US Airways.

⁹ American Trans Air, America West, Southwest, JetBlue, Allegiant, AirTran, Frontier and Spirit.

¹⁰ Horizon Air, Comair, American Eagle, Skywest, etc.

¹¹ A 77.1% load factor means that a 100-passenger aircraft would have an average of just over 77 of its seats filled.

¹² U.S. Department of Transportation, op. cit.

38.0 percent since 2000, the network carriers saw their enplanements decline by 18.5 percent. Overall, the network carriers' share of domestic mainline capacity has fallen to 64.4 percent in 2005 from 78.5 percent in 2000.

Outlook

The FAA expects commercial aviation activity to increase between now and 2017, with commercial air passenger totals exceeding 1 billion by 2015.¹³ However, in the short term, this growth is expected to be tempered by some significant challenges, including the impact of the high costs of fuel on the industry's financial condition. Current trends suggest increased passenger demand among the low-cost carriers and the smaller regional/commuter airlines, as well as some recovery of passenger demand among the established legacy carriers. What this means for the Sonoma County Airport is that beyond the March 2007 start of service by Horizon Air, there is a significant possibility for additional scheduled air carrier service by other regional or commuter air carriers or a combination of both over the next several years. Over the longer term, with a developed air service area, some service by a mainline (legacy) air carrier might also be expected.

General Aviation Influences and Trends

The numbers of general aviation (GA) aircraft operations at an airport are influenced both by national and regional conditions, as well as by various circumstances specific to the individual airport. Major influences impacting the Sonoma County Airport and its GA operational activities include:

National Trends

The FAA uses numerous demand factors in forecasting general aviation trends. These demand factors are part of what determines the growth rates of general aviation at a national level. The following national demand factors for general aviation operations were taken from *FAA Aerospace Forecasts, Fiscal Years 2006-2017 (March 2006)*:

- Total active general aviation aircraft fleet
- Total hours flown by aircraft type
- Total active pilots

All of the factors listed above have shown some growth through 2005. The growth of the active general aviation aircraft fleet is forecast to increase by an annual average rate of 1.4 percent through 2017, growing from an estimated 214,591 aircraft in 2005 to 252,775 in 2017.¹⁴ However, the more expensive, turbine-powered fleet (including helicopters) is projected to grow at an average rate of 4.0 percent annually through 2017, with the turbine jet fleet doubling in size. Single-engine piston aircraft (including helicopters) will continue to be the dominant aircraft in the GA fleet mix, but are expected to grow at only about 0.30 percent overall per year through

¹³ Ibid.

¹⁴ U.S. Department of Transportation, *op. cit.* Does not include light-sport aircraft. FAA projects an additional 14,000 light-sport aircraft to be in the GA fleet by 2017.

2017. Multi-engine piston aircraft are projected to grow at only 0.10 percent annually. Single-engine piston helicopter growth, projected at 6.7 percent annually, will offset the slower projected growth rates for single-engine piston propeller-driven aircraft and multi-engine piston propeller-driven aircraft.

The FAA also assumes that relatively inexpensive¹⁵ “microjets” or “very light jets,” and new light sport aircraft could dilute or weaken the replacement market for piston-engine aircraft. The FAA/Transportation Research Board Business Aviation Panel has suggested that the market for VLJs could add an additional 4,950 of these aircraft to the general aviation fleet by 2017. Other forecasts project from 7,400 to 10,900 new business jets entering the market between 2006 and 2014.¹⁶ These aircraft are expected to be divided between the “very light jet” (VLJ) and the long range business jet classes.¹⁷ An estimated 3,476 VLJs will be produced over the next decade, but this projection is heavily dependent on the success of VLJ-based on-demand air taxi services, fuel costs, and the state of the economy.¹⁸



The concept of on-demand air taxi services has its evolutionary roots in the “Small Aircraft Transportation System (SATS) Project,” which is being conducted through a public-private partnership including NASA, the FAA, and the National Consortium for Aviation Mobility (NCAM) SATSLabs. The purpose of SATS is to enable expanded use of smaller airports and smaller aircraft for public transportation. It is designed to:

¹⁵ Priced between \$1.0 to \$2.5 million.

¹⁶ “Aviation Week & Space Technology,” May 2005 and “Aviation International News,” July 2005.

¹⁷ “Aviation International News,” July 2005.

¹⁸ On-demand air taxi services marry two advanced technologies: Very Light Jet (VLJ) aircraft, which can seat four passengers and operate at half the cost of today’s small jets; and sophisticated computer databases that can determine the most efficient ways to route those aircraft to pick up customers. The service is likened to being halfway between a private jet charter and an airline.

- Develop and evaluate the technologies that enable the following four operating capabilities:
 1. Higher volume operations in non-radar airspace and at non-towered airports.
 2. Lower landing minimums at minimally equipped landing facilities.
 3. Increase single-pilot crew safety and mission reliability.
 4. En Route procedures and systems for integrated fleet operations.
- Demonstrate the technical and operational feasibility of the four operating capabilities;
- Assess the economic viability of SATS and its impact on the National Airspace and Airport Infrastructure; and
- Provide technical operational, economic, and societal bases for further investment decisions by stakeholders, funders and users.

Another new class of aircraft currently entering the GA fleet mix is “light-sport” aircraft (LSA). These aircraft evolved from and emulate the ultralight aircraft not currently included in the FAA’s aircraft registry counts.¹⁹ An anticipated 300-500 newly manufactured light-sport aircraft are projected to enter the active fleet on an annual basis beginning in 2006. The Aerospace Forecast assumed registration of over 14,000 of these aircraft by 2017.

Total general aviation hours flown is projected to increase by 3.2 percent annually through 2017. Growth in the active general aviation pilot population is also anticipated with an annual increase of 1.1 percent over the 12-year forecast period, going from 467,742 pilots in 2005 to 535,000 in 2016.²⁰

By all indices, the growth rate of general aviation will be positive in the years ahead. Increases in the number of GA aircraft utilizing the Sonoma County Airport will mainly depend on the state of the economy at the national, state and local levels, the availability of federal Airport Improvement Program (AIP) grant funds, and the availability of key aviation facilities and services.

State Trends

The most recent State aviation activity forecasts are presented in the 1999 California Aviation System Plan (CASP), which covers the years from 1995-2020. The state’s system plan includes all public use airports in California. The state forecast methodology allocates aviation activity in a top-down manner; the forecasts are distributed to respective geographic areas, then sub-areas and ultimately to individual airports.

The State CASP forecasts both a high and a low annual average growth rate for the numbers of based aircraft at the Sonoma County Airport. The high growth rate is 2.18% per year through 2010 and the low growth rate is 1.38% per year for the same period. The CASP based aircraft

¹⁹ The FAA created the new rule for the manufacture, certification, operation, and maintenance of light-sport aircraft. Light-sport aircraft weigh less than 1,320 pounds (1,430 pounds for aircraft intended for operation on water) and are heavier and faster than ultralight vehicles and include airplanes, gliders, balloons, powered parachutes, weight-shift-control aircraft, and gyroplanes. This action is necessary to address advances in sport and recreational aviation technology, lack of appropriate regulations for existing aircraft, several petitions for rulemaking, and petitions for exemptions from existing regulations. The intended effect of this action is to provide for the manufacture of safe and economical certificated aircraft that exceed the limits currently allowed by ultralight regulation, and to allow operation of these aircraft by certificated pilots for sport and recreation, to carry a passenger, and to conduct flight training and towing in a safe manner.

²⁰ Does not include Glider or Sport Pilots. In 2004 there were an estimated 21,100 pilots licensed for gliders only. There were no licensed Sports pilots in 2004. The FAA projects 21,720 licensed glider pilots and almost 13,600 licensed Sports Pilots by 2017.

forecasts for the Sonoma County Airport were based on information contained in the Metropolitan Transportation Commission's 1994 "Regional Aviation System Plan." In terms of operational growth rates, the CASP projects an annual average increase in operations of 1.44 % for the CASP high forecast and 1.04% for the low forecast.

Local Trends

As was noted in the 2005 air service market study prepared by Sonoma County,²¹ the estimated population of the Airport's service area is over 1 million people. As Sonoma County and the North Coast region continue to grow, quality air service will be critical for the development of business and tourism. However, prior to March 20, 2007, the Sonoma County Airport market area was one of the largest markets in the United States currently without commercial air passenger service. This market area is characterized as follows:

- 14.0 percent of the total consolidated Bay Area population
- 14.9 percent of households
- 14.3 percent of retail sales²²
- 10.7 percent of the buying income²³
- 10.2 percent of households with annual incomes of over \$50,000²⁴

An earlier survey to determine the air transportation needs of Sonoma and Marin Counties was also carried out by Tri-Star Marketing.²⁵ On the basis of interviews with eighteen businesses and organizations, it was determined that these entities alone would generate a total of over 60,000 round trip air passengers annually. The participants noted that reliable scheduled airline service to the Los Angeles area, San Diego, Chicago, Dallas and New York would fulfill their needs, and that they would use Sonoma County Airport for the majority of their flights if service was available.

Historical Passenger Activity

Historically, various factors, principally fluctuations in airline service levels, have influenced passenger volumes at Sonoma County Airport. Table 2-1 sets forth the historical numbers of air carrier passengers served at the Sonoma County Airport from 1985 through 2005.

From Table 2-1 it can be determined that for the period of 1985 to 1986 the Airport experienced almost a 188.5 percent increase in passengers served, growing from 7,200 total annual passengers²⁶ in 1985 to 20,770 passengers in 1986. From 1986-1987 the Airport experienced a 160 percent increase in passengers, growing from 20,770 total passengers in 1986 to 54,016 passengers in 1987. From 1987 to 1988 total annual passengers declined by 31.6 percent, with

²¹ Op. cit., June 2005.

²² California State Board of Equalization, "Taxable Sales in California-2004" 3rd quarter data.

²³ Tri-Star Marketing Company, "Air Service Study for Sonoma County Airport 2002" 2002.

²⁴ Ibid.

²⁵ Tri-Star Marketing Company, "Airline Service Study for Sonoma County Airport," (1998).

²⁶ Total annual passengers is the sum of passengers getting on aircraft (enplaned passengers) and those getting off aircraft (deplaned passengers). The number of annual enplaned passengers is typically used as the measurement for facilities planning.

only 36,966 passengers in 1988. In 1989 passenger levels began an upward trend, growing to 113,480 (a 207 percent increase over 1988 levels). Growth continued in 1990, but at a lesser rate (13.4 percent) to 128,376 passengers. This growth peaked in 1991 with 201,686 annual passengers (an increase of almost 57 percent over the previous year).

Year	Passengers	% Change
1985	7,200	0.0%
1986	20,770	188.5%
1987	54,016	160.0%
1988	36,966	-31.6%
1989	113,480	207.0%
1990	128,376	13.4%
1991	201,686	57.1%
1992	152,598	-24.3%
1993	118,568	-22.3%
1994	52,990	-55.3%
1995	57,026	7.6%
1996	55,544	-2.6%
1997	45,290	-18.5%
1998	37,986	-16.1%
1999	46,800	23.2%
2000	74,172	58.5%
2001	67,614	-8.8%
2002	3,600	94.7%
2003	3,600	0.0%
2004	3,600	0.0%
2005	3,600	0.0%

Source: FAA TAF

After the 1991 peak, passenger volume began to decline, going from 201,686 passengers in 1991 to 152,598 in 1992 (a 24.3 percent decline). This decline continued into 1993 and 1994 with 118,568 (-22.3 percent) passengers in 1993 and 52,990 (-55.3 percent) passengers in 1994. In 1995 passenger volumes took a brief upward turn to 57,026 passengers (up 7.6 percent), but dropped back to 55,544 (-2.6 percent) in 1996. In 1997 and 1998 passenger volume continued to decline, with 45,290 (-18.5 percent) in 1997 and 37,986 (-16.1 percent) in 1998. Passenger volume began to climb again in 1999 and 2000, going to 46,800 (23.2 percent) in 1999 and 74,172 (58.5 percent) in 2000. 2001 was the last year that the Airport experienced any significant passenger activity, with 67,614 passengers.²⁷ After 2001, only minimal passenger activity was experienced, estimated by the FAA to be less than 3,600 passengers annually.²⁸

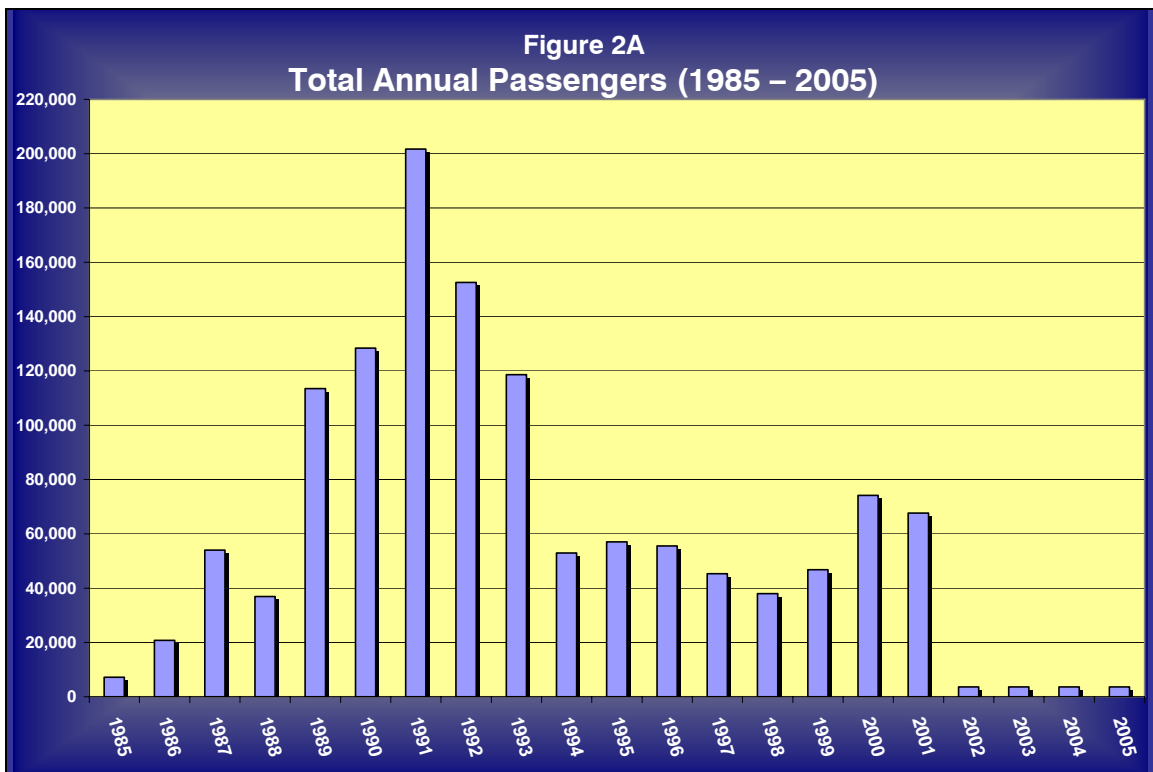
Even though only 67,614 passengers used the limited commuter airline service to and from San Francisco International (SFO) and Los Angeles International (LAX) airports provided by United Express from Sonoma County Airport in 2001, an estimated additional 300,000 customers used the shuttle buses between the Airport and the Bay Area air carrier airports. In October 2001, United Express discontinued scheduled commuter airline service to SFO and LAX, effectively leaving the North Bay community and nearby counties without scheduled airline service for the first time in many years. Although the United Express flights to LAX experienced average daily load factors of close to 100 percent, the airline claimed it was forced to curtail its service because the origin-destination nature of its STS service was not consistent with United Airlines' (UAL) hub and spoke orientation (i.e., UAL was not receiving any additional benefit from STS passengers, the majority of whom did not transfer to other UAL flights). In 2002, total STS air passengers were reduced to less than 3,600.²⁹ Since 2003, there has been no scheduled air carrier service at STS, but an estimated 420,000 annual passengers continued to use the shuttle service. Virtually all of these bus passengers had valid roundtrip airline tickets in their possession.

²⁷ The events of September 11, 2001 severely constrained passenger activity through the end of 2001.

²⁸ Federal Aviation Administration, APO TAF (Terminal Area Forecast) Enplanement data. 2003.

²⁹ Valley Air Express offered scheduled air charter services to OAK using a Cessna Caravan. The company ceased service in 2003.

Figure 2A illustrates graphically how passenger volumes have varied over the past 20 years at the Sonoma County Airport. However, air passenger demand levels have remained consistently high throughout the period, with service by United Express to Los Angeles and San Francisco International Airports as its mainstay. The most recent peak period for air passenger activity at the Sonoma County Airport was between 1989 and 1993. During this period, the Airport was served by both United Express, with jet service to Los Angeles International Airport, and by American Eagle with prop-jet (turbo-prop) service to San Jose International Airport. United Express curtailed its service to Los Angeles at the end of 1991 and American Eagle discontinued its San Jose connection at the end of 1993. In 1999, United Express began service to Los Angeles International Airport with turbo-prop aircraft and passenger enplanements began to rise again.



Aviation activity is also affected by many outside influences as well, such as population trends, business and tourism, discretionary income, energy and oil prices, and by the equipment and facilities available. Few industries have seen as much technological change as the aviation industry has since the first powered flight over one-hundred years ago. Major technological breakthroughs as well as regulatory and economic actions have resulted in erratic growth patterns and have had significant impacts upon activity at most airports. The Sonoma County Airport is no exception.

Airline Fleet Mix

The current mix of aircraft operating at the Sonoma County Airport ranges from small single-engine general aviation aircraft weighing less than 12,500 pounds up to and including, large business aircraft of 90,000 pounds and more (e.g. Gulfstream G550), and commercial airliners used as corporate aircraft weighing as much as 174,200 pounds (e.g. Boeing Business Jet 2 [BBJ2]).³⁰ This wide range of aircraft sizes and types is indicative of the requirements of the aviation community currently utilizing the Airport and is not be expected to change significantly in the future, even with the reintroduction of scheduled air carrier service.



BBJ2

From the above passenger activity information it seems apparent that annual passenger levels at the Sonoma County Airport were related not only to the availability of scheduled airline service, but to the type of equipment available and the diversity of destinations, as well. Scheduled airline activity at Sonoma County Airport has included both regional turboprop jets and turboprop commuter equipment. For example, the British Aerospace (BAe) 146 is a quiet technology 4-engine turboprop passenger jet that can carry between 82 to 128 passengers. The BAe-146 was used by United Airlines in its service to Los Angeles International Airport (LAX) from STS from 1989 to 1991. Variations of the BAe-146 are still being used today in regional jet service around the world, but few, if any, of these aircraft are still in service in California.³¹ Future air carrier aircraft likely to see service at the Sonoma County Airport include regional jet (RJ) aircraft such as the Embraer (EMB) 170 or 190,³² and/or the Bombardier CRJ-700 or CRJ-900.³³ In addition to regional jet aircraft, scheduled air carrier service could also include operations by Airbus A318/319³⁴ or B-737³⁵ aircraft.



EMB 170

The Embraer (EMB) 120 Brasilia is representative of the type of twin-engine turboprop commuter airliner used by United Express at STS in its previous service. The EMB-120 can carry up to 30 passengers. Beginning in March 2007, scheduled commuter airline operations at STS will be the larger, 76-passenger Bombardier Aerospace DeHavilland DHC-8 Q400.³⁶

³⁰ The BBJ2's landing/takeoff weight at Sonoma County Airport is restricted to 150,000 lbs or less due to runway bearing strength requirements.

³¹ The Avro RJ transport jet was developed from the BAE 146 short- to medium-range regional airliner. The three variants of regional jet are RJ70, RJ85 and RJ100, which have different cabin lengths, but complete engineering and operational commonality. The Avro RJ regional jet family has from 70 to over 100 seats. The first production aircraft was delivered in 1993 and production ceased in 2002.

³² The EMB-170 is a 70-passenger regional jet and is the successor to Embraer's earlier 37 to 44-seat RJs. The EMB-190 is a stretched version of the EMB-170, capable of carrying up to 104-passengers.

³³ The CRJ-700 is a 70-seat RJ. The CRJ-900 is a 75- 90-passenger derivative of the CRJ-700.

³⁴ The Airbus A318 is a 107-117 passenger jet. The A319 can accommodate 116 to 145 passengers.

³⁵ The Boeing B-737 is among the most successful of Boeing's airplanes. There are many versions of this aircraft in service today. Such service at STS would most likely entail the B-737-600/700 with a capacity of 110- to 149 passengers.

³⁶ The Q400 is quiet technology twin-engine turboprop airplane seating from 70- to 78 passengers.

The long-term outlook on fleet mix is dependent on traffic growth and on-going technological advancements. Sustained traffic growth has been and will continue to be generated by affordable fares and the airline industry's ability to provide outlying communities with connections through major hubs. In the past, STS service has relied on service to SFO and LAX for connections to other airports. In the future, connections through SFO may not be as critical if alternative destinations for connecting flights become available. For example, LAX and SEA-TAC (Seattle-Tacoma International Airport) may afford STS passengers connections to Asia and the Pacific Rim. While Denver, Salt Lake City, Phoenix, or Las Vegas could become connecting points to the Midwest, East Coast, Southeast and Europe.

AIR CARRIER / COMMUTER AIRLINE OPERATIONS FORECASTS

The Sonoma County General Plan contains an Air Transportation Element (ATE)³⁷ that established policies designed to guide future growth and development of aviation activities and facilities in the County through the year 2005 in a manner consistent with the goals and policies established in other elements of the General Plan. Although adopted in 1988, and amended in 1992, the ATE assumptions concerning the ability of the Sonoma County Airport to capture a significant portion of



Bombardier Q400

the North Bay-Southern California air travel market remains consistent with the findings of the 2005 Air Service Market Opportunity Study,³⁸ but the passenger and operational activity levels projected for the Airport in 2005 were never achieved. For example, the ATE projected that:

“This combination of factors would result in commuter (airline) service levels of about 50,000 total annual passengers (about 140 average daily passengers) by the year 2005. Using a 15-passenger aircraft with a 65 percent load factor, this would result in about 14 average daily flights (seven arriving plus seven departures) by twin-engine, turboprop-type aircraft; fewer operations would be necessary if larger aircraft or higher load factors were used. The annual operations generated from these flights would be about 5,000 in the year 2005.”

and,

“scheduled airline service at Sonoma County Airport could generate 560,000 total annual passengers by the year 2005 (about 1,500 per day). With a 66% load factor, this would require about 15 arrivals and 15 departures per day using an 80-seat aircraft. This service would generate about 10,900 annual operations in the year 2005. Scheduled airline service at Sonoma County Airport has been reduced to about 10,200 annual operations in 2005 due to potential air quality impacts resulting from the projected level of service.”

³⁷ Sonoma County Planning Department, “Air Transportation Element,” August 18, 1992.

³⁸ Op. cit. Approximately 15 percent of all airline tickets booked in the Sonoma County Airport Catchment Area were to southern California destinations.

Background to Forecasts

The Sonoma County Airport has had a long history of regularly scheduled airline service, but has been without air carrier or commuter airline service since October 2001. Because of this condition none of the more traditional approaches³⁹ to projecting operational and passenger growth were regarded as being suited to the current situation. These historical circumstances warranted a more tailored approach to the forecasting of air carrier and commuter airline activities at the Airport. As a result, it was decided that a logical place to start would be to establish a future (2010) baseline condition based upon the possible outcome of Sonoma County's marketing efforts with prospective air service providers.⁴⁰ This baseline was then projected through 2030 for two alternative commercial air service demand scenarios, i.e., (1) a Moderate Growth scenario (based on projections of the FAA's "Aerospace Forecast Fiscal Years 2006-2017") and (2) a Low Growth scenario (based on growth rates derived from FAA "Terminal Area Forecast (TAF) Enplanement Data."⁴¹ Each of these two scenarios were further broken down into two additional operational subsets reflecting a dominant "Scheduled Airline" fleet mix (up to 14 average daily departures [ADD]), and a "Commuter Airline" dominant fleet mix (up to 14 ADD) based on limitations published in the Sonoma County General Plan Air Transportation Element (ATE). The resultant forecasts are compared with ATE limits at the end of this report.

Air Carrier and Commuter Airline Forecasts

The two commercial air service scenarios, "moderate growth" and "low growth," each have two additional subsets for potential conditions after 2010. These are:

- Commuter airline service dominant
- Scheduled airline service dominant

The commuter airline dominant scenario assumes that scheduled commuter airlines, utilizing aircraft with an average capacity of 76 passenger seats, would use up to fourteen of the twenty-one average daily departure (ADD) slots allowed by the ATE. Scheduled air carrier airlines would use no more than seven ADD slots (for a total of no more than 21 ADD).

The air carrier airline dominant scenario assumes that scheduled airlines, utilizing aircraft with an average seating capacity of 101 passenger seats, would use up to fourteen of the twenty-one ATE allocated ADD slots. Commuter airlines would use no more than seven of the twenty-one slots (for a total of 21 ADD).

2010 Baseline Conditions

The baseline condition for the two commercial air service forecast scenarios begins with the assumptions that some degree of air service would begin in late 2006 or early 2007, and that by

³⁹ Methodologies such as Time-Series Analysis (R^2), Market Share of U.S. Domestic Enplanements, Enplanements Per Capita and Historical Growth Rate Projections did not lend themselves to this analysis due to the historically intermittent nature of air passenger service at the Airport.

⁴⁰ On April 26, 2006, Sonoma County announced that Horizon Air would be providing non-stop air service between STS and Los Angeles and STS and Seattle using 74-seat Q400 high speed turboprop aircraft effective March 20, 2007.

⁴¹ The FAA-based load factors and growth rates used in this forecast report were derived from data for airports of comparable size and operations, i.e., non-hub towered airports.

2010 such service would be of sufficient maturity that future activity levels for passengers and operations could be projected on the basis of FAA-defined passenger load factors and operational growth rates. The 2010 baseline conditions consist of the projected activity levels presented in Table 2.2.

		Commuter Airlines Dominant	Scheduled Airlines Dominant
SCHEDULED AIRLINE(S)	Average Daily Departures (ADD)	3.30	4.60
	Load Factor (101 seats X 75.6%)	76.36	76.36
	Enplaned Passengers Per Day	251.97	351.24
	Total Daily Air Carrier Passengers	503.95	702.48
	Total Annual Air Carrier Passengers	183,941.60	256,403.45
COMMUTER AIRLINE(S)	Average Daily Departures (ADD)	5.70	3.80
	Load Factor (76 seats X 69.0%)	52.44	52.44
	Enplaned Passengers Per Day	298.91	199.27
	Total Daily Commuter Passengers	597.82	398.54
	Total Annual Commuter Passengers	218,202.84	145,468.56
TOTALS	Average Daily Departures	9.00	8.40
	Annual Departures	3,285	3,066
	Annual Operations	6,570	6,132
	Daily Enplaned Passengers	551	551
	Annual Enplaned Passengers	201,072	200,936
	Total Annual Passengers	402,144	401,872

From the preceding table it can be seen that total average daily departures (ADD) for the two 2010 baseline scenarios range between 8.4 and 9.0 ADD.⁴² This is well within the proposed ATE limit of 21.0 ADD by 2020. The next step was to develop growth projections for the two scenarios for the period 2010 through 2030 in five-year increments.

Scheduled Air Carrier Airline Dominant Forecasts and Assumptions

The air carrier dominant forecast scenario assumes that the growth in commercial air service at STS between 2010 and 2030 would favor scheduled airline operations. Two forecast scenarios (Moderate Growth and Low Growth) were developed for the scheduled air carrier dominant scenario.

Moderate Growth Scenario

The following table sets forth the assumptions derived for the moderate growth⁴³ scenario of the scheduled air carrier dominant forecast.

⁴² For reference purposes the Horizon Air service to LAX and SEA-TAC beginning in March 2007 is the equivalent of 2.85 ADD.

⁴³ The moderate growth scenario is based on FAA TAF load factors and projected growth rates from the FAA's "Aerospace Forecast Fiscal Years 2006-2017"

Table 2-3 Scheduled Air Carrier Dominant (Moderate Growth Scenario)					
		2015	2020	2025	2030
AIR CARRIER AIRLINE(S)	Average Daily Departures (ADD)	5.38	6.17	7.22	8.44
	Annual Air Carrier Departures	1,962.61	2,252.05	2,635.30	3,080.60
	Annual Air Carrier Operations	3,925.21	4,504.10	5,270.60	6,161.20
	Boarding Load Factor (Based on 101 avg. seats X FAA LF growth rates)	76.86	77.27	77.57	77.97
	Enplaned Air Carrier Passengers Per Day	413.28	476.73	560.04	658.08
	Annual Enplaned Air Carrier Passengers	150,847.78	174,004.64	204,414.95	240,200.54
	Total Daily Air Carrier Passengers	826.56	953.45	1,120.08	1,316.17
	Total Annual Air Carrier Passengers	301,695.57	348,009.29	408,829.90	480,401.09
COMMUTER AIRLINE(S)	Average Daily Departures (ADD)	4.00	4.40	4.65	4.89
	Annual Commuter Departures	1,460.00	1,606.00	1,697.25	1,784.85
	Annual Commuter Operations	2,920.00	3,212.00	3,394.50	3,569.70
	Boarding Load Factor (Based on 76 avg. seats X FAA LF growth rates)	53.96	55.02	56.16	57.30
	Enplaned Commuter Passengers Per Day	215.84	242.11	261.16	280.22
	Annual Enplaned Commuter Passengers	78,781.60	88,368.54	95,324.35	102,279.04
	Total Daily Commuter Passengers	431.68	484.21	522.33	560.43
	Total Annual Commuter Passengers	157,563.2	176,737.09	190,648.70	204,558.09
TOTALS	Average Daily Departures	9.38	10.57	11.87	13.33
	Annual Departures	3,423	3,858	4,333	4,865
	Annual Operations	6,846	7,716	8,665	9,731
	Daily Enplaned Passengers	629	719	821	938
	Annual Enplaned Passengers	229,629	262,373	299,739	342,480
	Total Annual Passengers	459,259	524,746	599,479	684,959

From the preceding table it can be seen that the total average daily departures (ADD) through 2020 (10.57) are well within the proposed ATE 2020 limit of 21 ADD, as are the total annual operations (7,716 versus the draft 2020 ATE’s 15,200). Similarly, 2020 commuter airline operations (3,212) are well under the ATE limit of 5,200, and 2020 air carrier operations (4,504) are also well under the ATE’s 10,000 annual operations limit. Similarly, the 2020 air carrier passenger level of 348,009 would not exceed the ATE’s limit of 523,000 annual passengers, but the 2020 commuter passengers (176,737) would exceed the ATE’s current limit of 50,000 annual passengers. Although overall well within the ADD slots allocated for commercial air service, the size and load factors of the commuter airline aircraft anticipated to serve the Airport in 2020 are considerably larger than those assumed in the ATE.⁴⁴

Low Growth Scenario

The following table sets forth the assumptions derived for the low growth⁴⁵ scenario of the scheduled air carrier dominant forecast.

⁴⁴ The ATE’s assumptions in this regard are not consistent with current airline industry trends.

⁴⁵ The low growth scenario is based on FAA TAF load factors and projected TAF growth rates through 2020, and extrapolated for 2025 and 2030.

Table 2-4 Scheduled Air Carrier Dominant (Low Growth Scenario)					
		2015	2020	2025	2030
AIR CARRIER AIRLINE(S)	Average Daily Departures (ADD)	5.24	5.75	6.36	6.95
	Annual Air Carrier Departures	1,912.60	2,098.75	2,321.40	2,536.75
	Annual Air Carrier Operations	3,825.20	4,197.50	4,642.80	5,073.50
	Boarding Load Factor (Based on 101 avg. seats X FAA LF growth rates)	76.86	77.27	77.57	77.97
	Enplaned Air Carrier Passengers Per Day	402.75	444.27	493.33	541.91
	Annual Enplaned Air Carrier Passengers	147,004.35	162,159.92	180,066.36	197,795.47
	Total Daily Air Carrier Passengers	805.50	888.55	986.66	1,083.81
	Total Annual Air Carrier Passengers	294,008.70	324,319.84	360,132.71	395,590.94
COMMUTER AIRLINE(S)	Average Daily Departures (ADD)	4.00	4.40	4.65	4.89
	Annual Commuter Departures	1,460.00	1,606.00	1,697.25	1,784.85
	Annual Commuter Operations	2,920.00	3,212.00	3,394.50	3,569.70
	Boarding Load Factor (Based on 76 avg. seats X FAA LF growth rates)	53.96	55.02	56.16	57.30
	Enplaned Commuter Passengers Per Day	215.84	242.11	261.16	280.22
	Annual Enplaned Commuter Passengers	78,781.60	88,368.54	95,324.35	102,279.04
	Total Daily Commuter Passengers	431.68	484.21	522.33	560.43
	Total Annual Commuter Passengers	157,563.20	176,737.09	190,648.70	204,558.09
TOTALS	Average Daily Departures	9.24	10.15	11.01	11.84
	Annual Departures	3,373	3,705	4,4019	4,322
	Annual Operations	6,746	7,410	8,037	8,643
	Daily Enplaned Passengers	619	686	754	822
	Annual Enplaned Passengers	225,786	250,528	275,391	300,075
	Total Annual Passengers	451,572	501,057	550,781	600,149

From the preceding table it can be seen that the total average daily departures (ADD) through 2020 (10.15) are well within the proposed ATE 2020 limit of 21 ADD, as are the total annual operations (6,746 versus the draft 2020 ATE's 15,200). Similarly, 2020 commuter airline operations (3,212) are well under the ATE limit of 5,200, and 2020 air carrier operations (4,198) are also well under the ATE's 10,000 annual operations limit. Similarly, the 2020 air carrier passenger level of 324,320 would not exceed the ATE's limit of 523,000 annual passengers, but the 2020 commuter passengers (176,737) would exceed the ATE limit of 50,000 annual passengers. Although overall well within the ADD slots allocated for commercial air service, the size and load factors of the commuter airline aircraft anticipated to serve the Airport in 2020 are considerably larger than those assumed in the ATE.⁴⁶

Commuter Airline Dominant Forecasts and Assumptions

This forecast scenario assumes that the growth in commercial air service between 2010 and 2030 will favor commuter airline operations. Two forecast scenarios (Moderate Growth and Low Growth) were developed for the commuter airline dominant scenario.

⁴⁶ The ATE's assumptions in this regard are not consistent with current airline industry trends.

Moderate Growth Scenario

The following table sets forth the assumptions derived for the moderate growth⁴⁷ scenario of the commuter airline dominant forecast. The following table sets forth the assumptions used in this scenario:

Table 2-5 Commuter Airline Dominant (Moderate Growth Scenario)					
		2015	2020	2025	2030
AIR CARRIER AIRLINES	Average Daily Departures (ADD)	3.55	4.10	4.65	4.90
	Annual Air Carrier Departures	1,295.75	1,496.50	1,697.25	1,788.50
	Annual Air Carrier Operations	2,591.50	2,993.00	3,394.50	3,577.00
	Boarding Load Factor (Based on 101 avg. seats X FAA LF growth rates)	76.86	77.27	77.57	77.97
	Enplaned Air Carrier Passengers Per Day	272.86	316.79	360.69	382.06
	Annual Enplaned Air Carrier Passengers	99,592.64	115,627.07	131,652.29	139,452.92
	Total Daily Air Carrier Passengers	545.71	602.67	659.33	681.48
	Total Annual Air Carrier Passengers	199,185.28	231,254.15	263,304.58	278,905.84
COMMUTER AIRLINE(S)	Average Daily Departures (ADD)	6.60	7.30	8.20	9.70
	Annual Commuter Departures	2,409.00	2,664.50	2,993.00	3,540.50
	Annual Commuter Operations	4,818.00	5,329.00	5,986.00	7,081.00
	Boarding Load Factor (Based on 76 avg. seats X FAA LF growth rates)	53.96	55.02	56.16	57.30
	Enplaned Commuter Passengers Per Day	356.14	401.68	460.54	555.85
	Annual Enplaned Commuter Passengers	129,989.64	146,611.45	168,098.85	202,884.81
	Total Daily Commuter Passengers	712.27	803.35	921.09	1,111.70
	Total Annual Commuter Passengers	259,979.28	293,222.90	336,197.7	405,769.62
TOTALS	Average Daily Departures	10.15	11.40	12.85	14.60
	Annual Departures	3,705	4,161	4,690	5,329
	Annual Operations	7,410	8,322	9,381	10,658
	Daily Enplaned Passengers	629	718	821	938
	Annual Enplaned Passengers	229,582	262,239	299,751	342,338
	Total Annual Passengers	459,165	524,477	599,502	684,675

The above table shows that the total average daily departures (ADD) for 2020 (11.40) are well within the proposed ATE limit of 21 ADD, as are the total annual operations (8,322 versus the draft ATE’s limit of 15,200). However, 2020 commuter airline operations (5,329) slightly exceed the 2020 ATE limit of 5,200 operations, while 2020 air carrier operations (2,993) are about 30 percent of the ATE’s 10,000 annual operations limit. The 2020 air carrier passenger level of 231,254 is well within the ATE limit of 523,000 passengers, while the 2020 commuter passengers (293,223) would clearly exceed the ATE’s limits of 50,000 passengers.⁴⁸

⁴⁷ The moderate growth scenario is based on FAA TAF load factors and projected growth rates from the FAA’s “Aerospace Forecast Fiscal Years 2006-2017”

⁴⁸ The ATE’s assumptions in this regard are not consistent with current airline industry trends.

Low Growth Scenario

The following table sets forth the assumptions derived for the low growth⁴⁹ scenario of the commuter airline dominant forecast:

Table 2-6 Commuter Airline Dominant (Low Growth Scenario)					
		2015	2020	2025	2030
AIR CARRIER AIRLINES	Average Daily Departures (ADD)	3.45	3.90	4.25	4.37
	Annual Air Carrier Departures	1,259.25	1,423.50	1,551.25	1,595.05
	Annual Air Carrier Operations	2,518.50	2,847.00	3,102.50	3,190.10
	Boarding Load Factor (Based on 101 avg. seats X FAA LF growth rates)	76.86	77.27	77.57	77.97
	Enplaned Air Carrier Passengers Per Day	265.17	301.33	329.66	340.74
	Annual Enplaned Air Carrier Passengers	96,787.21	109,986.73	120,327.36	124,369.24
	Total Daily Air Carrier Passengers	530.34	602.67	659.33	681.48
	Total Annual Air Carrier Passengers	193,574.43	219,973.46	240,654.72	248,738.48
COMMUTER AIRLINE(S)	Average Daily Departures (ADD)	6.55	7.00	7.55	8.40
	Annual Commuter Departures	2,390.75	2,555.00	2,755.75	3,066.00
	Annual Commuter Operations	4,781.50	5,110.00	5,511.50	6,132.00
	Boarding Load Factor (Based on 76 avg. seats X FAA LF growth rates)	53.96	55.02	56.16	57.30
	Enplaned Commuter Passengers Per Day	353.43	385.17	424.04	481.35
	Annual Enplaned Commuter Passengers	129,004.87	140,586.32	154,773.94	175,694.06
	Total Daily Commuter Passengers	706.88	770.34	848.08	962.71
	Total Annual Commuter Passengers	258,009.74	281,172.64	309,547.89	351,388.13
TOTALS	Average Daily Departures	10.00	10.90	11.80	12.77
	Annual Departures	3,650	3,979	4,307	4,661
	Annual Operations	7,300	7,957	8,614	9,322
	Daily Enplaned Passengers	619	687	754	822
	Annual Enplaned Passengers	225,792	250,573	275,101	300,063
	Total Annual Passengers	451,584	501,146	550,203	600,127

The above table shows that the total average daily departures (ADD) for 2020 (10.90) are well within the proposed ATE limit of 21 ADD, as are the total annual operations (7,957 versus the draft ATE's limit of 15,200). 2020 commuter airline operations (5,110) are slightly under the 2020 ATE limit of 5,200 operations, while 2020 air carrier operations (2,847) are about 28.5 percent of the ATE's 10,000 annual operations limit. The 2020 air carrier passenger level of 219,973 is well within the ATE limit of 523,000 passengers, while the 2020 commuter passengers (281,173) would clearly exceed the ATE's limits of 50,000 passengers.⁵⁰ Table 2-7 presents a summary of the above enplanements forecasts.

⁴⁹ The moderate growth scenario is based on FAA TAF load factors and projected growth rates from the FAA's "Aerospace Forecast Fiscal Years 2006-2017"

⁵⁰ The ATE's assumptions in this regard are not consistent with current airline industry trends.

Scenario	2010	2015	2020	2025	2030
Moderate Growth: Air Carrier Dominant	200,936	229,629	262,373	299,739	342,480
Moderate Growth: Commuter Dominant	201,072	229,582	262,239	299,751	342,338
Low Growth: Air Carrier Dominant	200,936	225,786	250,528	275,391	300,075
Low Growth: Commuter Dominant	201,072	225,792	250,573	275,101	300,063

Figure 2B is a graphical representation of the historical enplanements and forecast low growth and moderate growth enplanements projections for STS.⁵¹ As can be seen from the figure, neither the moderate growth scenario nor the low growth scenario would exceed the County’s proposed ATE 2020 annual enplanement limit of 286,500. The moderate growth scenario could exceed 286,500 annual enplanements around 2023 and the low growth scenario could exceed this level a little later, around 2027.

Figure 2B
STS Annual Enplanements



⁵¹ Only the moderate growth and low growth scenarios are depicted because any differences between the air carrier dominant and commuter airline dominant enplanement figures within these two scenarios are minor.

PREFERRED AIR CARRIER AND COMMUTER AIRLINE FORECASTS

This chapter has presented the methodologies and assumptions used to forecast a range of potential air carrier and commuter airline activities at the Sonoma County Airport. The next step should be to select one of the two forecast scenarios as the master plan’s commercial air service forecast. To the extent possible, the selected forecast should correlate with the County’s General Plan 2020 Air Transportation Element (ATE). However, as was discussed above, the currently adopted ATE had forecast certain activity levels for 2005 based on aircraft fleet mix and boarding load factors developed in 1992. Since then, many things have changed in the airline industry. The 15-passenger commuter airliners and 50-passenger regional jets used as the basis for the ATE projections will not likely ever see substantial service at the Sonoma County Airport. Unfortunately, in its current update of the ATE, the County has retained the fleet mix and load factor assumptions used in the original ATE and projected these assumptions to 2020. This is not consistent with current commercial air carrier trends, or with the assumptions developed for this report. For these reasons the ATE assumptions need to be reevaluated.

Similarly, the definition of a commuter airline set forth in the ATE is not consistent with current terminology. The ATE classifies any commercial aircraft used in scheduled intrastate service as a commuter airline. This means that any aircraft, including those with as many as 150 passenger seats and capable of using the Airport, used in intrastate service would be classified as a commuter airline. This definition also needs to be reevaluated.

For reasons of consistency, the assumptions developed in the Sonoma County Airport Master Plan Update and the 2020 Sonoma County General Plan Update must be the same. The ATE should be thoroughly reviewed to ensure that any assumptions or other information projected to the year 2020 are consistent with the operational realities of the Airport and current airline trends. For purposes of this report, and to allow for a



more conservative evaluation of the potential environmental impacts associated with master plan implementation, the Moderate Growth: Air Carrier Dominant Scenario is proposed as the approved Master Plan air carrier and commuter airline forecast (see Table 2-8).

Table 2-8 Adopted Master Plan Air Carrier and Commuter Airline Forecast Scheduled Air Carrier Dominant (Moderate Growth Scenario)					
		2015	2020	2025	2030
AIR CARRIER AIRLINE(S)	Average Daily Departures (ADD)	5.38	6.17	7.22	8.44
	Annual Air Carrier Departures	1,962.61	2,252.05	2,635.30	3,080.60
	Annual Air Carrier Operations	3,925.21	4,504.10	5,270.60	6,161.20
	Boarding Load Factor (Based on 101 avg. seats X FAA LF growth rates)	76.86	77.27	77.57	77.97
	Enplaned Air Carrier Passengers Per Day	413.28	476.73	560.04	658.08
	Annual Enplaned Air Carrier Passengers	150,847.78	174,004.64	204,414.95	240,200.54
	Total Daily Air Carrier Passengers	826.56	953.45	1,120.08	1,316.17
	Total Annual Air Carrier Passengers	301,695.57	348,009.29	408,829.90	480,401.09
COMMUTER AIRLINE(S)	Average Daily Departures (ADD)	4.00	4.40	4.65	4.89
	Annual Commuter Departures	1,460.00	1,606.00	1,697.25	1,784.85
	Annual Commuter Operations	2,920.00	3,212.00	3,394.50	3,569.70
	Boarding Load Factor (Based on 76 avg. seats X FAA LF growth rates)	53.96	55.02	56.16	57.30
	Enplaned Commuter Passengers Per Day	215.84	242.11	261.16	280.22
	Annual Enplaned Commuter Passengers	78,781.60	88,368.54	95,324.35	102,279.04
	Total Daily Commuter Passengers	431.68	484.21	522.33	560.43
	Total Annual Commuter Passengers	157,563.2	176,737.09	190,648.70	204,558.09
TOTALS	Average Daily Departures	9.38	10.57	11.87	13.33
	Annual Departures	3,423	3,858	4,333	4,865
	Annual Operations	6,846	7,716	8,665	9,731
	Daily Enplaned Passengers	629	719	821	938
	Annual Enplaned Passengers	229,629	262,373	299,739	342,480
	Total Annual Passengers	459,259	524,746	599,479	684,959

GENERAL AVIATION AND AIR TAXI FORECASTS

General aviation forecasts traditionally consist of two parts: based aircraft and aircraft operations. GA operations are further broken down into itinerant and local operations. Air Taxi operations are listed under itinerant operations.⁵²

Based Aircraft Demand Factors

Current and future demand for based aircraft parking space in hangars, tie-downs, and transient parking at the Sonoma County Airport is influenced by a variety of factors. Some of these factors are national or regional in character; others are specific to the Airport. Each of these demand factors needs to be considered in the development of based aircraft forecasts for the Airport.

⁵² Operations are categorized as Itinerant, Local or Instrument Flight Rules (IFR). Itinerant means an operation is arriving from outside the traffic pattern or departs the airport traffic pattern. Local means an operation that stays within the traffic pattern airspace (non-itinerant). IFR means an operation that is conducted under Instrument Flight Rules. IFR operations are a sub-category of the total number of operations as they can be either local or itinerant. Total Operations = Itinerant Operations + Local Operations.

National Demand Factors

National influences on local based aircraft demand are significant in that they are external influences, largely beyond the direct control of the airport or local community. These demand factors are part of what determines the growth rates of general aviation. The FAA Aerospace Forecasts, 2006-2017 cites the following national demand factors:

- Total active general aviation aircraft fleet
- Total hours flown by aircraft type
- Total active pilots

The overall growth of the active general aviation aircraft fleet is forecast to increase at an average annual rate of 1.4 percent over the FAA's 12-year forecast period (2006-2017), with the number of active aircraft increasing from 214,591 in 2005 to 252,775 in 2017. The more sophisticated and expensive turbine-powered fleet is projected to grow at an average of 4.0 percent a year over the 12-year forecast period, with the turbine jet fleet doubling in size. The Aerospace Forecasts assume that the new Very Light Jets (VLJs) will begin to enter the active GA fleet in 2006 and grow by 400 to 500 aircraft a year thereafter, with almost 5,000 of these aircraft in the fleet by 2017. Another new category of aircraft was created in 2005—Light Sport Aircraft. These aircraft evolved from and emulate ultralight aircraft not currently included in the FAA's aircraft registry counts.⁵³ An anticipated 300-500 newly manufactured light-sport aircraft are projected to enter the active national GA fleet on an annual basis beginning in 2006. The Aerospace Forecast assumed registration of some 14,000 of these aircraft by 2017.

The number of general aviation hours flown is projected to increase by 3.2 percent annually through 2017. The projected increase is reflective of increased flying by business and corporate aircraft. Hours flown by turbine aircraft are forecast to increase 6.4 percent yearly through 2017, compared with 1.8 percent for piston-powered aircraft. Jet aircraft are anticipated to account for the greatest increase in hours flown, growing at an anticipated annual rate of 10.2 percent through 2017. The projected increase in jet hours flown is anticipated to result from the introduction of the VLJs and from increases in the fractional ownership fleet. Fractional ownership aircraft fly about 1,200 hours per year compared to about 350 hours for all business jets in other applications. Some analysts project utilization rates as high as 2,000 hours per year for the VLJs used in on-demand air taxi services. However, the FAA believes the VLJ utilization rate will be closer to the rates achieved by fractional operators.

Growth in the active general aviation pilot population (excluding air transport pilots) is projected to result in about 535,000 pilots in 2017, and increase of 67,300 from 2005 (an annual increase of 1.1 percent over the FAA's 12-year forecast period). The FAA is also projecting nearly 13,600 new sports pilots will be certified by 2017.

⁵³ The FAA created the new rule for the manufacture, certification, operation, and maintenance of light-sport aircraft. Light-sport aircraft weigh less than 1,320 pounds (1,430 pounds for aircraft intended for operation on water) and are heavier and faster than ultralight vehicles and include airplanes, gliders, balloons, powered parachutes, weight-shift-control aircraft, and gyroplanes. This action is necessary to address advances in sport and recreational aviation technology, lack of appropriate regulations for existing aircraft, several petitions for rulemaking, and petitions for exemptions from existing regulations. The intended effect of this action is to provide for the manufacture of safe and economical certificated aircraft that exceed the limits currently allowed by ultralight regulation, and to allow operation of these aircraft by certificated pilots for sport and recreation, to carry a passenger, and to conduct flight training and towing in a safe manner.

By all indices, the growth rate of general aviation will be generally positive in the years ahead, but, as noted above, certain sectors of general aviation will not grow as fast as others. For example, the number of piston-powered aircraft is projected to increase at an average annual rate of 1.0 percent per year, but even this estimate is largely driven by a projected growth rate of 6.7 percent annually through 2017 for piston-powered rotorcraft. Single-engine and multi-engine piston-powered fixed wing aircraft are only anticipated to grow at 0.3 and 0.1 percent, respectively.

State and Regional Demand Factors. Statewide forecasts have been established by the California Aviation System Plan (CASP)(1999). The System Plan includes all public use airports in California. The state's forecast methodology allocates aviation activity in a top-down manner; the forecasts are distributed to respective geographic areas, then sub-areas and ultimately to individual airports. The 1999 CASP projected that the Sonoma County Airport would have from 500 to 585 based aircraft by 2010.⁵⁴ There are currently 415 aircraft based at the Sonoma County Airport.

Demands Specific to Sonoma County Airport

Increases in the number of based aircraft at the Sonoma County Airport will mainly depend on decisions by individuals and businesses as to where to base their aircraft. Such decisions are influenced by the following local factors:

Nearby Airports — Six public-use airports are located in Sonoma County. Sonoma County Airport is the only airport in the County offering airline service and precision approach capabilities. Sonoma County Airport also has the longest runway (5,115 feet) in the County. It is also the closest airport to the County's largest city and county seat, Santa Rosa. Sonoma County Airport also offers a comprehensive array of aeronautical services and facilities to the general aviation pilot community. These factors make the Sonoma County Airport a more convenient airport to base one's aircraft at if proximity to Santa Rosa's business and governmental services are a factor.

Airport Role — Currently, operational activity at the Sonoma County Airport includes significant use by corporate/business general aviation aircraft and personal general aviation aircraft. Its future role will be defined more by the reintroduction of scheduled air carrier and/or commuter airline service than by changes in the volume of activity and the types of aircraft of the existing uses (i.e., fleet mix). In other words, the addition of scheduled air carrier and/or commuter airline service will not change the basic character of the Airport, but will add an additional component to the range of services offered.

Availability of Services — Existing facilities and services at the Sonoma County Airport are more comprehensive than at other Sonoma County airports. The Airport also has sufficient developable land to accommodate new and/or expanded aeronautical services.

⁵⁴ The 1999 CASP based aircraft forecast for STS was based on forecasts contained in the 1994 Regional Aviation System Plan prepared by the San Francisco Bay Area Metropolitan Transportation Commission.

Proximity to Nearby Industry — Commercial and industrial growth in the Sonoma County Region will have a positive effect on the Airport’s aviation activity. As the Airport Business Park develops, users of business aircraft desiring easy access to the area are expected to make increasing use of the Airport.

Regional Population — Historically, there has been a weak correlation between population growth and based aircraft; it is not a significant factor in forecasting based aircraft at the Sonoma County Airport.

Demand for Hangar Space — Increasingly more sophisticated and expensive equipment is being added to aircraft. New aircraft are being manufactured with state-of-the-art avionics (electronic and navigational equipment) and existing aircraft have become more valuable. Hangars offer aircraft owners increased security and safety for their aircraft as well as protection from climatic conditions. There is significant interest in hangars for general aviation aircraft at Sonoma County Airport. There are 69 aircraft owners on the waiting list for hangars at the Airport.

Methodology

Considering the above demand factors and the FAA policy that GA activity forecasts should not deviate too much from published FAA forecast information, the following forecasts are derived primarily from information presented in the “FAA Aerospace Forecasts Fiscal Years 2006-2017,” and are supplemented by the FAA’s “Terminal Area Forecast Summary Fiscal Years 2006-2025” (December 2006).

Based Aircraft

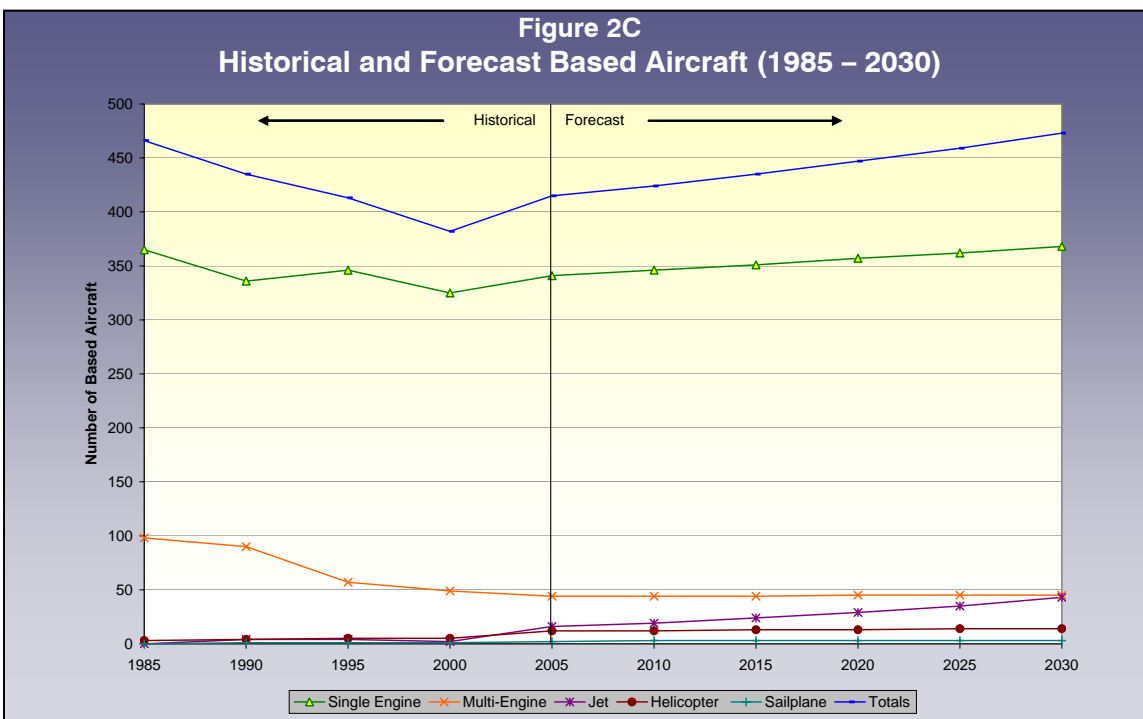
As is common with many airports, reliable historical information on based general aviation aircraft is limited, and even published information is often derived from estimates. Based on information provided by the FAA, the number of aircraft based at STS reached a peak of 466 in the period 1984-1987.⁵⁵ From 1987 to 1992 based aircraft declined to 359 (a decline of almost 23 percent). From 1992 through 1994, the number of based aircraft remained at 359. In 1995, the number of based aircraft jumped to 413 (a 15 percent increase), where they remained through 1998. In 1999, based aircraft dropped to 377 (a decline of 8.7 percent). Based aircraft remained at 377 through 2001. In 2002, based aircraft increased to 380, to 382 in 2003, and back to 380 in 2004. In 2005, the FAA estimated that there were still 380 aircraft based at STS. However, it was determined from Airport records that there were actually 416 aircraft based at the Airport. Of the 416 aircraft based at the Sonoma County Airport in 2005, 345 were single-engine propeller (82.9%), 44 were multi-engine (10.58%), 12 were jets (2.9%), 12 were helicopters (2.9%), and 3 were motorized gliders (0.72%). Table 2-9 and Figure 2C depict the historical trends in based aircraft at STS since 1985.

⁵⁵ Federal Aviation Administration, “APO Terminal Area Forecast Based Aircraft Data,” (December 2006).

Based Aircraft Demand Conclusions

In recognition of the above-noted national, state, and local demand factors and FAA planning projections, the *Airport Master Plan Update* concludes that there is potential for an increase in Sonoma County Airport’s based aircraft population.⁵⁶ The plan projects that based aircraft at the Sonoma County Airport will increase by 57 additional aircraft over the forecast period. Of these aircraft, some 27 are anticipated to be jets, including several VLJs. Table 2-9 summarizes the *Master Plan’s* forecast for future based aircraft for the Airport by aircraft classification. Figure 2C compares the forecast data with historical based aircraft.

Table 2-9 Based Aircraft Forecast (2005 – 2030)						
Aircraft Classification	2005	2010	2015	2020	2025	2030
Single-Engine	341	346	351	357	362	368
Multi-Engine	44	44	44	45	45	45
Jet	16	19	24	29	35	43
Helicopter	12	12	13	13	14	14
Sailplane (motorized)	3	3	3	3	3	3
Totals	416	424	435	447	459	473



⁵⁶ The forecasts of based aircraft are derived from the annual growth rates set forth for general aviation in the “FAA Aerospace Forecasts Fiscal Years 2006-2017,” as follow: Single-engine piston (0.3%), multi-engine piston (0.1%), jet-turbine (4.0%). The FAA Aerospace Forecast projected an annual growth rate of 6.7% for piston-engine helicopters, but it is not believed that STS could attract that many additional helicopters, given that several of the helicopters “based” at STS are rotated between other airports. The FAA Aerospace Forecast growth rates were projected through 2030.

General Aviation and Air Taxi Operations

The number of aircraft operations at an airport is influenced both by national and regional conditions and by various circumstances specific to the individual airport. Major influences impacting the Sonoma County Airport’s general aviation and air taxi aircraft operations forecast include:

- **Facilities and Services Available**—Existing general aviation facilities and air taxi services at the Sonoma County Airport are satisfactory for the Airport’s current level of activity. However, the two primary fixed base operators at the Airport (Apex and Sonoma Jet Center) have both expressed an interest in expanding their operations and services in the future.



Fixed Base Operation

- **Air Taxi Services**—Historically, there have always been a significant number of air taxi operations at the Sonoma County Airport, including those by non-certificated commuter airlines. In the future, particularly with the advent of on-demand air taxi services by the New Light Jets, air taxi operations are anticipated to increase.
- **Air Cargo Operations**—There are two basic types of air cargo and air freight carriers: integrated and non-integrated. An integrated air cargo carrier provides door-to-door pickup and delivery services using a combination of surface vehicles and aircraft. FedEx, UPS, and DHL are examples of integrated air cargo carriers. FedEx and UPS provide air cargo services at the Sonoma County Airport with small, single-engine turboprop aircraft (Cessna 208B Caravans). Non-integrated air cargo carriers do not usually have the ground connections associated with the integrated carriers and typically handle heavier, bulkier cargo and freight using larger aircraft. There is no regular use of the Sonoma County Airport by non-integrated air cargo airlines.

The FedEx air cargo service at Sonoma County Airport is provided by West Air, Inc. and UPS is served by Martinaire, PLP. The two carriers average a total of 76 landings per month, bringing in an average of almost 28,500 pounds of cargo per month. Outbound cargo



Cessna Caravan

averages about 118,000 pounds per month. It is anticipated that air cargo volume will increase in the future, but operations will not increase significantly. This is primarily because as cargo volume increases, the carriers have the option of bringing in larger aircraft. These aircraft could include medium-sized twin-engine turboprops such as the ATR-42 or ATR-72 (42,000 – 48,500 pounds MGTOW).

One advantage of having service by the twin-engined cargo aircraft is that palletized or containerized cargo can be carried on these aircraft, as well as on similar-sized, or larger, commercial airliners as belly cargo.

- **CDF Operations**—Flight training and fire suppression operations conducted by the California Department of Forestry and Fire Suppression (CDF/CALFIRE) are largely seasonal, but nonetheless contribute to overall military and governmental operations at Sonoma County Airport.
- **Extent of Transient Aircraft Use**—Increased business, corporate, and industrial development within Sonoma County is expected to generate increased aircraft operations at the Airport. Larger general aviation aircraft, including turboprops and business jets, will generate much of this increased activity.
- **Number and Type of Based Aircraft**—The shift toward proportionately more complex single-engine and multi-engine airplanes, along with some VLJs and light sport aircraft at Sonoma County Airport will tend to push operations counts upward more rapidly than the rate of based aircraft growth. Typically, complex aircraft are used more frequently and thus generate more operations per aircraft.



ATR 42



ATR 72

Methodology

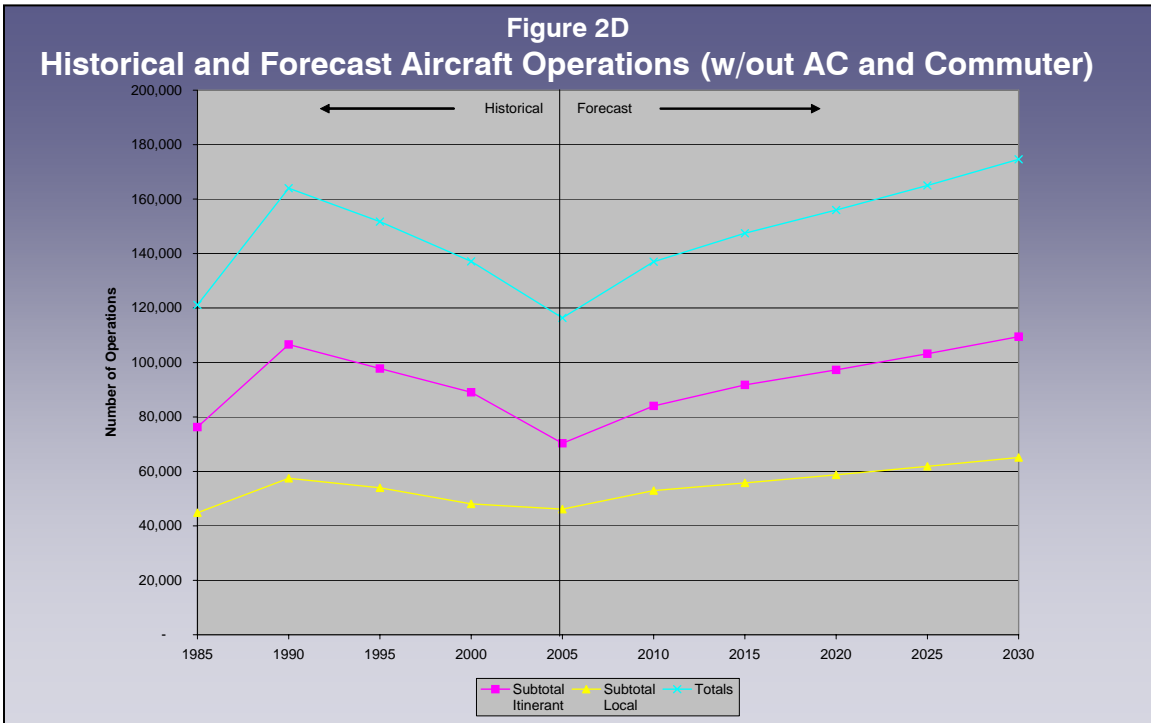
As with the based aircraft forecasts, the annual operations forecasts consider the above demand factors and FAA policies guiding the preparation of activity forecasts at GA airports. The following forecasts are derived primarily from information presented in the “FAA Aerospace Forecasts Fiscal Years 2006-2017,” and are supplemented by the FAA’s “Terminal Area Forecast Summary Fiscal Years 2006-2025” (December 2006).

Annual Operations Demand Conclusions

Continued growth in annual aircraft operations at Sonoma County Airport is anticipated. This growth in operations will be generated by the anticipated increase in air taxi activity and increased use by transient (not based at STS) corporate/business aircraft. The percentage split between itinerant general aviation and air taxi operations and local operations is projected to change only slightly by 2030. The current split is 60.4 percent of operations being itinerant and 39.6 percent local. By 2030, it is projected that 62.7 percent of all general aviation and air taxi operations will be itinerant and 37.3 percent will be local.

Table 2-10 summarizes the Master Plan forecasts⁵⁷ of future annual general aviation and air taxi aircraft operations for the Sonoma County Airport. The Master Plan forecast projects that total annual aircraft operation will increase from the 2005 level of 116,406 to 174,672 in the year 2030. Figure 2D provides a comparison of historical and forecast aircraft operations (not including air carrier or commuter airline operations).

Table 2-10 Aircraft Operations Forecast (2005 – 2030)						
Operations by Aircraft Class	2005	2010	2015	2020	2025	2030
Itinerant						
Air Taxi	4,836	5,991	6,432	6,907	7,413	7,959
GA	65,139	77,686	84,906	89,991	95,380	101,092
Military/Government	330	380	390	400	410	420
Subtotal	70,305	84,057	91,728	97,298	103,203	109,471
Local						
GA	46,035	52,952	55,763	58,724	61,842	65,125
Military/Government	66	68	70	72	74	76
Subtotal	46,101	53,020	55,833	58,796	61,916	65,201
Totals	116,406	137,077	147,561	156,094	165,119	174,672



⁵⁷ For itinerant air taxi and general aviation operations the forecast uses the December 2006 FAA APO TAF growth rates through 2025 and projected to 2030. Because military/government aircraft operations have not been a significant factor at the Airport in recent years, a constant growth rate of 0.5% per annum was used in the forecast. For local GA operations the December 2006 FAA APO TAF rates were used through 2025 and projected for 2030.

Instrument Operations

Instrument operations are those operations conducted by aircraft under instrument flight rules (IFR) in both visual meteorological conditions (VMC) and instrument meteorological conditions (IMC). Virtually all scheduled air carrier and commuter airline operations are conducted under instrument flight rules. With a precision instrument landing system on Runway 32 and non-precision instrument approaches to Runway 14, the Sonoma County Airport experiences a significant number of instrument operations. From a low of 9,816 instrument operations in 1985, annual instrument operations peaked in 1990 with almost 21,000 such operations. Between 1990 and 2005 instrument operations fluctuated up and down, but decreased to 14,410 by 2005. The FAA Aerospace Forecast for Fiscal Years 2006-2017 anticipates general aviation instrument operations to grow at an annual rate of 2.4% per year through 2007, then at 3.3% through 2017. Military activity is expected to remain constant at its 2005 level throughout the forecast period.

Table 2-11 presents the annual instrument operations forecast for the Sonoma County Airport (note that these operations are not additive to the total operations). Overall, instrument operations at the Airport are projected to grow from 13,378 in 2005 to 41,548 in 2030. This is due in part to the return of regularly scheduled air carrier and commuter airline operations, and the introduction of the new very light jets (VLJs) in 2007.

Total Operations

Table 2-12 consolidates the operational, passenger and based aircraft forecasts described in Tables 2-8 and 2-10.



Table 2-11 Annual Instrument Operations						
	Instrument Operations					
	2005	2010	2015	2020	2025	2030
Air Carrier Airline	-	3,358	3,925	4,504	5,271	6,161
Commuter Airline	-	2,774	2,920	3,212	3,395	3,570
Air Taxi	2,673	3,164	3,721	4,377	5,148	6,056
General Aviation	10,644	13,429	15,796	18,580	21,854	25,706
Military/Government	61	55	55	55	55	55
Subtotals	13,378	22,780	26,417	30,728	35,723	41,548

Table 2-12 Consolidated Summary of Airport Master Plan Forecasts						
ANNUAL AIRCRAFT OPERATIONS	2005	2010	2015	2020	2025	2030
Itinerant Operations						
Air Carrier Airline	0	3,358	3,925	4,504	5,271	6,161
Commuter Airline	0	2,774	2,920	3,212	3,395	3,570
Air Taxi	4,836	5,991	6,432	6,907	7,413	7,959
General Aviation	65,139	77,686	84,906	89,991	95,380	101,092
Military/Government	330	380	390	400	410	420
Subtotals	70,305	90,189	98,573	105,014	111,869	119,202
Local Operations						
General Aviation	46,035	52,952	55,763	58,724	61,842	65,125
Military/Government	66	68	70	72	74	76
Subtotals	46,101	53,020	55,833	58,796	61,916	65,201
Total Operations	116,406	143,209	154,406	163,810	173,785	184,403
Instrument Operations						
Air Carrier Airline	0	3,358	3,925	4,504	5,271	6,161
Commuter Airline	0	2,774	2,920	3,212	3,395	3,570
Air Taxi	2,673	3,164	3,721	4,377	5,148	6,056
General Aviation	10,644	13,429	15,796	18,580	21,854	25,706
Military/Government	55	55	55	55	55	55
Subtotals	13,372	22,780	26,417	30,728	35,723	41,548
Annual Enplanements						
Air Carrier Passengers	0	128,203	150,848	174,005	204,415	240,201
Commuter Airline Passengers	0	72,734	78,782	88,369	95,324	102,279
Total Annual Enplanements	0	200,936	229,629	262,373	299,739	342,480
Annual Passengers						
Air Carrier Passengers	0	56,405	301,696	348,009	408,830	480,401
Commuter Airline Passengers	0	145,467	157,563	176,737	190,649	204,558
Total Annual Passengers	0	401,872	459,259	524,746	599,479	684,959
Based Aircraft						
Single-Engine	341	346	351	357	362	368
Multi-Engine	44	44	44	45	45	45
Jet	16	19	24	29	35	43
Helicopter	12	12	13	13	14	14
Sailplane (motorized)	3	3	3	3	3	3
Totals	416	424	435	447	459	473

Forecast Comparison

Table 2-13 compares the above Master Plan operational forecasts with the projected operational activity levels for the Sonoma County Airport as set forth in the adopted “*Comprehensive Land Use Plan for Sonoma County (CALUP 2010)*”⁵⁸ and the draft “*Sonoma County General Plan 2020, Air Transportation Element (Draft ATE 2020)*.”⁵⁹ From Table 2-13 it can be determined that the master plan forecast data for 2010 and 2020 are significantly less than as projected by the CALUP 2010 and Draft ATE 2020 in all cases.⁶⁰

As can be determined from Table 2-13 the draft ATE 2020 has projected 800 based aircraft at the Airport by 2020. The Master Plan projects slightly more than half this number. For general aviation and air taxi operations the CALUP 2010 projected 210,000 operations by 2010. The Master Plan projects slightly more than 137,000 such operations for 2010. The draft ATE 2020 projects 240,000 GA and air taxi operations by 2020, while the Master Plan forecasts about 84,000 fewer operations. For air carrier and commuter operations the CALUP 2010 projected 15,000 such operations in 2010, while the Master Plan projects only 6,132 of these operations. The draft ATE 2020 projected 15,200 air carrier and commuter airline operations in 2020, while the Master Plan forecasts only around 7,700 such operations. In terms of total operations, the CALUP 2010 projected 225,000 operations by 2010, but the Master Plan anticipates just 143,213 such operations by 2010. For 2020, the draft ATE 2020 projects 255,200 total annual operations and the Master Plan forecasts only 184,403 total annual operations.

	2010	2020	2030
BASED AIRCRAFT			
2007 Airport Master Plan	416	447	473
Draft ATE 2020		800	
ANNUAL OPERATIONS			
GA and Air Taxi			
2007 Airport Master Plan	137,081	156,094	174,672
CALUP 2010	210,000		
Draft ATE 2020		240,000	
Air Carrier and Commuter			
2007 Airport Master Plan	6,132	7,716	9,731
CALUP 2010	15,000		
Draft ATE 2020		15,200	
TOTAL ANNUAL OPERATIONS			
2007 Airport Master Plan	143,209	163,810	184,403
CALUP 2010	225,000		
Draft ATE 2020		255,200	

= No Data

⁵⁸ Sonoma County Airport Land Use Commission, January 2001.
⁵⁹ Sonoma County Permit and Resource Management Department. January 2006.
⁶⁰ Neither the CALUP 2010 or the draft ATE 2020 made projections for 2030.

AIRFIELD CAPACITY

An airport's airfield capacity is generally measured in terms of the number of aircraft operations the runway and taxiway system can accommodate in an hour or over a year. Calculations of airfield capacity, particularly annual capacity, are dependent on various physical and operational factors. Hourly capacity and annual service volume (ASV) are estimated using the FAA's "Airport Capacity and Delay Model" and FAA Advisory Circular (AC) 150/5060-5 "Airport Capacity and Delay," (Change 2). This model uses information concerning airfield layout, meteorological conditions, runway use, aircraft fleet mix, percent arrivals, percent touch-and-go operations and exit taxiway locations.

Annual Service Volume

Annual Service Volume (ASV) is used to assess the overall adequacy of the airfield design, including the number and orientation of runways. As the number of annual operations increase and approach an airport's ASV, the average amount of operational delay also increases. When annual operations equal the ASV, the average delay is 1 to 4 minutes per operation. When the number of annual operations exceeds the ASV, severe congestion occurs and the average delay per operation increases significantly. The FAA considers delays of 6 minutes or more to be significant.

Based on the information contained in AC 150/5060-5, the airfield capacity (expressed as ASV) for the Sonoma County Airport is 230,000 annual operations.⁶¹ This level of activity is almost 37 percent higher than the 168,234 total annual operations forecast for 2030. The FAA recommends consideration of capacity enhancements when annual operations reach 60 percent of ASV, or, in this case, 138,000 operations. Based on the above operational forecasts, this could occur before 2015.

Hourly Capacity

This is the maximum number of aircraft operations that can be accommodated on an hourly basis. The FAA's airport capacity model provides weighted measures of the airfield's hourly capacity for both VFR and IFR operations. The VFR capacity of the STS runway system is 77 operations per hour, and the IFR capacity is 57 operations per hour. At 182,102 annual operations, aircraft may expect delays of from 0.7 minutes to 2.2 minutes per operation, and from 127 minutes to 400 minutes of delay annually. This is not considered to be a significant amount of delay by the FAA.

⁶¹ The 2006 FAA APO TAF also uses this number as a measure of ASV for STS.