Charles M. Schulz – Sonoma County Airport

Master Plan

Adopted January 24, 2012

County of Sonoma

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Adopted January 24, 2012

Prepared for the
County of Sonoma

Prepared by

Mead & Hunt

www.meadhunt.com

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1 Background and Inventory

CHARLES M. SCHULZ–SONOMA COUNTY AIRPORT

Location and Environs

The Charles M. Schulz–Sonoma County Airport (Airport) is located in central Sonoma County, approximately 7 miles northwest of the City of Santa Rosa and 18 miles inland from the Pacific Ocean. The Airport is conveniently accessible to most of the County via U.S. Highway 101, the region's only major north-south highway (**Figure 1A**). The Airport terminal complex is located 1.6 miles west of Highway 101 on Airport Boulevard, which is the Airport's principal ground access route.

The Airport lies in a broad, flat valley at an elevation of 125 feet above mean sea level (MSL). Most of the immediate Airport environs are rural residential and agricultural lands. The City of Santa Rosa has been expanding northward toward the Airport. Extensive residential development has been occurring over the past two decades in the incorporated Town of Windsor area to the north and the Larkfield-Wikiup area to the east. Several large office complexes and one light industrial/business park have been established east of the Airport, between the Airport boundary and Highway 101.

History

In 1939, Sonoma County purchased approximately 339 acres of agricultural land and constructed the Airport's first runway using grant funds from the Civil Aeronautics Authority (predecessor to the Federal Aviation Administration). Between 1941 and 1943, the Army Air Corps added 826 acres, extended the original runway, and constructed the Airport's second runway, taxiways, apron areas and other facilities. The Army Air Corps took over the Airport in 1943 for use as a military installation. Two of the hangars constructed by the Army remain in use today; the large maintenance hangar occupied by Sonoma Jet Center and the steel-arched "Butler" hangar which is utilized for aircraft storage.

Between February 1943 and January 1946, the Airport was operated by the U.S. Fourth Air Corps. At that time, the Airport was known as the Santa Rosa Army Airfield and was used primarily to train fighter groups and squadrons. At its peak, some 300 to 500 aircraft and 10,000 personnel were based on the army field.

Figure 1A

Location Map

Sonoma County Airport

On July 8, 1946, Sonoma County resumed operation of the Airport as a civil facility. Shortly thereafter, two T-hangar structures were built on the Airport. Relatively few improvements occurred in the following decade due to uncertainties about whether or not this site or the Santa Rosa Air Center (located 6 miles southeast of the Airport) would be better suited as the County's main airfield. The 1960s brought resolution to this issue in favor of the current site. Shortly thereafter, development of additional T-hangars, the Air Traffic Control Tower (ATCT) and the airline terminal building began.

In the 1970s and early 1980s, the "Nob Hill" T-hangars (located on Apron E), fire station, an instrument landing system, and non-aviation commercial facilities were added to the Airport. Other improvements that occurred during this time period include additional T-hangars, portable hangars, executive hangars, apron expansion, and on-airport access roads and fencing. A composite listing of recent facility improvements are presented in **Table 1-1**.

Air Carrier Service

Throughout its history, the Sonoma County Airport has operated primarily as a general aviation facility serving private/recreational airplanes, and business/corporate aircraft. It has also operated as a commercial service airport offering mostly commuter airline service to San Francisco and Los Angeles

In March 1947, Southwest Airways (changed to Pacific Airlines in 1958) operated a DC-3 out of Sonoma County Airport as the first scheduled commercial flight. In later years, this airline operated Martin 202s and Martin 404s and occasionally the Fairchild F-27 flew service from the Airport.

In 1968, Pacific Airlines was merged into Hughes Airwest. Scheduled feeder/commuter service by STOL Air, Inc. began in September 1972, with Sonoma County Airport as the base for its operations. In the past, Sonoma County Airport has also had service to various Northern California cities via commuter carriers such as Golden Pacific and Golden West, both of which utilized Beech 99 aircraft.

Passenger enplanements have varied greatly at the Sonoma County Airport over the past 15 years. Yet air passenger demand levels have remained consistently high throughout the period. Between 1989 and 1991, 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. From 1991 to 1998 passenger enplanements declined, going from 58,074 passengers in 1991 to 17,762 in 1998. In 1999 and 2000 passenger enplanements began to climb again, going from 27,335 in 1999 to 32,177 in 2000. United Express discontinued its air carrier service in October, 2001. From October 2001 until March 2007 the Airport did not have any regularly scheduled air carrier or commuter airline service. During this period, significant numbers of passengers either used the Airport bus service or drove to San Francisco, Oakland or Sacramento International Airports.

Table 1-1
Recent Airfield Improvements

Listed below are a sampling of the recent construction projects completed at the Charles M. Schulz-Sonoma County Airport since 2001.

2010	♦ Terminal Expansion and Remodeling ♦ Taxiway Z (Phase II) Rehabilitation ♦ Security Equipment Improvements ♦ Taxiways D and Y Seal Coat and Enhanced Markings
2009	♦ Taxiways H, Z and Apron A Rehabilitation

2007-2008	♦ Installation of PAPIs to Runway 19 ♦ Rehabilitation of Parking Lot and Terminal Building ♦ Runway 14-32 Seal Coat ♦ KaiserAir Apron Reconstruction

2006	♦ Pavement Overlay of Runway 1-19 ♦ Construction of Private Sector Hangars (south & west sides of airport) ♦ Construction of Sonoma Jet Center Fuel Farm ♦ Sonoma Jet Center Office Building Construction ♦ Construction of Airport Security Screening and Hold Area Building

2005	♦ Installation of Airport Perimeter Fencing ♦ Taxiway H Rehabilitation ♦ Safety Area Improvements ♦ Rehabilitation of Taxiways A & B (west side) ♦ Supplemental Wind Socks ♦ Construction of Access Road ♦ Drainage Improvements ♦ Construction of REACH Hangar
2004	♦ Construction of Southeast Access Road (Apron E)

2003	♦ Construction of Executive and T-Hangars (Apron E)
2002	♦ Installation of Fire Sprinkler Systems ♦ Construction of Executive Hangars

2001	♦ Construction of Executive Hangar ♦ Runway 14-32 and Exit Taxiway Rehabilitation ♦ Taxiway B, D, and Y Rehabilitation ♦ Airfield Lighting Improvements

The 21st Century

In March of 2000, the Sonoma County Board of Supervisors voted to rename Sonoma County Airport, Charles M. Schulz–Sonoma County Airport. The name change was in honor of the famous "Peanuts" comic strip cartoonist.

On March 20, 2007, Horizon Air instituted nonstop scheduled commuter air service from the Airport to Los Angeles and Seattle. The schedule has expanded to include:

- 1 daily departure to Las Vegas
- 2 daily departures to Los Angeles
- 1 daily departure to Portland, Oregon connecting to Seattle
- 1 daily departure to Seattle

Flights are operated with 76-seat, Q400 twin-engine turboprop airplanes. The service by Horizon Air has resulted in the Airport's peak period for passenger activity reaching 204,734 in 2008.

Facilities, Management, and Services

The Airport is owned by the County of Sonoma and operated by the County of Sonoma Department of Transportation and Public Works. Day-to-day operation of the Airport is the responsibility of the Airport Manager. The manager is supported by a full-time staff of 15, all of whom are stationed at the Airport. In addition to management, record keeping and related activities, designated staff members operate the Airport Rescue and Fire Fighting (ARFF) equipment and perform routine maintenance of Airport facilities. Table 1-2 presents a composite of Airport services and features.

A seven-member Aviation Commission, appointed by the Sonoma County Board of Supervisors, meets monthly to provide guidance on important Airport issues. Major policy decisions regarding the Airport are the responsibility of the Sonoma County Board of Supervisors. The County's Airport Land Use Commission (ALUC) provides guidance on land use compatibility issues on development proposed in the environs of the Airport.

Airfield

The Airport currently occupies approximately 1,048 acres and features two runways. Runway 14-32, the Airport's primary runway has a published length of 5,115 feet and is 150 feet wide. Runway 14-32 can accommodate aircraft weighing up to 145,000 pounds. This runway is lighted and has an instrument landing system (ILS) serving the approach end of Runway 32. Runway 1-19 is designated as the crosswind runway. It has a published length of 5,002 feet and is 100 feet wide. The runway is currently unlighted.

Table 1-2
Airport Profile

Major Features

Property
- Existing: 1,048.1 acres
- Easements: 62.4 acres
- Property encompasses airfield, building area, and most portions of runway protection zones.

Airfield
- Runway 14-32: 5,115 feet long, 150 feet wide; asphalt
- Runway 1-19: 5,003 feet long, 100 feet wide; asphalt
- Runway Lighting (14-32): High Intensity

Navigational Aids
- Airport:
  - Segmented circle & lighted wind cone
  - Rotating Beacon
  - Pilot Controlled Runway Lights (when tower closed), Runway 14-32
  - Automated Surface Observation System (ASOS)
- Runways:
  - Runway 32: Medium Intensity Approach Lighting System with RAILs
  - Runway 14: Runway End Identifier Lights, Visual Approach Slope Indicator (VASI)
  - Runway 19: PAPI

Building Area
- Majority of facilities located on east side of Airport
- Aircraft Parking Capacity
  - T-/Shade Hangars: 261
  - County Tiedowns: 262
  - Transient Tiedowns: 73
- Aviation-Related Facilities
  - Airline Terminal & Boarding Lounge
  - CAL FIRE Sonoma County Air Attack Base
  - Sonoma County Sheriff's Helicopter Center
  - Redwood Empire Air Care Helicopter (Reach) Facility
  - Aircraft Parking and Storage
  - Above ground Fuel
  - Aviation Museum
- Non-Aviation Facilities
  - Automobile Parking
  - Car Rental
  - Industrial Buildings

Management and Services

Management
- Airport Management and Maintenance:
  - County of Sonoma Transportation & Public Works Dept.
  - Airport Manager and on-site staff of 13

Fixed Base Operations (FBO) Services
- Several FBOs are located at the Airport. Services include: aircraft fuel, parking maintenance, avionics, flight training, aircraft rental, charter, and car rental.
- Fuel: 100LL/Jet- self-service cardlock system & truck

Emergency and Security
- Fire Protection:
  - CAL FIRE (on-site)
  - ARFF (on-site)
  - Rincon Valley Fire Department
- Police:
  - Patrolled by Sonoma County Sheriff's Dept. on random basis

Airport Site and Environs

Topography
- Airport elevation: 125 ft. MSL
- Terrain:
  - On Airport: Terrain ranges from 80 ft. to 125 ft.
  - Off Airport: Rising terrain 3 miles northwest to 500 ft.

Access
- Direct: Airport Boulevard east side of airport
- U.S. Highway 101: 2 miles east
- Airport 7 miles northwest of the City of Santa Rosa

Jurisdictions
- Airport within unincorporated portion of Sonoma County

Nearby Land Uses
- East: Agriculture/Light Industrial
- North and West: Rural Residential/Agricultural
- South: Vineyard

Air Traffic Procedures

Traffic Patterns
- Runway 14-32: left traffic
- Runway 1-19: left traffic
- Pattern Altitudes
  - Light aircraft: 1,125 ft. (MSL), (1,000 ft. AGL)
  - Heavy aircraft: 1,625 ft. (MSL), (1,500 ft. AGL)

Instrument Approach Procedures
- Runway 14 GPS:
  - Straight-in (1 mile; 441 ft. AGL)
  - Circle-to-Land (1 mile; 475 ft. AGL)
- Runway 14 VOR/DME:
  - Straight-in (1 mile; 521 ft. AGL)
  - Circle-to-Land (1 mile; 515 ft. AGL)
- Runway 32 ILS:
  - Special CAT II (1,800 ft., 200 ft. AGL)
  - Straight-in (1/2 mile; 200 ft. AGL)
  - Circle-to-Land (1 mile; 455 ft. AGL)
- Runway 32 GPS
  - Straight-in (1 mile; 481 ft. AGL)
  - Circle-to-Land (1 mile; 475 ft. AGL)
- Runway 32 VOR
  - Straight-in (1/2 mile; 401 ft. AGL)
  - Circle-to-Land (1 mile; 455 ft. AGL)

Communications
- CTAF/UNICOM: 118.5 MHz/122.95 MHz
- Santa Rosa ATCT: 118.5 MHz (7:00 am to 8:00 pm daily)

Noise Abatement Procedures
- Pilots requested to minimize overflight of residential areas north & east of Airport as published in Noise Management Guide
- Departure Noise Levels
  - Daytime (0600-2200L): 83.2 dBA
  - Nighttime (2200-0600L): 72.0 dBA

The majority of the airfield and apron pavement is made of asphalt concrete. This pavement was constructed at various times throughout the Airport's 70-year existence. The condition of this pavement varies. In general, these pavement areas are in good to very-good condition.

Building Area

Nearly all building area facilities are situated on the east side of the Airport, most are located south of Airport Boulevard. This includes the airline terminal building. The terminal area supports an approximately 13,000-square-foot terminal building, short-term automobile parking lot, four rental car facilities, restrooms and a passenger boarding lounge. The FAA Air Traffic Control Tower (ATCT) is also located within the terminal area.

The building area immediately north of Airport Boulevard consists of a long-term automobile parking lot, general aviation aircraft parking apron and terminal building, two Airport maintenance hangars, fuel facility, FBO building, and a helicopter parking area. The California Department of Forestry and Fire Protection (Cal Fire) air attack base is north of the general aviation terminal building.

Apron

There are six aircraft parking aprons designated A through F at the Airport. Except for Apron F, all of the parking aprons are located on the east side of the Airport. Apron F is located on the south side of the Airport.

Apron A provides parking for transient general aviation aircraft. Aprons A and C support fixed base operations. Apron B supports commercial airline service. Storage hangars (e.g., portable, shade, box, executive/corporate) for based aircraft are situated on Aprons D and E. T-hangars and box hangars are located on Aprons E and F. Apron F is the only apron located on the south side of the Airport. It is supported by Taxiway D, which connects to the ends of Runway 1 and Runway 32.

Fuel

Fuel is available 24 hours a day at the Airport. Pilots can obtain fuel from two FBO facilities on the Airport. One FBO, Sonoma Jet Center, currently offers 100 low-lead (LL) AvGAS from a card lock self-serve facility located to the east of the "Redwood" hangar. A second FBO, Santa Rosa Jet Center – KaiserAir, also offers both 100LL and Jet-A dispensed from fuel trucks and supported by an above-ground fuel farm. The FBOs also provide Jet-A fuel, dispensed from fuel trucks.

FAA Facilities

The principal Federal Aviation Administration (FAA) function at the Airport is operation of the Airport ATCT. From 0700 local time (LT) through 2000 LT, the tower staff provides ground and local air traffic control (ATC) services in the immediate vicinity of the Airport. Other FAA duties at the Airport include operation and maintenance of electronic navigational aids including the Instrument Landing System (ILS), the Very High Frequency Omni-Directional Range (VOR), Approach Lighting System (ALS), and the Automated Surface Observing System (ASOS).

AIRPORT TENANTS

Fixed Base Operators (FBO)

Fixed base operators (FBOs) and specialty aeronautical service operators provide a wide range of general aviation services including aircraft rental and charter, flight instruction, aircraft sales, major maintenance and repair and fuel service.

Two full service FBOs at the Airport offer multiple services such as; aircraft maintenance, avionics, tiedowns, aircraft charter, sales, flight lounge and lobby, and fuel. Seven other operators at the Airport provide specialized services in aircraft maintenance, air ambulance, flight instruction, aircraft charter, and aircraft rental.

Other Tenants

A 1,000 square-foot aviation museum building housing the Pacific Coast Air Museum (PCAM) is located west of north Laughlin Road. The museum showcases aviation related aircraft artifacts spanning the period from World War II to present. Historical aircraft such as the UH-1H Huey helicopter, F-14, F-86, T-37 and others are displayed on three acres of land.

Civil Air Patrol (CAP), Experimental Aircraft Association (EAA, Chapter 124), and the Ninety-Nines have established facilities at the Airport. Civil Air Patrol pilots fly reconnaissance missions for homeland security, search and rescue, and transport personnel and medical supplies. The CAP facility is located in an office trailer near the Pacific Coast Air Museum. The EAA facility is located on the west side of the Airport. EAA maintains facilities for 36 sport/recreational aircraft, including 19 in hangars and 17 on tiedowns. The Ninety-Nines is an international woman pilots' organization named because of the original 99 members. The Ninety Nines was founded in 1929 by Amelia Earhart. **Table 1-3** provides information on the tenants currently based at the Airport.

Table 1-3
Airport Tenants
Sonoma County Airport

FIXED BASE OPERATIONS (AVIATION-RELATED SERVICES)

	Fuel Sales		Flight Instruction		Aircraft Rental		Aircraft Parts & Maintenance				Aircraft Storage			Miscellaneous			
Name	100/100LL	Jet-A	Fixed Wing	Helicopter	Fixed Wing	Helicopter	Engine	Airframe	Avionics	Helicopter	Other	Based Tiedowns	Hangars	Transient Ramp	Pilots' Supplies	Charter (FAR 135)	Aircraft Sales	Other
Kaiser Air- Santa Rosa Jet Center	✓	✓					✓	✓				✓	✓	✓	✓	✓	✓	✓[1]
Barron Air							✓											
Dragonfly Aviation			✓[2, 3]				✓											
North Coast Air			✓[2]		✓													✓[4]
Propjet Aviation							✓										✓	
Sonoma Jet Center	✓	✓					✓	✓	✓			✓	✓	✓	✓		✓	
Solairus Aviation																✓	✓	✓[1,4]
Sonoma Helicopter				✓		✓									✓			✓

OTHER AVIATION-RELATED TENANTS

Name	Type of Business
California Department of Forestry (CAL FIRE) and Fire Protection Air Attack Base	Administration of California's private and public forests Prevent and extinguish wildfires
Civil Air Patrol Redwood Empire–Squadron 157	Reconnaissance missions for homeland security, and search and rescue
Experimental Aircraft Association–Chapter 124	Personal/Recreational aircraft enthusiasts group
Santa Rosa Ninety Nines	International woman pilots organization
Pacific Coast Air Museum	Aviation education and historical aircraft displays
REACH	Air ambulance emergency medical transport–rotor and fixed wing aircraft
Sonoma County Sheriff	Law enforcement, search and rescue, medical transport, and fire suppression
Alaska Air	Commercial passenger services

NON-AVIATION TENANTS

Avis, Budget, Enterprise and Hertz	Car rental
Cornerstone Properties	Industrial
Republic Parking System	Automobile parking operator
Sky Lounge	Restaurant
Transit Technology	Passenger screening

[1] Aircraft Management
[2] VFR/IFR Flight Instruction
[3] Cessna Pilot Center
[4] Scenic Air Tours

Source: Data compiled by Mead & Hunt, Inc. (February 2011)

EMERGENCY RESPONSE

ARFF

The Airport Aircraft Rescue and Fire Fighting (ARFF) equipment building is located north of the airline terminal. County staff operates the ARFF equipment. When an aircraft emergency is declared, emergency vehicles will leave the ARFF building and proceed to the incident or specified staging positions in accordance with standard operating practices. The Airport acquired a new, state-of-the-art ARFF truck with FAA funding in mid-2006. This equipment and its response time classify the Airport as 14 CFR, Part 139 Index B.

CAL FIRE

The California Department of Forestry and Fire Protection (CAL FIRE) Air Attack Base was established at the Airport in 1964. CDF continues to serve Sonoma County and outlying areas. The Air Attack Base's immediate response area covers 4,000 square miles. CDF responds to an average of 300 calls during the annual fire season. CDF staff consists of a battalion chief, fire captain, fire apparatus engineer, and six firefighters.

There are three CDF aircraft based at the Airport, an OV-10 Bronco airtactical aircraft and two S-2T airtankers. These aircraft work in unison to extinguish wild fires. The OV-10 is the command and control aircraft. The OV-10 pilot directs the S-2 pilot where to make their fire retardant/water drops.

REACH

Redwood Empire Air Care Helicopter (REACH) is a first responder air medical unit that responds to emergency calls. REACH Air Medical Services is headquartered in Santa Rosa and provides helicopter and airplane patient transportation for injured patients throughout northern California. Critically ill patients are transferred to larger, more specialized hospitals in the Bay Area. Since its inception in 1987, REACH has performed more than 25,000 air ambulance missions and has developed proficiency for serving pediatric and neonatal patients.

Sonoma County Sheriff

The Sonoma County Sheriff's Helicopter Unit is based at the Airport. A Bell 407 rescue helicopter is used to respond to rescue calls in the county relating to law enforcement, search and rescue, medical transport, and fire suppression.

AERONAUTICAL SETTING

Area Airports

A total of seven public-use airports are located within a 40-nautical mile flying distance of the Airport. , In Sonoma County, there are three publicly-owned airports (i.e., Cloverdale Municipal Airport, Healdsburg Municipal Airport, and Petaluma Municipal Airport) in addition to the Sonoma County Airport. Sonoma County Airport is the only airport owned by the County; five airports are owned by other counties, four airports are city-owned, and two are privately-owned.

Among the publicly-owned airports, Sonoma County Airport is the only one to offer an ATCT, a precision instrument approach, ARFF, and ASOS. In addition it is the only airport in Sonoma County capable of accommodating commercial air carrier service. **Table 1-4** provides information on other airports within the Sonoma County Airport environs.

Area Airspace

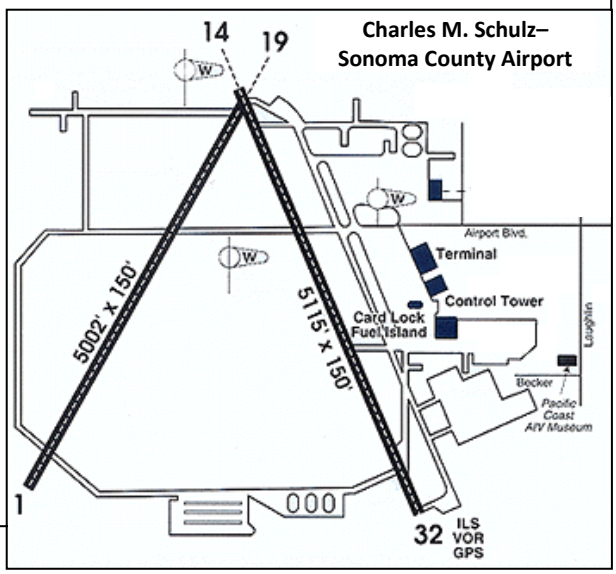
Airspace in the vicinity of the Airport is relatively uncomplicated. None of the area airports are located close enough to the Sonoma County Airport to result in a need for airspace coordination.

The presence of ground-to-air communication capability and weather observation reporting provided by the ATCT at the Airport permits the existence of Class D – Controlled airspace around the Airport. This controlled airspace, extending a radius of five statute miles around the Airport and upward from the surface to the base of the overlying Class E – Controlled airspace at 2,600 feet mean sea level (MSL) is in-effect during the hours when the ATCT is in operation (currently, 0700 Local Time [LT] through 2000 LT). When the Airport ATCT is not in operation (i.e., 2000 LT through 0700 LT), the airspace in the vicinity of the Airport reverts to Class G – Uncontrolled airspace from the surface up to but not including 700 feet above the surface and Class E – Controlled airspace from 700 feet above the surface to 18,000 feet MSL. **Figure 1B** presents an aeronautical chart of the Airport vicinity. In addition, numerous "Victor" airways based on the Santa Rosa VOR/DME overly the Airport. Figure 1C presents a graphic portrayal and description of the various airspace classes.

Table 1-4
Area Airports

Airport Name [1]	Owner	Location		Facilities						Services						
		Associated City (County)	Distance/Direction [2]	Based Aircraft [3]	Number of Runways	Longest Runway (ft.)	Surface [4]	Lighting Intensity [5]	Approach Visibility [6]	Control Tower	Airline Service	AvGas	Jet Fuel	Maintenance	Automobile Rentals	Food
Sonoma County	**County of Sonoma**	**Santa Rosa (Sonoma)**	**–**	**380**	**2**	**5,115**	**asph**	**H**	**½***	***Yes***	***Yes***	✓	✓	✓	✓	✓
Area Airports																
Healdsburg Airport	City of Healdsburg	Healdsburg (Sonoma)	10NW	63	1	2,707	asph	M	VIS	No	No	✓	–	✓	–	–
Angwin-Parrett Field Airport	Private	Angwin (Napa)	17NE	38	1	3,217	asph	L	VIS	No	No	✓	–	✓	–	–
Cloverdale Municipal Airport	City of Cloverdale	Cloverdale (Sonoma)	18NW	21	1	3,155	asph	M	2	No	No	✓	–	–	–	–
Petaluma Municipal Airport	City of Petaluma	Petaluma (Sonoma)	18SE	203	1	3,600	asph	M	1	No	No	✓	✓	✓	–	✓
Gnoss Field Airport	County of Marin	Novato (Marin)	25SE	301	1	3,300	asph	M	1¼	No	No	✓	✓	✓	–	–
Lampson Field Airport	County of Lake	Lakeport (Lake)	29N	110	1	3,597	asph	M	1¼	No	No	✓	–	✓	✓	✓
Napa County Airport	County of Napa	Napa (Napa)	31SE	222	3	5,931	conc/ asph	M	¾	Yes	No	✓	✓	✓	✓	✓
Ukiah Regional Airport	City of Ukiah	Ukiah (Mendocino)	39NW	95	1	4,415	asph	M	1¼	No	No	✓	✓	✓	✓	–
Sonoma Valley Airport	Private	Schellville/ Sonoma (Sonoma)	25SE	333	2	2,700	asph	–	VIS	No	No	✓	–	✓	–	–

[1] Airports within 40 nautical miles of Sonoma County Airport
[2] Relative to Sonoma County Airport
[3] FAA Airport Master Record data as of August 2005; totals exclude ultralights
[4] ASPH=asphalt; CONC=concrete
[5] L=low; M=medium; H=high
[6] Lowest visibility minimums for instrument approach procedures; distance in statute miles. VIS = No instrument approach – VFR only.
*RVR 1,800 feet authorized with Flight Director or Autopilot or HUD to DA.



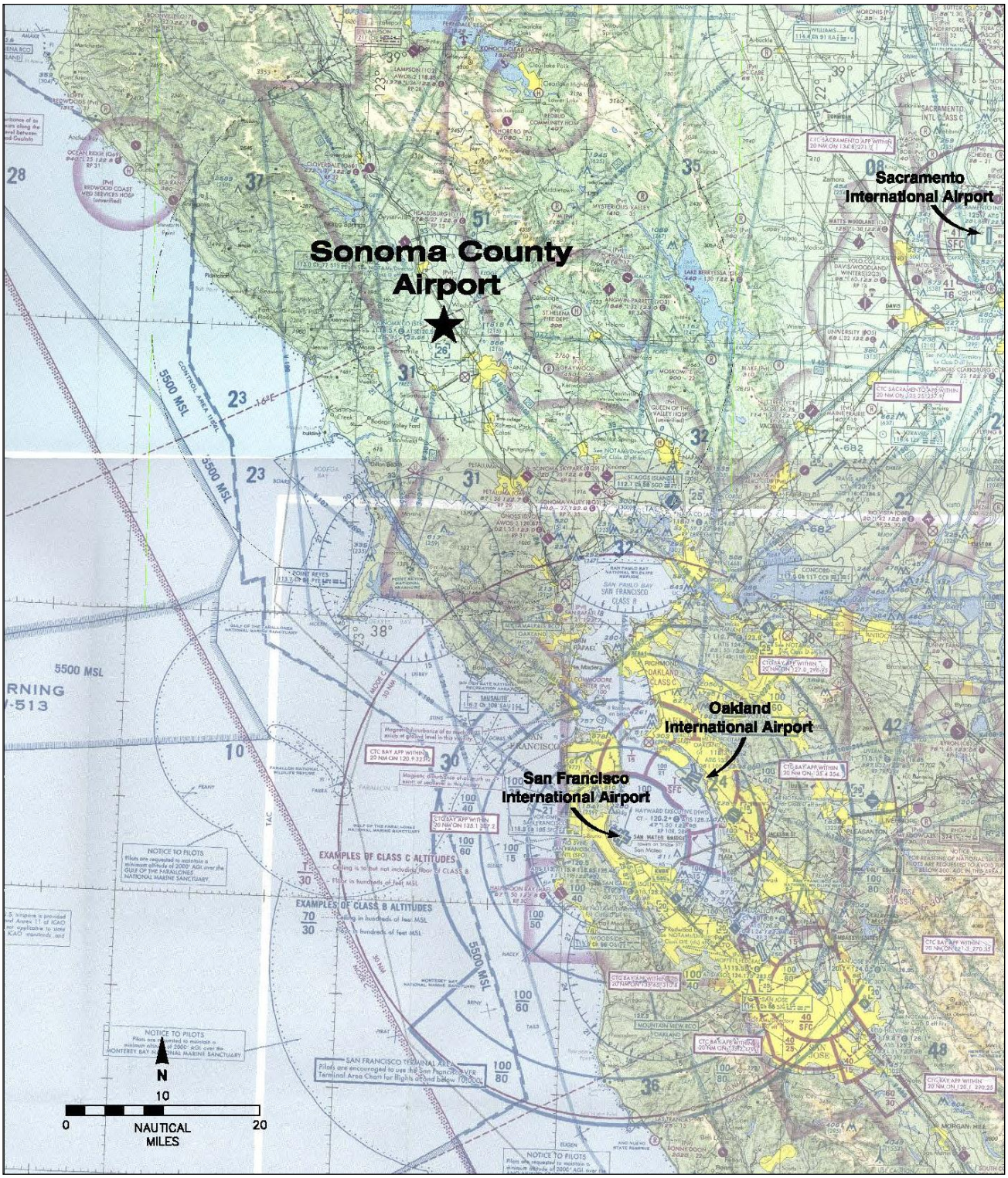
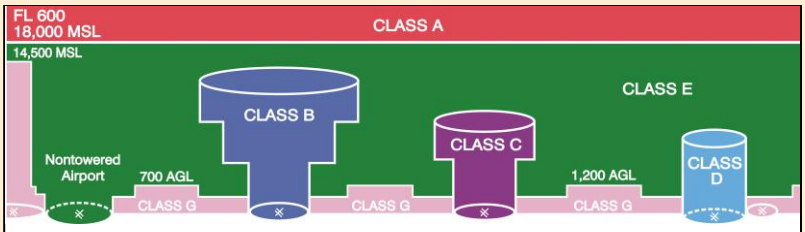


Figure 1B

Area Airspace

Sonoma County Airport

Figure 1C
Airspace Classes



AGL – above ground level, MSL – mean sea level, FL – flight level

Airspace Classes	Communications	Entry Requirements	Separation	Special VFR in Surface Area
A	Required	ATC clearance	All	N/A
B	Required	ATC clearance	All	Yes
C	Required	Two-way communications prior to entry	VFR/IFR	Yes
D	Required	Two-way communications prior to entry	Runway operations	Yes
E	Not required for VFR	None for VFR	None for VFR	Yes
G	Not required	None	None	N/A

Airspace Classes. Federal Aviation Regulations define six categories of airspace, which conform in both name and description with airspace designations used internationally. **Controlled Airspace** is any of several types of airspace in which some or all aircraft may be subject to air traffic control. With the number of aircraft flying over the United States today, proper airspace usage is critical for flight safety and efficient service to pilots and the flying public. To assist in this goal, the airspace is divided into six classifications.

CLASS A is the airspace from 18,000 feet to 60,000 feet. VFR is not allowed. All pilots flying in Class A airspace shall file an Instrument Flight Rules (IFR) flight plan and receive an appropriate air traffic control (ATC) clearance.

CLASS B is generally the airspace from the surface to 10,000 feet. This airspace is normally around the busiest airports in terms of aircraft traffic. Class B airspace is individually designed to meet the needs of the particular airport and consists of a surface area and two more layers. Pilots must contact air traffic control to receive an air traffic control clearance to enter Class B airspace.

CLASS C is the airspace from the surface to 4,000 feet above the airport elevation. Class C airspace will only be found at airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations. Although Class C airspace is individually tailored to meet the needs of the airport, the airspace usually consists of a surface area with a 5 nautical mile (NM) radius, an outer circle with a 10 NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation and an outer area. Pilots must establish and maintain two-way radio communications with the ATC facility providing air traffic control services prior to entering airspace. Pilots of visual flight rules (VFR) aircraft are separated from pilots of instrument flight rules (IFR) aircraft only.

CLASS D is generally that airspace from the surface to 2,500 feet above the airport elevation. Class D airspace only surrounds airports that have an operational control tower. Class D airspace is also tailored to meet the needs of the airport. Pilots are required to establish and maintain two-way radio communications with the ATC facility providing air traffic control services prior to entering the airspace.

CLASS E is generally that airspace that is not Class A, B, C, D, or G. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. If an aircraft is flying on a Federal airway below 18,000 feet, it is in Class E airspace. Class E airspace is also the airspace used by aircraft transiting to and from the terminal or en route environment normally beginning at 14,500 feet to 18,000 feet. Class E airspace ensures IFR aircraft remain in controlled airspace when approaching aircraft without Class D airspace or when flying on "Victor airways" -- federal airways that are below 18,000 feet.

CLASS G is **uncontrolled** airspace. IFR aircraft will not operate in Class G airspace. VFR aircraft can operate in Class G airspace.

In addition, there are eight other forms of Special Use airspace (e.g., Prohibited Areas, Restricted Areas, etc.) that pilots must be aware of.

Instrument Flight Procedures

One precision and four nonprecision instrument approach procedures serve the Airport. Runway 32 has three straight-in instrument approach procedures – an instrument landing system (ILS) precision approach and VOR and GPS nonprecision approaches. The lowest approach minimums at the Airport are associated with Runway 32 ILS and VOR; as low as 1,800 feet.

Global Positioning System (GPS) - utilizes a network of satellites to assist pilots in determining a positional fix to the airport.

Very-High-Frequency Omnidirectional Range (VOR) - is a navigational aid used to provide bearing information to aircraft en-route to the airport.

Two nonprecision approaches serve Runway 14 – a straight-in GPS approach and a VOR/DME approach. Both procedures have visibility minimums as low as 1-mile. All five approach procedures allow aircraft to circle-to-land to all runways.

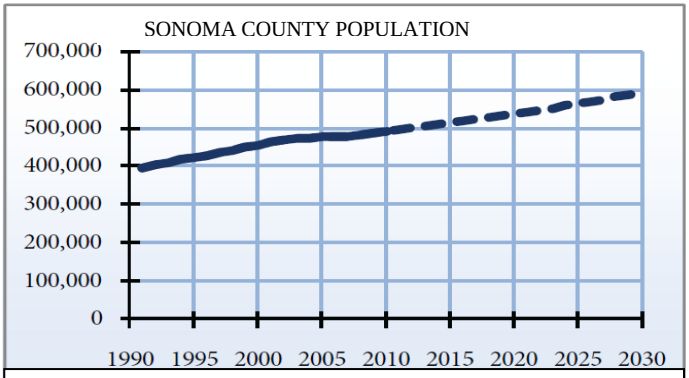
Community Profile

Santa Rosa, the county seat, is one of eight incorporated cities in the County. Santa Rosa is an important regional business center and also has many businesses with national and international affiliations. With a population of over 150,000, Santa Rosa is the largest city in California north of the line connecting San Francisco and Sacramento.

The population of Sonoma County has increased from roughly 422,000 in 1995 to nearly 493,285 in 2010. The population of the County is projected to increase to almost 600,000 by 2030. The largest age group in Sonoma County in 2005 was 50-59 years of age (73,865 people). This age group represents 16 percent of the county's total population.

Industry Employment

Based on Sonoma County 2010-11 Economic and Demographic Profile, in 2008 the top three industries in the county were government (10.5 percent), retail trade (10.6 percent) and healthcare (9.9 percent)). Agriculture, forestry, and fishing businesses made up 3 percent of the industry sectors.



Source: Sonoma County 2010-11 Economic and Demographic Profile

The largest private employers in the County are Kaiser Permanente, St. Joseph Health System, Agilent, Medtronic Vascular, and Sutter Medical Center of Santa Rosa. Each of these employers provides over 1,000 jobs; the County employs 5,000 people.

Of all the establishments in Sonoma County, 62 percent employed between one and four employees. This suggests a strong trend in small local businesses (See **Table 1-5** for a synopsis of the Sonoma County region).

Table 1-5
Community Profile

GEOGRAPHY

Location
- Sonoma County is located in northern California
- Sonoma County total land area: 1,576 square miles
- 65 miles north of City of San Francisco
- 107 miles west of Sacramento

Topography
- Airport elevation: 125 ft. MSL (approximate)
- Terrain in the vicinity of the airport is relatively flat

SURFACE TRANSPORTATION

Major Highways
- Highways:
  - U.S. Highway 101: 1.6 miles east, four-lane divided highway
  - Highway 12: 7 miles southeast, four-lane divided highway

Public Transportation
- Sonoma County Transit:
  - Service to Sonoma County
  - Connections to Golden Gate Transit and Santa Rosa City Bus
- Connections to Sonoma County Transit from:
  - Santa Rosa City Bus
  - Healdsburg In-City Transit
  - Petaluma Transit
- Airport Express
  - Daily shuttle service from the Airport and Sonoma and Marin Counties to:
    - San Francisco International Airport
    - Oakland International Airport
- Mendocino County Transit
  - Service to Fort Bragg, Santa Rosa and the Airport

POPULATION AND ECONOMY

Historical/Current Population

	2000	*2005*	*2010*
Sonoma County	457,300	478,440	493,285
City of Santa Rosa	147,100	156,268	163.436
City of Rohnert Park	42,300	42,445	43,398
City of Windsor	22,600	25,475	26,955

(Source: Sonoma County Economic Development Board)

Projected Population

	2015	*2020*	*2030*
Sonoma County	503,138	528,403	606,346

(Sources: California Dept. of Finance; County of Sonoma)

Basis of Economy
- Sonoma County economy historically based on wine, dairy, fish, apples, vegetables, and livestock
- 2010 Industry groups with greatest percentage of employment in Sonoma County:
  - Retail trade 10.6%
  - Construction Government 10.6%
  - Services Healthcare 9.9%

(Source: Sonoma Cnty 2010-11Economic & Demographic Profile)

CLIMATE

Temperature

	Avg. High	*Avg. Low*
Hottest month (August)	83.2°F	57.4°F
Coldest month (January)	51.1°F	37.1°F

(Source: Western Regional Climate Center)

Precipitation and Fog
- Average annual rainfall in Santa Rosa: 30.3 inches; mostly from November through March
- Marine layer fog occurs in early morning and late afternoon during certain times of the year

Winds
- Prevailing winds from the south and southeast.

Tourism

According to the 2011 Sonoma County Indicators report prepared by Sonoma County Economic Development Board (SCEDB), revenue and employment in the tourism sector have declined over the last three years. However, in 2009 Sonoma County moved from fourth to third place in visitor spending among comparable counties; visitors spent over $1.2 Billion dollars. In 2009, destination spending generated more than 16,640 jobs in the County. Tourism comprises nearly 6.5% of the total employment in Sonoma County. That is, for every $74,500 in visitor sales, the tourism industry produced an average of one job.

Previous Airport Plans and Studies

A series of previously conducted Airport-related plans and studies set many of the conditions which influenced formulation of the current Airport Master Plan. Key among these is the following two studies:

Charles M. Schulz-Sonoma County Airport: Airport Layout Plan Narrative Report and Technical Study (Mead & Hunt, Inc. – 2004) – This study investigated the question of what would be the appropriate runway length required to sustain scheduled air carrier service at the Airport and what steps would be required to implement the project.

New Passenger Terminal Study: Sonoma County Airport (Gerson/Overstreet Architects – August 2002) – This study evaluated the existing passenger terminal site and prepared alternative development concepts for future terminal development.

Other relevant studies include:

Sonoma County General Plan 2020 Air Transportation Element (Sonoma County PRMD – 2005) – The stated purpose of the Airport Transportation Element is "to establish policies that will guide future growth and development of aviation activity and Airport facilities in the county though the year 2020 in a manner consistent with the goals and policies established in other elements of the General Plan." The policies in the Air Transportation Element were considered in the development of this Airport Master Plan.

Air Service Market Opportunity with Sonoma County Airport 2005 – The study was prepared for American West Airlines. It examined the market including a catchment area of over one million people. The study assessed prices and fares of San Francisco and Oakland International Airports, as well as the routes of existing and potential air travelers. The study concluded: "From a population standpoint, Sonoma County Airport may be the most underserved Airport in the United States. Without air service, residents opt to fly from other area Airports even though the drive is long and the highways are congested." This study was updated in 2009 and 2011. The general conclusions of the study remained unchanged.

Air Service Study for Sonoma County Airport 2002 (Tri-Star Marketing Company – 2002) – The stated purpose of this study was to determine the required elements for evaluating the feasibility for commercial air service to return to Sonoma County Airport.

Comprehensive Airport Land Use Plan (Coffman Associates, Inc. – 2001) – This plan updated the 1981 Airport Land Use Policy Plan. It provides the guidelines for the Sonoma County Airport Land Use Commission's (ALUC) determinations regarding the aviation compatibility of land uses proposed for development in the vicinity of any of the airports in the County. The plan also provides guidance to protect the public from the adverse effects of aircraft noise, to ensure that people and facilities are not concentrated in areas susceptible to aircraft accidents, and to ensure that no structures or activities encroach upon or adversely affect the uses of navigable airspace.

1998 Sonoma County Airport Master Plan – 1998 – This document was prepared by the Sonoma County Permit and Resource Management Department and is the currently adopted Airport Master Plan (December 15, 1998).

Sonoma County General Plan Air Transportation Element (Walter E. Gillfillan and Associates – 1988) – The stated purpose of the Airport Transportation Element is "to establish policies that will guide future growth and development of aviation activity and Airport facilities in the county though the year 2005 in a manner consistent with the goals and policies established in other elements of the General Plan." The policies adopted in the Air Transportation Element provided guidance for the present Airport Master Plan.

Approach Protection Study (Hodges & Shutt – 1983) – The impetus for this study was a long perceived need to provide permanent, positive protection against the development of incompatible land uses in the runway approaches at the Sonoma County Airport. The study contained recommendations regarding acquisition of fee title and easements on property near the Airport and also addressed zoning and Airport Land Use Commission policies. Although the study itself was never adopted, many of its components are reflected in the adopted Sonoma County General Plan Air Transportation Element. An update of this study is contained in Chapter 7 of the present Airport Master Plan report.

Facility Plan for the Sonoma County Airport (Hodges & Shutt – 1982) – The Facility Plan was an abbreviated update of the 1975 Airport Master Plan. It addressed on-airport facility issues and was the basis for revision of the Airport Layout Plan approved by the Board of Supervisors in 1984. Most of the Airport development that occurred during the remainder of the 1980s was based upon this plan.

Airport Land Use Policy Plan (Hodges & Shutt – 1981) – Adopted by the Sonoma County Airport Land Use Commission, this plan provides the guidelines for the Commission's determinations regarding the aviation compatibility of land uses proposed for development in the vicinity of any of the airports in the County.

Sonoma County Airport Master Plan (Arnold Thompson Associates – 1975) – Even though many of the existing Airport buildings were constructed prior to this plan, the plan's overall designation of land uses within the eastside building area is essentially the pattern found today. This plan also envisioned the need for a general aviation parallel runway.

Air Trade Study (Leigh Fisher & Associates – 1959) – This study was instrumental in the Sonoma County decision to develop the Sonoma County Airport rather than the former Navy Airfield west of Santa Rosa, which had recently been deemed excess by the federal government.

2

Aviation Activity Forecasts

INTRODUCTION

The Charles M. Schulz–Sonoma County Airport (Airport) is one of six public-use airports in Sonoma County. It is the only commercial service airport[1] 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 one million people[2] and includes Sonoma, Lake, and Mendocino counties, and parts of Marin and Napa counties.

Airport Role

The Airport, as the region's principal airport, serves many roles, including providing facilities for scheduled regional and mainline airline services. 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.

The Airport also serves a growing population of general aviation (GA) activities including corporate and business flying. For this reason, the Federal Aviation Administration's (FAA) National Plan of Integrated Airport Systems (NPIAS) currently classifies the Airport as a Commercial Service Non-Primary Airport. A strong potential exists for additional scheduled airline service, particularly in the form of new, quiet technology jet aircraft with up to 150 passenger seats.[3]

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

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1 A commercial service airport is a publicly-owned airport providing scheduled passenger service and having at least 2,500 passenger boardings

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.

3 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.

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 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)[4] is based at the Airport. The California Department of Forestry and Fire protection (Cal Fire) also maintains a fire attack base at the Airport for the suppression of wild land fires.

The Future

The catastrophic events of September 11, 2001, had a serious financial and operational 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. This caused 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 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 mainline and regional airlines and a wide range of general aviation activities. Airport activities will continue to include scheduled passenger and regional 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.

[4] 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 project. These are airline industry trends and general aviation industry trends.

Airline Industry Trends

The U.S. commercial aviation industry consists of sixteen mainline air carriers that operate large passenger jets (more than 100 seats) and more than 30 regional/regional airlines that operate smaller piston, turboprop, and regional jet aircraft (of up to 100 seats).[5] Some of the regional/commuter airlines also fly aircraft with more than 100 passenger seats.[6] 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 2010 for many of the mainline carriers. The FAA estimates that there were 7,096 aircraft in the U.S. commercial airline fleet (including regional airlines) in 2010, a decrease of 126 aircraft from 2009.[7] Included in this number are 3,713 mainline airline passenger aircraft (over 100 seats), 2,577 regional airline aircraft (jets, turboprops and piston-engine), and 806 mainline air cargo aircraft. [8]

Over the past decade the commercial airline industry has suffered several major shocks that have led to reduced demand for air travel. These shocks include the terror attacks of September 11, skyrocketing prices for fuel, and a global recession. To manage through this period of extreme volatility, airlines fine-tuned their business models with the aim of minimizing financial losses. To lower operating costs, carriers eliminated unprofitable routes and grounded older, less fuel efficient aircraft. To increase operating revenues, carriers charged separately for services historically bundled in the price of ticket and initiated new services which customers were willing to purchase. The capacity discipline exhibited by the carriers and their focus on additional revenue streams bolstered the industry to profitability. Going into the next decade, there is cautious optimism that the industry has been transformed from one of a boom-to-bust cycle to one of sustainable profits.

As the economy recovers from the most serious economic downturn since the Great Depression, aviation will continue to grow over the long term. For the year 2010, mainline carrier passenger growth was up 0.1 percent while passenger growth for the regional carriers was up 5.0 percent. Passenger demand shows moderate to strong growth in 2011 with system Revenue Passenger Miles (RPMs) forecast to grow 4.9 percent (up 5.0 percent for mainline carriers and up 4.3 percent for regional carriers) as passenger enplanements increase 3.5 percent (up 3.5 percent for mainline carriers and up 3.4 percent for regional carriers). Growth is projected to slow slightly in 2012 with system RPMs and passengers increasing 4.3 and 3.4 percent, respectively, on a

[5] U.S. Department of Transportation, Federal Aviation Administration, "*FAA Aerospace Forecasts, Fiscal Years 2011-2031 (March 2011)*.

[6] 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.

[7] U.S. Department of Transportation, op. cit.

[8] Ibid.

capacity increase of 3.8 percent. For the overall forecast period, system capacity is projected to increase an average of 3.6 percent a year. Supported by a growing U.S. economy and falling real yields, system RPMs are projected to increase 3.8 percent a year, with regional carriers (4.2 percent a year) growing faster than mainline carriers (3.7 percent a year). System passengers are projected to increase an average of 2.8 percent a year, with regional carriers growing at the same rate as mainline carriers. By 2031, U.S. commercial airlines are projected to transport 1.3 billion enplaned passengers a total of 1.7 trillion passenger miles.

Outlook

The FAA expects commercial aviation activity to increase between now and 2031, with commercial air passenger totals exceeding 1 billion by 2021.[9] 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 airlines, as well as some recovery of passenger demand among the established legacy carriers. What this means for the 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 mainline 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) airline 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. The downturn in the economy has dampened the near-term prospects for the general aviation industry, but the long-term outlook remains favorable. 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 2011-2031 (March 2011):*

- 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, albeit slowed, through 2011. The growth of the active general aviation aircraft fleet is forecast to increase by an annual average rate of 0.9 percent through 2031, growing from an estimated 224,172 aircraft in 2010 to 270,920 in

[9] Ibid.

2031.[10] However, the more expensive, turbine-powered fleet (including helicopters) is projected to grow at an average rate of 3.0 percent annually through 2031, with the turbine jet fleet increasing at 4.2 percent a year. 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 0.20 percent overall per year through 2031. Multi-engine piston aircraft are projected to grow at only 0.09 percent annually. Single-engine piston helicopter hours flown, projected at 2.9 percent annually, will offset the slower projected growth rates for single-engine piston propeller-driven aircraft and multi-engine piston propeller-driven aircraft.

After growing rapidly for most of the past decade, the demand for business jet aircraft has slowed over the past few years. While new product offerings, the introduction of very light jets, and increasing foreign demand have helped to drive this growth in the earlier part of the decade, the past few years have seen the hard impact of the recession on the business jet market. Despite the impact of the recession felt in the business jet market, the forecast calls for robust growth in the long term outlook, driven by higher corporate profits and continued concerns about safety/security and flight delays, increasing the attractiveness of business aviation relative to commercial air travel and predicts business usage of general aviation aircraft will expand at a faster pace than that for personal/recreational use.

Eclipse 500 **Cessna Mustang**

A **Very Light Jet (VLJ**) is an extremely small jet aircraft approved for single-pilot operation. With a maximum take-off weight of under 10,000 lbs., they are lighter than business jets and seat between three and five passengers plus one crew member. A number of designs are currently in development and will feature advanced avionics with glass cockpit technology. VLJs are intended to have lower operating costs than conventional jets, and will be able to operate from runways as short as 3,000 feet. The two jets shown above were certified in 2006. These new jets will be used by pilot/owners, air taxi charter, and corporate operations.

Contributing to the advancement of the general aviation industry is 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

[10] 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.

(NCAM) SATSLabs. The purpose of SATS is to enable expanded use of smaller airports and smaller aircraft for public transportation. It is designed to:

- 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.

Starting in 2005, a new class of aircraft was created by the FAA and entered the GA fleet mix: "light-sport" aircraft (LSA). These aircraft evolved from and emulate the ultralight aircraft not currently included in the FAA's aircraft registry counts.[11] An anticipated 450 newly manufactured light-sport aircraft are projected to enter the active fleet on an annual basis until 2013 and 300 per year thereafter. The Aerospace Forecast assumed registration of 13,870 of these aircraft by 2031.

Total general aviation hours flown is projected to increase by 2.2 percent annually through 2031. Growth in the active general aviation pilot population is also anticipated with an annual increase of 0.4 percent over the 20-year forecast period, going from 485,660 pilots in 2010 to 527,660 in 2031.

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 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. This System Plan is old. It obviously could not anticipate

[11] 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.

the effects of 9-11 and the current recession on aviation. It is presented here because it is the most recent state document.

The State CASP forecasts a high and a low annual average growth rate for the numbers of based aircraft at the 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 forecasts for the 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,[12] the estimated population of the Airport's service area is over one 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. This service 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 sales[13]
- 10.7 percent of the buying income[14]
- 10.2 percent of households with annual incomes of over $50,000[15]

An earlier survey to determine the air transportation needs of Sonoma and Marin Counties was also carried out by Tri-Star Marketing.[16] 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 the 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 the Airport. **Table 2-1** sets forth the historical numbers of airline passengers served at the Airport from 1985 through 2010.

From Table 2-1 and **Figure 2A** 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 passengers[17] in 1985 to 20,770 passengers in 1986. From 1986-1987 the Airport

[12] Op. cit., June 2005.
[13] California State Board of Equalization, "*Taxable Sales in California-2004*" 3rd quarter data.
[14] Tri-Star Marketing Company, "*Air Service Study for Sonoma County Airport 2002."*
[15] Ibid.
[16] Tri-Star Marketing Company, "*Airline Service Study for Sonoma County Airport," (1998).*
[17] Total annual passengers are 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.

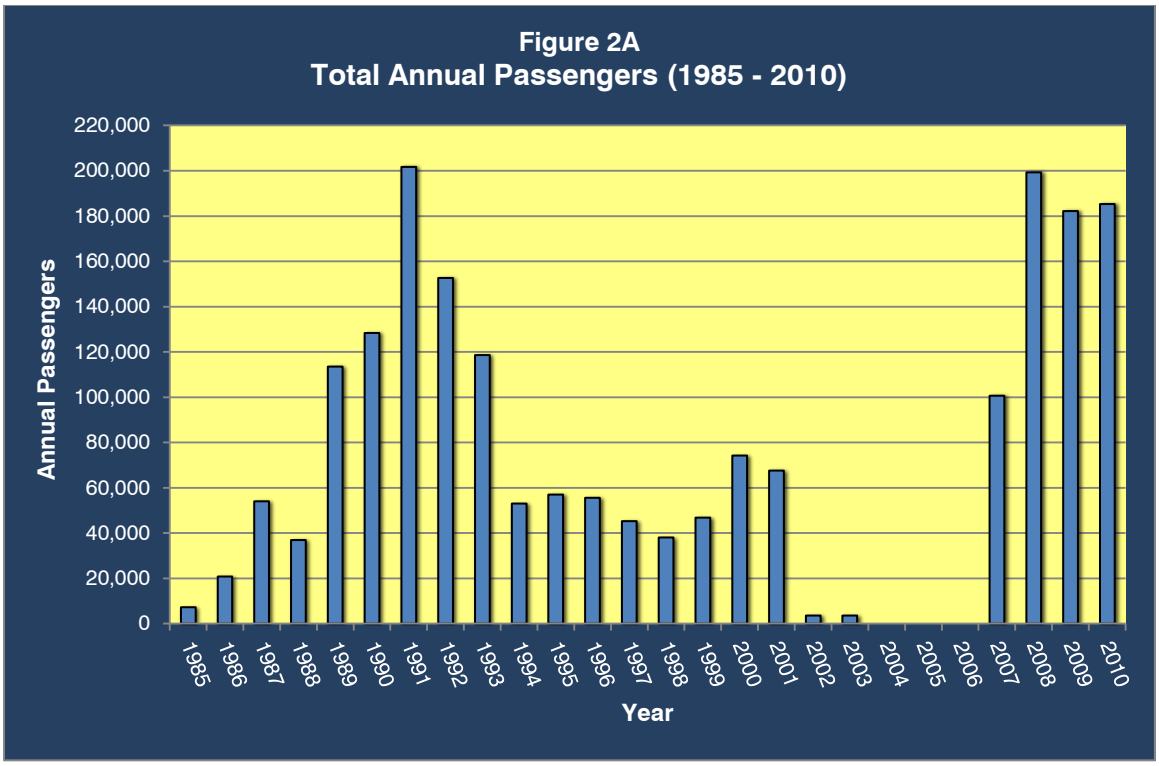
experienced a 160 percent increase in passengers, growing from 20,770 total passengers in 1986 to 54,016 passengers in 1987. From 1987 to 1988 total annual passengers declined by 31.6 percent, with only 36,966 passengers in 1988. In 1989 passenger levels began an upward trend, growing to 113,480 (a 207 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).

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 total passengers equaling 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. In 2002 and 2003 only minimal passenger activity was experienced, estimated by the FAA to be less than 3,600 passengers annually.[18] Scheduled passenger service was resumed in 2007 using new Bombardier Q-400 turbprops flown by Horizon Air. The first (partial) year of renewed airline service saw over 100,000 passengers. The next year almost 205,000 passengers were served; this was the historical peak. Unfortunately the global recession intervened and passenger volumes dropped 8.6 percent in 2009. Improving economic conditions supported an increase of 1.7 percent in 2010.

Table 2-1
Total Annual Passengers
(1985-2010)
Sonoma County Airport

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	0	0.0%
2005	0	0.0%
2006	0	0.0%
2007	109,080	—
2008	204,734	87.7%
2009	186,014	-9.1%
2010	188,755	1.5%

[18] Federal Aviation Administration, APO TAF (Terminal Area Forecast) Enplanement data. 2003.



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 Airport is no exception.

Airline Fleet Mix

The current mix of aircraft operating at the 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]).[19] This wide range of aircraft sizes and types is indicative of the requirements of the aviation community currently utilizing the Airport and is not expected to change significantly in the future, even with the reintroduction of scheduled airline service.

BBJ2

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

From the preceding passenger activity information it seems apparent that annual passenger levels at the 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 the Airport has included both regional turbofan jets and turboprop regional equipment. For example, the British Aerospace (BAe) 146 is a quiet technology 4-engine turbofan passenger jet that can carry between 82 and 128 passengers. The BAe-146 was used by United Airlines in its service to Los Angeles International Airport (LAX) from the Airport 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.[20] Future airline aircraft likely to see service at the Airport include regional jet (RJ) aircraft such as the Embraer (EMB) 170 or 190,[21] and/or the Bombardier CRJ-200 or CRJ-900.[22] In addition to regional jet aircraft, scheduled airline service could also include operations by Airbus A318/319[23] or B-737[24] aircraft.

EMB 170

CRJ 200

The Embraer (EMB) 120 Brasilia is representative of the type of twin-engine turboprop airliner used by United Express at the Airport in its previous service. The EMB–120 can carry up to 30 passengers. Currently airline operations at the Airport are the larger, 76-passenger Bombardier Aerospace DeHavilland DHC-8 Q400.[25] 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, 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 airport 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.

[20] 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.

[21] 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-pasengers.

[22] The CRJ-200 is a 50-seat RJ. The CRJ-900 is a 75- 90-passenger derivative of the CRJ-700.

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

[24] 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.

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

MAINLINE / REGIONAL AIRLINE OPERATIONS FORECASTS

The *Sonoma County General Plan* 2020 contains an Air Transportation Element (ATE)[26] adopted in 2008 that continued policies established in the late 1980's designed to guide future growth and development of aviation activities and facilities in the County through the year 2020 in a manner consistent with the goals and policies established in other elements of the General Plan. The 2008 ATE contains assumptions first developed in the mid-1980's are now obsolete.

Bombardier Q400

Background to Forecasts

The Airport has had a long history of regularly scheduled airline service. However, there was a recent six-year break in airline service and a national recession started shortly after the resumption in service. Because of these circumstances none of the more traditional approaches[27]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 mainline[28]and regional airline[29] activities at the Airport. As a result, the existing level of service was 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."[30] Each of these scenarios were further broken down into two additional operational subsets reflecting a dominant "mainline airline" fleet mix (up to 14 average daily departures [ADD] by mainline airlines and 7 by regional airlines), and a "regional airline" dominant fleet mix (up to 14 ADD by regional airlines and 7 by mainline airlines) based on limitations published in the Sonoma County General Plan Air Transportation Element (ATE)[31]. The resultant forecasts are compared with the 2008 ATE limits at the end of this report.

[26] County of Sonoma, "Air Transportation Element," August 18, 1992.
[27] Methodologies such as Time-Series Analysis (R2), 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.
[28] Mainline Airline is defined as one using jet aircraft with approximately 100 to 150 seats.
[29] Regional Airline is defined as one using turboprop or small jets with less than 99 seats.
[30] 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.
[31] Note that these forecasts were based upon the version of the ATE that existed in 2007. Currently proposed changes to the ATE would reduce the maximum number of daily Mainline Airline departures to seven.

Mainline and Regional 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:

- Regional airline service dominant
- Mainline airline service dominant

The regional airline dominant scenario assumes that scheduled regional 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 mainline airlines would use no more than seven ADD slots (for a total of no more than 21 ADD).

The mainline 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. Regional airlines would use no more than seven of the twenty-one slots (for a total of 21 ADD).

2010 Baseline Conditions

The baseline conditions for all air service forecast scenarios are those that existed in 2010. These activity levels are presented in Table 2-2.

From the adjacent table it can be seen that total average daily departures (ADD) for the 2010 baseline condition is 6.0 ADD.[32] 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.

Table 2-2
2010 Baseline Conditions

		Actual Activity Levels
SCHEDULED AIRLINE(S)	Average Daily Departures (ADD)	0
	Load Factor (101 seats X 75.6%)	0
	Enplaned Passengers Per Day	0
	Total Daily Mainline Passengers	0
	Total Annual Mainline Passengers	0
REGIONAL AIRLINE(S)	Average Daily Departures (ADD)	6.0
	Load Factor (74 seats X 57.2%)	42.3
	Enplaned Passengers Per Day	253.9
	Total Daily Regional Passengers	507.7
	Total Annual Regional Passengers	185,318
TOTALS	Average Daily Departures	6.0
	Annual Departures	2,190
	Annual Operations	4,380
	Daily Enplaned Passengers	507.7
	Annual Enplaned Passengers	92,659
	Total Annual Passengers	**185,318**

Scheduled Mainline Airline Dominant Forecasts and Assumptions

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

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

Moderate Growth Scenario

Table 2-3 sets forth the assumptions derived for the moderate growth[33] scenario of the scheduled mainline dominant forecast. From this table it can be seen that the total average daily departures (ADD) through 2020 (9.38) are well within the proposed ATE 2020 limit of 21 ADD, as are the total annual operations (6,846 versus the ATE's Objective AT-5.1 of 15,200 annual airline service operations by 2020). Similarly, 2020 regional airline operations (2,920) are well under the ATE limit of 5,200, and 2020 mainline operations (3,925) are also well under the ATE's 10,000 annual operations limit. Similarly, the Year 2020 mainline passenger level of 301,696 would not exceed the ATE's limit of 523,000 annual passengers, but the 2020 regional passengers (157,563) 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 regional airline aircraft anticipated to serve the Airport in 2020 are considerably larger than those assumed in the 2008 ATE.[34]

Table 2-3
Scheduled Mainline Dominant (Moderate Growth Scenario)

		2015	2020	2025	2030
MAINLINE AIRLINE(S)	Average Daily Departures (ADD)	4.60	5.38	6.17	7.22
	Annual Mainline Departures	1,679.00	1,962.61	2,252.05	2,635.30
	Annual Mainline Operations	3,358.00	3,925.21	4,504.10	5,270.60
	Boarding Load Factor (Based on 101 avg. seats X FAA LF growth rates)	76.36	76.86	77.27	77.57
	Enplaned Mainline Passengers Per Day	351.24	413.28	476.73	560.04
	Annual Enplaned Mainline Passengers	128,201.73	150,847.78	174,004.64	204,414.95
	Total Daily Mainline Passengers	702.48	826.56	953.45	1,120.08
	Total Annual Mainline Passengers	256,403.45	301,695.57	348,009.29	408,829.90
REGIONAL AIRLINE(S)	Average Daily Departures (ADD)	3.80	4.00	4.40	4.65
	Annual Regional Departures	1,387.00	1,490.00	1,606.00	1,697.25
	Annual Regional Operations	2,774.00	2,920.00	3,212.00	3,394.50
	Boarding Load Factor (Based on 76 avg. seats X FAA LF growth rates)	52.44	53.96	55.02	56.16
	Enplaned Regional Passengers Per Day	199.27	215.84	242.11	261.16
	Annual Enplaned Regional Passengers	72,733.55	78,781.60	88,368.54	95,324.35
	Total Daily Regional Passengers	398.54	431.68	484.21	522.33
	Total Annual Regional Passengers	145,468.56	157,563.2	176,737.09	190,648.70
TOTALS	Average Daily Departures	8.40	9.38	10.57	11.87
	Annual Departures	3,066	3,423	3,858	4,333
	Annual Operations	6,132	6,846	7,716	8,665
	Daily Enplaned Passengers	551	629	719	821
	Annual Enplaned Passengers	200,936	229,629	262,373	299,739
	Total Annual Passengers	401,872	459,259	524,746	599,479

[33] 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"

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

Low Growth Scenario

Table 2-4 sets forth the assumptions derived for the Low Growth[35] scenario of the scheduled mainline dominant forecast.

Table 2-4
Scheduled Mainline Dominant (Low Growth Scenario)

		2015	2020	2025	2030
MAINLINE AIRLINE(S)	Average Daily Departures (ADD)	4.60	5.24	5.75	6.36
	Annual Mainline Departures	1,679.00	1,912.60	2,098.75	2,321.40
	Annual Mainline Operations	3,358.00	3,825.20	4,197.50	4,642.80
	Boarding Load Factor (Based on 101 avg. seats X FAA LF growth rates)	76.36	76.86	77.27	77.57
	Enplaned Mainline Passengers Per Day	351.24	402.75	444.27	493.33
	Annual Enplaned Mainline Passengers	128,201.73	147,004.35	162,159.92	180,066.36
	Total Daily Mainline Passengers	702.48	805.50	888.55	986.66
	Total Annual Mainline Passengers	256,403.45	294,008.70	324,319.84	360,132.71
REGIONAL AIRLINE)S)	Average Daily Departures (ADD)	3.80	4.00	4.40	4.65
	Annual Regional Departures	1,387.00	1,460.00	1,606.00	1,697.25
	Annual Regional Operations	2,774.00	2,920.00	3,212.00	3,394.50
	Boarding Load Factor (Based on 76 avg. seats X FAA LF growth rates)	52.44	53.96	55.02	56.16
	Enplaned Regional Passengers Per Day	199.27	215.84	242.11	261.16
	Annual Enplaned Regional Passengers	2,733.55	78, 781.60	88,368.54	95,324.35
	Total Daily Regional Passengers	398.54	431.68	484.21	522.33
	Total Annual Regional Passengers	145,468.56	157,563.20	176,737.09	190,648.70
TOTALS	Average Daily Departures	8.40	9.24	10.15	11.01
	Annual Departures	3,066	3,373	3,705	4,019
	Annual Operations	6,132	6,746	7,410	8,037
	Daily Enplaned Passengers	551	619	686	754
	Annual Enplaned Passengers	200.93	225,786	250,528	275,391
	Total Annual Passengers	401,872	451,572	501,057	550,781

From the preceding table it can be seen that the total average daily departures (ADD) through 2020 (9.24) are well within the proposed ATE 2020 limit of 21 ADD, as are the total annual operations (6,746 versus the 2020 ATE's 15,200). Similarly, 2020 regional airline operations (2,920) are well under the ATE limit of 5,200, and 2020 mainline operations (3,825) are also well under the ATE's 10,000 annual operations limit. Similarly, the 2020 mainline passenger level of 294,008 would not exceed the ATE's limit of 523,000 annual passengers, but the 2020 regional passengers 157,563) 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 regional airline aircraft anticipated to serve the Airport in 2020 are considerably larger than those assumed in the ATE.[36]

[35] The low growth scenario is based on FAA TAF load factors and projected TAF growth rates through 2020, and extrapolated for 2025 and 2030. The ATE's assumptions in this regard are not consistent with current airline industry trends.

Regional Airline Dominant Forecasts and Assumptions

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

Moderate Growth Scenario

Table 2-5 sets forth the assumptions derived for the Moderate Growth[37] scenario of the regional airline dominant forecast. The following table sets forth the assumptions used in this scenario:

Table 2-5
Regional Airline Dominant (Moderate Growth Scenario)

		2015	2020	2025	2030
MAINLINE AIRLINES	Average Daily Departures (ADD)	3.3	3.55	4.10	4.65
	Annual Mainline Departures	1,204.50	1,295.75	1,496.50	1,697.25
	Annual Mainline Operations	2,409.00	2,591.50	2,993.00	3,394.50
	Boarding Load Factor (Based on 101 avg. seats X FAA LF growth rates)	76.36	76.86	77.27	77.57
	Enplaned Mainline Passengers Per Day	251.97	272.86	316.79	360.69
	Annual Enplaned Mainline Passengers	91,970.80	99,592.64	115,627.07	131,652.29
	Total Daily Mainline Passengers	503.94	545.71	602.67	659.33
	Total Annual Mainline Passengers	183,941.60	199,185.28	231,254.15	263,304.58
REGIONAL AIRLINE(S)	Average Daily Departures (ADD)	5.7	6.60	7.30	8.20
	Annual Regional Departures	2080.5	2,409.00	2,664.50	2,993.00
	Annual Regional Operations	4161.00	4,818.00	5,329.00	5,986.00
	Boarding Load Factor (Based on 76 avg. seats X FAA LF growth rates)	52.44	53.96	55.02	56.16
	Enplaned Regional Passengers Per Day	298.91	356.14	401.68	460.54
	Annual Enplaned Regional Passengers	109,101.42	129,989.64	146,611.45	168,098.85
	Total Daily Regional Passengers	597.82	712.27	803.35	921.09
	Total Annual Regional Passengers	218,202.84	259,979.28	293,222.90	336,197.7
TOTALS	Average Daily Departures	9.00	10.15	11.40	12.85
	Annual Departures	3,285	3,705	4,161	4,690
	Annual Operations	6,570	7,410	8,322	9,381
	Daily Enplaned Passengers	551.00	629	718	821
	Annual Enplaned Passengers	201,072	229,582	262,239	299,751
	Total Annual Passengers	402,144	459,165	524,477	599,502

The preceding table shows that the total average daily departures (ADD) for 2020 (10.15) are well within the proposed ATE limit of 21 ADD, as are the total annual operations (7,410 versus the ATE's limit of 15,200). Similarly, 2020 regional airline operations (4,818) are within the 2020 ATE limit of 5,200 operations, while 2020 mainline operations (2,591) are about 30.26

[37] 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".

percent of the ATE's 10,000 annual operations limit. The 2020 mainline passenger level of 199,185 is well within the ATE limit of 523,000 passengers, while the 2020 regional passengers 259,979, would clearly exceed the ATE's limits of 50,000 passengers.[38]

Low Growth Scenario

Table 2-6 sets forth the assumptions derived for the Low Growth[39] scenario of the regional airline dominant forecast:

Table 2-6
Regional Airline Dominant (Low Growth Scenario)

		2015	2020	2025	2030
MAINLINE AIRLINES	Average Daily Departures (ADD)	3.3	3.45	3.90	4.25
	Annual Mainline Departures	1,204.50	1,259.25	1,423.50	1,551.25
	Annual Mainline Operations	2,409.00	2,518.50	2,847.00	3,102.50
	Boarding Load Factor (Based on 101 avg. seats X FAA LF growth rates)	76.36	76.86	77.27	77.57
	Enplaned Mainline Passengers Per Day	251.97	265.17	301.33	329.66
	Annual Enplaned Mainline Passengers	91,970.80	96,787.21	109,986.73	120,327.36
	Total Daily Mainline Passengers	503.94	530.34	602.67	659.33
	Total Annual Mainline Passengers	183,941.60	193,574.43	219,973.46	240,654.72
REGIONAL AIRLINE(S)	Average Daily Departures (ADD)	5.7	6.55	7.00	7.55
	Annual Regional Departures	2080.50	2,390.75	2,555.00	2,755.75
	Annual Regional Operations	4,161.00	4,781.50	5,110.00	5,511.50
	Boarding Load Factor (Based on 76 avg. seats X FAA LF growth rates)	52.44	53.96	55.02	56.16
	Enplaned Regional Passengers Per Day	298.91	353.43	385.17	424.04
	Annual Enplaned Regional Passengers	109,101.42	129,004.87	140,586.32	154,773.94
	Total Daily Regional Passengers	597.82	706.88	770.34	848.08
	Total Annual Regional Passengers	218,202.84	258,009.74	281,172.64	309,547.89
TOTALS	Average Daily Departures	9.00	10.00	10.90	11.80
	Annual Departures	3,285	3,650	3,979	4,307
	Annual Operations	6,570	7,300	7,957	8,614
	Daily Enplaned Passengers	551.00	619	687	754
	Annual Enplaned Passengers	201,072	225,792	250,573	275,101
	Total Annual Passengers	402,144	451,584	501,146	550,203

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

[39] 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"

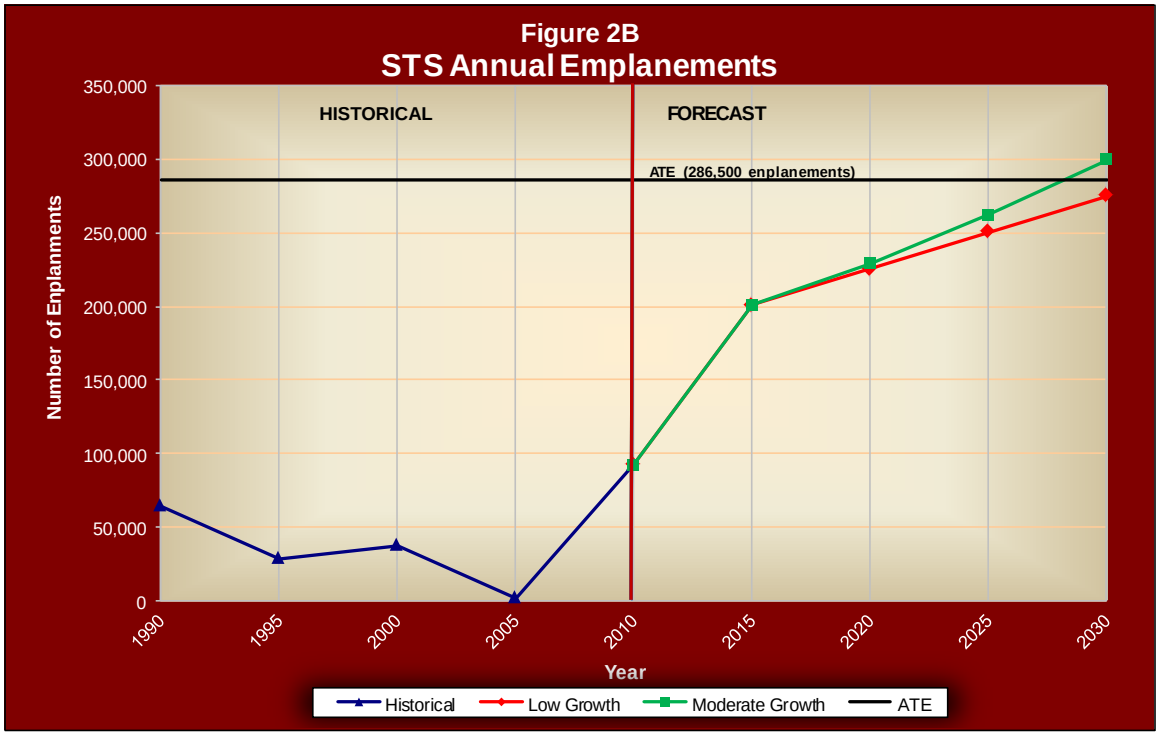
The preceding table shows that the total average daily departures (ADD) for 2020 (10.00) are well within the proposed ATE limit of 21 ADD, as are the total annual operations (7,300 versus the draft ATE's limit of 15,200). 2020 regional airline operations for 2020 (4,782) are slightly under the 2020 ATE limit of 5,200 operations, while 2020 mainline operations (2,519) are about 28.2 percent of the ATE's 10,000 annual operations limit. The 2020 mainline passenger level of 193,574 is well within the ATE limit of 523,000 passengers, while the 2020 regional passengers (258,010) would clearly exceed the ATE's limits of 50,000 passengers.[40] **Table 2-7** presents a summary of the above enplanements forecasts.

Table 2-7
Enplanement Forecasts Summary

Scenario	2010	2015	2020	2025	2030
Moderate Growth: Mainline Dominant	92,659	200,936	229,629	262,373	299,739
Moderate Growth: Regional Dominant	92,659	201,072	229,582	262,239	299,751
Low Growth: Mainline Dominant	92,659	200,936	225,786	250,528	275,391
Low Growth: Regional Dominant	92,659	201,072	225,792	250,573	275,101

Figure 2B is a graphical representation of the historical enplanements and forecast for Low Growth and Moderate Growth enplanements projections for the Airport.[41] 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 (or 573,000 annual passengers). The Moderate Growth scenario could exceed 286,500 annual enplanements around 2028 and the Low Growth scenario would not exceed this level during the 20-year forecast period.

[40] The ATE's assumptions in this regard are not consistent with current airline industry trends.
[41] Only the moderate growth and low growth scenarios are depicted because any differences between the airline dominant and regional airline dominant enplanement figures within these two scenarios are minor.



PREFERRED MAINLINE AND REGIONAL AIRLINE FORECASTS

This chapter has presented the methodologies and assumptions used to forecast a range of potential mainline and regional airline activities at the 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 2008 adopted ATE had forecast certain activity levels for 2005 based on assumptions developed in the mid-1980's. Since then, many things have changed in the airline industry. The 15-passenger regional airliners and 50-passenger regional jets which form the basis for the 2008 ATE projections will not likely ever see substantial service at the Airport. In the 2008 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 mainline trends. For these reasons the ATE assumptions need to be reevaluated.

Similarly, the definition of a regional airline set forth in the 2008 ATE is not consistent with current terminology. The 2008 ATE classifies any commercial aircraft used in scheduled intrastate service as a regional 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 regional airline. 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 requires consistency between the Sonoma County Airport Master Plan, including any assumptions or other information projected to the year 2020 that 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: Mainline Dominant Scenario is proposed as the Master Plan mainline and regional airline forecast (see **Table 2-8**).

Table 2-8
Proposed Master Plan Mainline and Regional Airline Forecast
Scheduled Mainline Dominant (Moderate Growth Scenario)

		2015	2020	2025	2030
MAINLINE AIRLINE(S)	Average Daily Departures (ADD)	4.60	5.38	6.17	7.22
	Annual Mainline Departures	1,679.00	1,962.61	2,252.05	2,635.30
	Annual Mainline Operations	3,358.00	3,925.21	4,504.10	5,270.60
	Boarding Load Factor (Based on 101 avg. seats X FAA LF growth rates)	76.36	76.86	77.27	77.57
	Enplaned Mainline Passengers Per Day	3 51.24	413.28	476.73	560.04
	Annual Enplaned Mainline Passengers	128,201.73	150,847.78	174,004.64	204,414.95
	Total Daily Mainline Passengers	702.48	826.56	953.45	1,120.08
	Total Annual Mainline Passengers	256,403.45	301,695.57	348,009.29	408,829.90
REGIONAL AIRLINE(S)	Average Daily Departures (ADD)	3.80	4.00	4.40	4.65
	Annual Regional Departures	1,387.00	1,460.00	1,606.00	1,697.25
	Annual Regional Operations	2,774.00	2,920.00	3,212.00	3,394.50
	Boarding Load Factor (Based on 76 avg. seats X FAA LF growth rates)	52.44	53.96	55.02	56.16
	Enplaned Regional Passengers Per Day	199.27	215.84	242.11	261.16
	Annual Enplaned Regional Passengers	72,733.55	78,781.60	88,368.54	95,324.35
	Total Daily Regional Passengers	398.54	431.68	484.21	522.33
	Total Annual Regional Passengers	145,468.56	157,563.2	176,737.09	190,648.70
TOTALS	Average Daily Departures	8.4	9.38	10.57	11.87
	Annual Departures	3,066	3,423	3,858	4,333
	Annual Operations	6,132	6,846	7,716	8,665
	Daily Enplaned Passengers	551	629	719	821
	Annual Enplaned Passengers	200,936	229,629	262,373	299,739
	Total Annual Passengers	401,872	459,259	524,746	599,479

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.[42]

Based Aircraft Demand Factors

Current and future demand for based aircraft parking space in hangars, tiedowns, and transient parking at the 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.

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*, 2011-2031 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 0.9percent over the FAA's 20-year forecast period (2011-2031), with the number of active aircraft increasing from 224,172 in 2010 to 270,920 in 2031. The more sophisticated and expensive turbine-powered fleet is projected to grow at an average of 3.0 percent a year over the 20-year forecast period, with the turbine jet fleet increasing at 4.2 percent a year. Another new category of aircraft was created in 2005: Light Sport Aircraft. These aircraft evolved from and emulate ultralight and small aircraft not currently included in the FAA's aircraft registry counts.[43]At the end of 2009, a total of 6,547 active aircraft were estimated to be in this category. An anticipated 450 newly manufactured light sport aircraft are projected to enter the active national GA fleet on an annual basis through 2013 with an assumed registration of some 13,870 of these aircraft by 2031. The number of general aviation hours flown is projected to increase by 2.2 percent annually through 2031. The projected increase is reflective of increased flying by business and corporate aircraft. Hours flown by turbine aircraft are forecast to increase 3.7

[42] 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.

[43] 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.

percent yearly through 2031, compared with 0.8 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 5.3 percent through 2031

Growth in the active general aviation pilot population (excluding air transport pilots) is projected to result in about 527,660 pilots in 2031, an increase of over 42,000 from 2009(an average annual increase of 0.4 percent over the FAA's 12-year forecast period). The FAA is also projecting nearly12,850 new sports pilots will be certified by 2031.

By all indices, the growth rate of general aviation will be generally positive in the long term, but, as noted above, certain sectors of general aviation will see decreases in the short term. For example, the number of piston-powered aircraft is projected to decrease from the 2009 total of 160,623 to 156,175 by 2018. Beyond 2018, active piston-powered aircraft are forecast to increase to 168,140 by 2031 – a 0.2 percent average annual increase over the forecast period. Single-engine and multi-engine piston-powered fixed wing aircraft are only anticipated to grow at 0.3 and 0.9 percent, respectively. In addition, the forecasts assume that new light sport aircraft could impact the replacement market for traditional piston aircraft.

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 Airport would have from 500 to 585 based aircraft by 2010.[44] There are currently 356 aircraft based at the Airport.

Demands Specific to Sonoma County Airport

Increases in the number of based aircraft at the 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. The Airport is the only airport in the County offering airline service and precision approach capabilities. The 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. The Airport also offers a comprehensive array of aeronautical services and facilities to the general aviation pilot community. These factors make the 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 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 mainline and/or regional airline service

[44] 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.

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 mainline and/or regional 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 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.

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 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 interest in hangars for larger personal and corporate aircraft 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 2011-2031* , and are supplemented by the FAA's 2010 *Terminal Area Forecast* (December2010).

Based Aircraft

As is common with many airports, reliable historical information on based general aviation aircraft is limited, and until recent, changes in data collection methods (even published information) was often derived from estimates. Based on information provided by the FAA, the number of aircraft based at the Airport reached a peak of 466 in the mid 1980s.[45]The trend since that time has been a slow decline in the total number of based aircraft. The apparent spike in based aircraft in 2007 to 415, indicated in FAA data sources, does not appear to have actually occurred. Airport records do not report the addition of 36 aircraft in that year. The decline in the number of based aircraft to around 350 is consistent with Airport records. Current Airport data indicates that of the 356 aircraft based at the Airport in 2010, 300were single-engine propeller (84.7%), 31were twin-engine piston (8.8%), 7 were turboprops (1.9%),11 (2.0%), were jets (3.1%), 5 were helicopters (1.4%), and 2 were motorized gliders (0.6%). **Figure 2C** depicts the historical trends in based aircraft at the Airport since 1985.

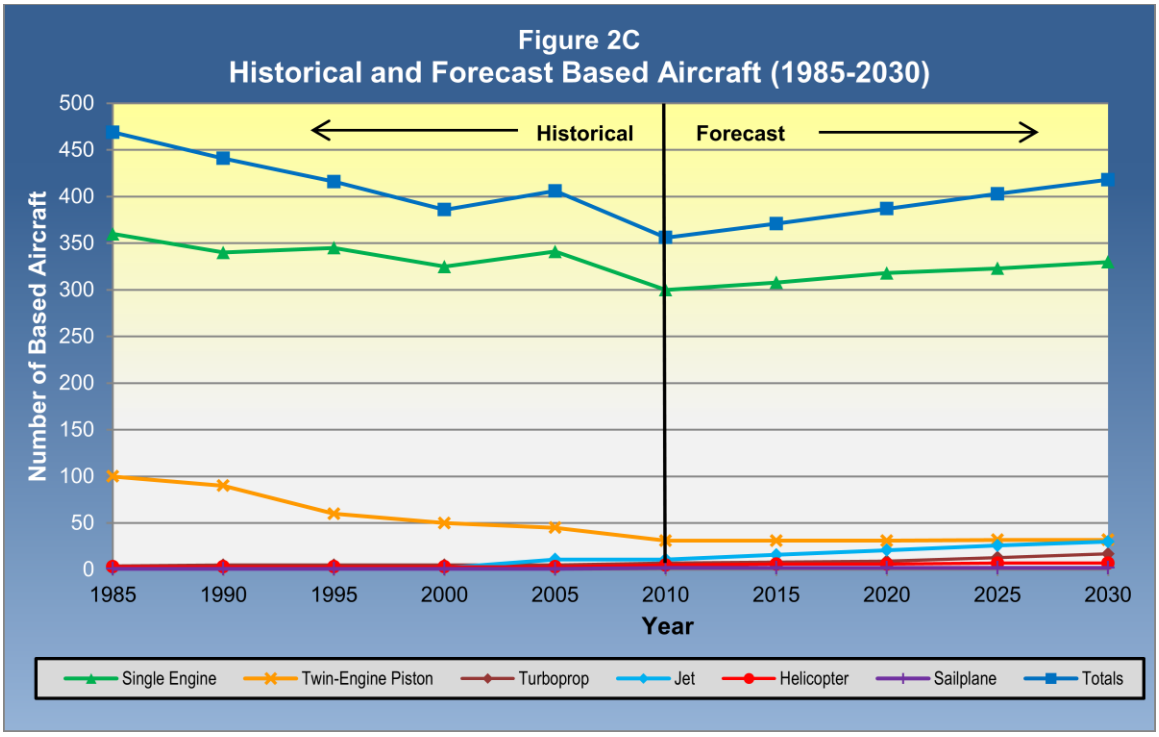
[45] Federal Aviation Administration, "APO Terminal Area Forecast Based Aircraft Data," (December 2006).

Based Aircraft Demand Conclusions

In recognition of the above-noted national, state, and local demand factors and FAA planning projections, the *Airport Master Plan* concludes that there is potential for an increase in the Airport's based aircraft population.[46] The plan projects that based aircraft at the Airport will increase by 62additional aircraft over the forecast period. Of these aircraft, some 30 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. Figure2C compares the forecast data with historical based aircraft.

Table 2-9
Based Aircraft Forecast (2005 – 2030)

Aircraft Classification	2010	2015	2020	2025	2030
Single-Engine	300	308	318	323	330
Twin-Engine Piston	31	31	31	32	32
Turboprop	7	8	9	13	17
Jet	11	16	21	26	30
Helicopter	5	6	6	7	7
Sailplane (motorized)	2	2	2	2	2
Totals	356	371	387	403	418



[46] 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 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 Airport are satisfactory for the Airport's current level of activity. However, the two primary fixed base operators at the Airport (Kaiser Air-Santa Rosa Jet Center 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 Airport, including those by non-certificated 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 and UPS are examples of integrated air cargo carriers. FedEx and UPS provide air cargo services at the 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 Airport by non-integrated air cargo airlines.

Cessna Caravan

The FedEx air cargo service at the Airport is provided by West Air, Inc. and UPS is served by Martinaire, PLP. The two carriers average a total of 67 landings per month, bringing in an average of almost 14,000 pounds of cargo per month. Outbound cargo averages over 98,000

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.

ATR 42

ATR 72

- **CALFIRE Operations**—Flight training and fire suppression operations conducted by the California Department of Forestry and Fire Suppression (CALFIRE) are largely seasonal, but nonetheless contribute to overall military and governmental operations at the 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 the 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.

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 2011-2031*, and are supplemented by the FAA's *2010Terminal Area Forecast* (December2010).

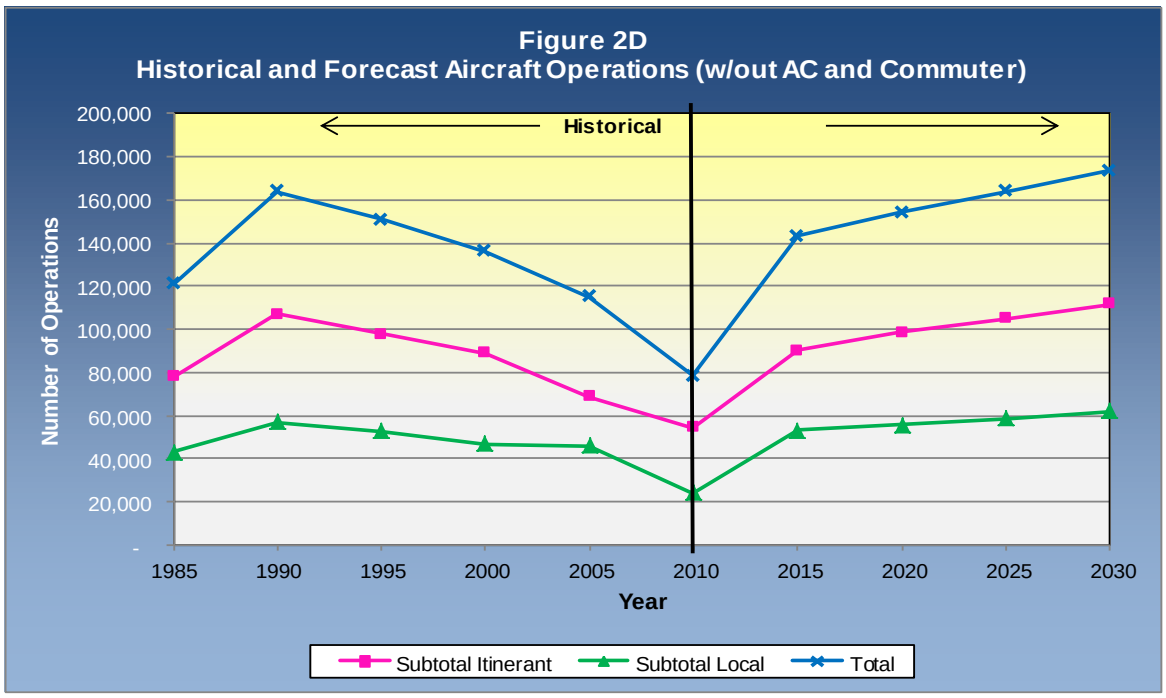
Annual Operations Demand Conclusions

Continued growth in annual aircraft operations at the 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 the Airport) 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 69.4 percent of operations being itinerant and 39.6 percent local. By 2030, it is projected that 64.4 percent of all general aviation and air taxi operations will be itinerant and 35.6 percent will be local.

Table 2-10 summarizes the Master Plan forecasts[47] of future annual general aviation and air taxi aircraft operations for the Airport. The Master Plan forecast projects that total annual aircraft operations will increase from the 2010 level of 78,497 to 173,785 in the year 2030. Figure 2D provides a comparison of historical and forecast aircraft operations (not including mainline or regional airline operations).

Table 2-10 (Final Revision)
Aircraft Operations Forecast (2005 – 2030)

Operations by Aircraft Class	2010	2015	2020	2025	2030
Itinerant					
Air Taxi	5,791	5,991	6,432	6,907	7,413
GA	45,243	77,686	84,906	89,991	95,380
Military/Government	267	380	390	400	410
Subtotal	51,301	84,057	91,728	97,298	103,203
Local					
GA	23,971	52,952	55,763	58,724	61,842
Military/Government	14	68	70	72	74
Subtotal	23,985	53,020	55,833	58,796	61,916
Totals	75,286	137,077	147,561	156,094	165,119



[47] 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 mainline and regional airline operations are conducted under instrument flight rules. With a precision instrument landing system on Runway 32 and nonprecision instrument approaches to Runway 14, the 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 7,621 by 2010.The FAA Aerospace Forecast for Fiscal Years 2011-2031 anticipates general aviation instrument operations to grow at an annual rate of 1.5 percent per year through 2031. Military activity is expected to remain constant at its 2010 level throughout the forecast period.

Table 2-11 presents the annual instrument operations forecast for the Airport (note that these operations are not added to the total operations). Overall, instrument operations at the Airport are projected to grow from 7,621 in 2010to 35,723 in 2030. This is due in part to the return of regularly scheduled mainline and regional airline operations, and the introduction of the new very light jets (VLJs).

Table 2-11
Annual Instrument Operations

	Instrument Operations				
	2010	2015	2020	2025	2030
Mainline Airline	0	3358	3,925	4,504	5,271
Regional Airline	1,650	2,774	2,920	3,212	3,395
Air Taxi	1,719	3,164	3,721	4,377	5,148
General Aviation	4,222	13,429	15,796	18,580	21,854
Military/Government	20	55	55	55	55
Subtotals	**7,621**	**22,780**	**26,417**	**30,728**	**35,723**

Total Operations

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

Forecast Comparison

Table 2-13 compares the above Master Plan operational forecasts with the projected operational activity levels for the Airport as set forth in the adopted "*Comprehensive Land Use Plan for*

Sonoma County (CALUP 2010)"[48] and the draft "*Sonoma County General Plan 2020, Air Transportation Element* (Draft ATE 2020)."[49] 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.

Table 2-12 (Final Revision)
Consolidated Summary of Airport Master Plan Forecasts

ANNUAL AIRCRAFT OPERATIONS	2010	2015	2020	2025	2030
Itinerant Operations					
Mainline Airline	0	3,358	3,925	4,504	5,271
Regional Airline	3,406	2,774	2,920	3,212	3,395
Air Taxi	267	5,991	6,432	6,907	7,413
General Aviation	45,243	77,686	84,906	89,991	95,380
Military/Government	267	380	390	400	410
Subtotals	50,157	90,189	98,573	105,014	111,869
Local Operations					
General Aviation	23,971	52,952	55,763	58,724	61,842
Military/Government	14	68	70	72	74
Subtotals	23,987	53,020	55,833	58,796	61,916
Total Operations	78,497	134,209	154,406	163,810	173,785
Instrument Operations					
Mainline Airline	0	3,358	3,925	4,504	5,271
Regional Airline	1,650	2,774	2,920	3,212	3,395
Air Taxi	1,719	3,164	3,721	4,377	5,148
General Aviation	4,222	13,429	15,796	18580	21,854
Military/Government	20	55			55
Subtotals	7,621	22,780	26,417	30,728	35,723
Annual Enplanements					
Mainline Airline Passengers	0	128,202	150,848	174,005	204,415
Regional Airline Passengers	92,659	72,734	78,781	88,368	95,324
Total Annual Enplanements	92,659	200,936	229,629	262,373	299,739
Annual Passengers					
Mainline Airline Passengers	0	256,403	301, 696	348,009	408,830
Regional Airline Passengers	185,318	145,469	157,563	176,737	190,649
Total Annual Passengers	185,318	401,872	459,259	524,746	599,479
Based Aircraft					
Single-Engine	300	308	318	323	330
Twin-Engine Piston	31	31	31	32	32
Turboprop	7	8	9	13	17
Jet	11	16	21	26	30
Helicopter	5	6	6	7	7
Sailplane (motorized)	2	2	2	2	2
Totals	356	371	387	403	418

[48] Sonoma County Airport Land Use Commission, January 2001.
[49] Sonoma County Permit and Resource Management Department. January 2006.

As can be determined from **Table 2-13,** the draft ATE 2020 projects 387 based aircraft at the Airport by 2020. For general aviation and air taxi operations the CALUP 2010 projected 210,000 operations by 2010. The actual count was less than 80,000such operations for 2010. The ATE 2020 projects 154,406operations by 2020. For mainline and regional operations the CALUP 2010 projected 15,000 such operations in 2010, while only 3,406 of these operations actually occurred. The draft ATE2020 projected projects 9,490 mainline and regional airline operations in 2020 which matches the Master Plan forecast. In terms of total operations, the CALUP 2010 projected 225,000 operations by 2010, but just 78,497 such operations actually occurred. For 2020, the draft ATE 2020 projects 154,406 total annual operations which match the Master Plan forecast.

Table 2-13 (Final Revision)
Forecast Comparison Data

	2010	2020	2030
BASED AIRCRAFT			
2007 Airport Master Plan	**356**	**387**	**418**
Draft ATE 2020		387	
ANNUAL OPERATIONS			
GA and Air Taxi			
2011 Airport Master Plan	**78,497**	**147,561**	**165,120**
CALUP 2010	210,000		
Draft ATE 2020		147,561	
Mainline and Regional			
2011 Airport Master Plan	**3,406**	**6,845**	**8,665**
CALUP 2010	15,000		
Draft ATE 2020		6,845	
TOTAL ANNUAL OPERATIONS			
2007 Airport Master Plan	**78,497**	**154,406**	**173,785**
CALUP 2010	225,000		
Draft ATE 2020		154,406	

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 occursand 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, "Airport Capacity and Delay,"the airfield capacity (expressed as ASV) for the Airport is 230,000 annual operations.[50] This level of activity is over 32 percent higher than the 173,785 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 Airport 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 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.

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

3

Airfield Design

OVERVIEW

Future Airport facility needs are categorized into three major groupings: airfield, passenger terminal, and landside. This chapter evaluates and recommends improvements to the Airport airfield, including runways, taxiways, and navigational aids. Improvements to the airfield will typically enhance safety or improve operational efficiency.

Specifically addressed in this chapter are the following airfield design elements:

- Basic Design Factors
- Runways
- Taxiway System
- Air Traffic Control Tower (ATCT)
- Airfield Lighting
- Navigational Aids (NAVAIDS)
- Other Airfield Design Issues
- Security Considerations
- Future Airport Development
- Property Needs

Setting

The Airport currently occupies approximately 1,048.1acres in unincorporated Sonoma County and controls another 62.4 acres under avigation easements (see **Figure 3A**).[1] An additional 129.1acres is designated for future acquisition, primarily for approach protection. The majority of Airport buildings and facilities are located on the east side of the Airport (see **Figure 3B**). These buildings and facilities are discussed in Chapter 4.

BASIC AIRPORT DESIGN FACTORS

The Federal Aviation Administration (FAA) provides guidance for airport design through a series of Advisory Circulars (AC). These guidelines promote improvements that enhance airport safety and operational utility for the types of aircraft currently using or that are anticipated to use the Airport on a regular basis. Major considerations when designing with FAA ACs include: airport role, airport classification, wind coverage, instrument approach procedures, and airfield capacity.

[1] Avigation Easement – A type of easement that typically conveys the following rights:

- A right-of-way for free and unobstructed passage of aircraft through the airspace over the property at any altitude above a surface specified in the easement (usually set in accordance with FAR Part 77 criteria).
- A right to subject the property to noise, vibrations, fumes, dust, and fuel particle emissions associated with normal airport activity.
- A right to prohibit the erection or growth of any structure, tree, or other object that would enter the acquired airspace.
- A right-of-entry onto the property, with proper advance notice, for the purpose of removing, marking, or lighting any structure or other object that enters the acquired airspace.
- A right to prohibit electrical interference, glare, misleading lights, visual impairments, and other hazards to aircraft flight from being created on the property.

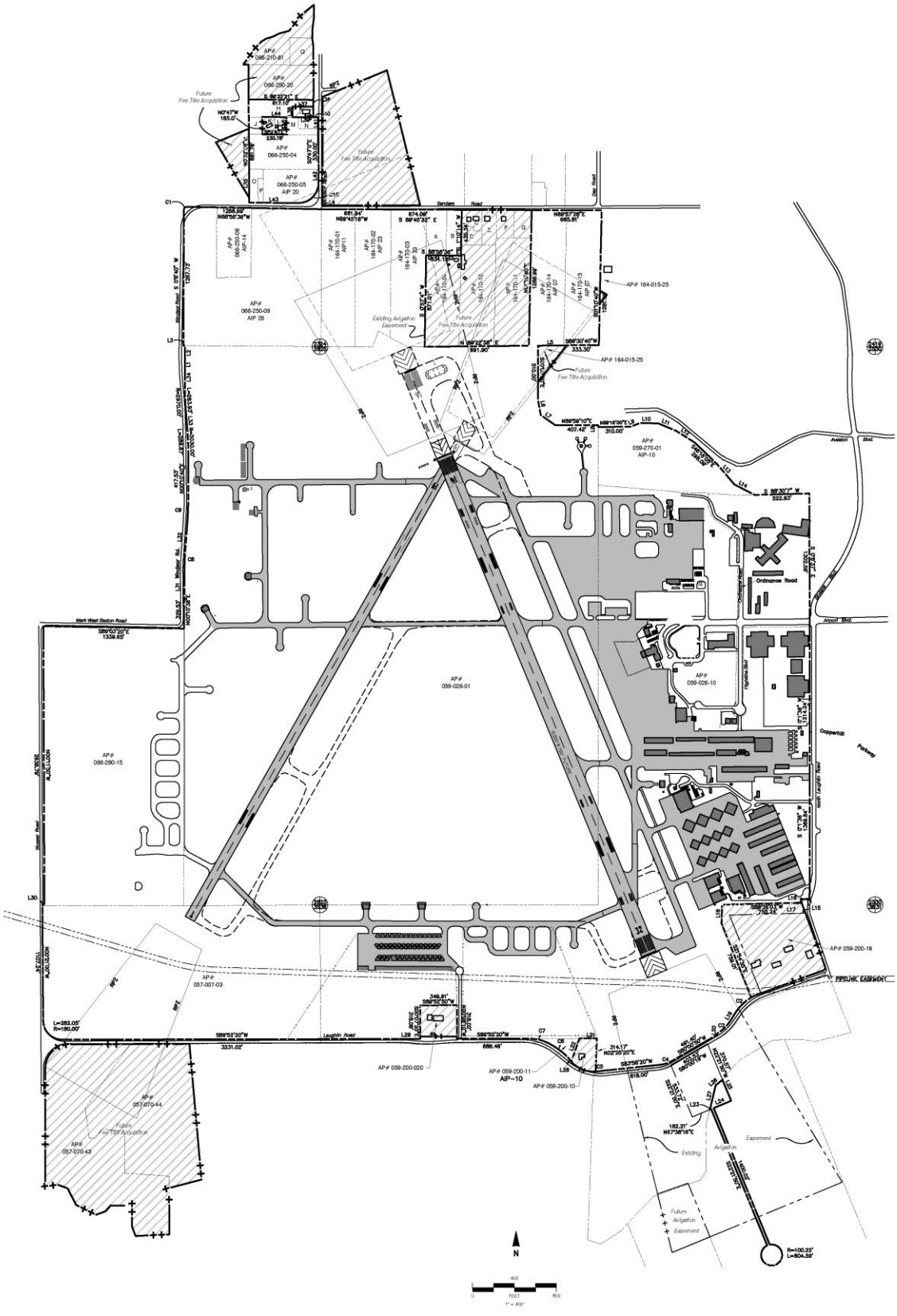


Figure 3A

Airport Property Map

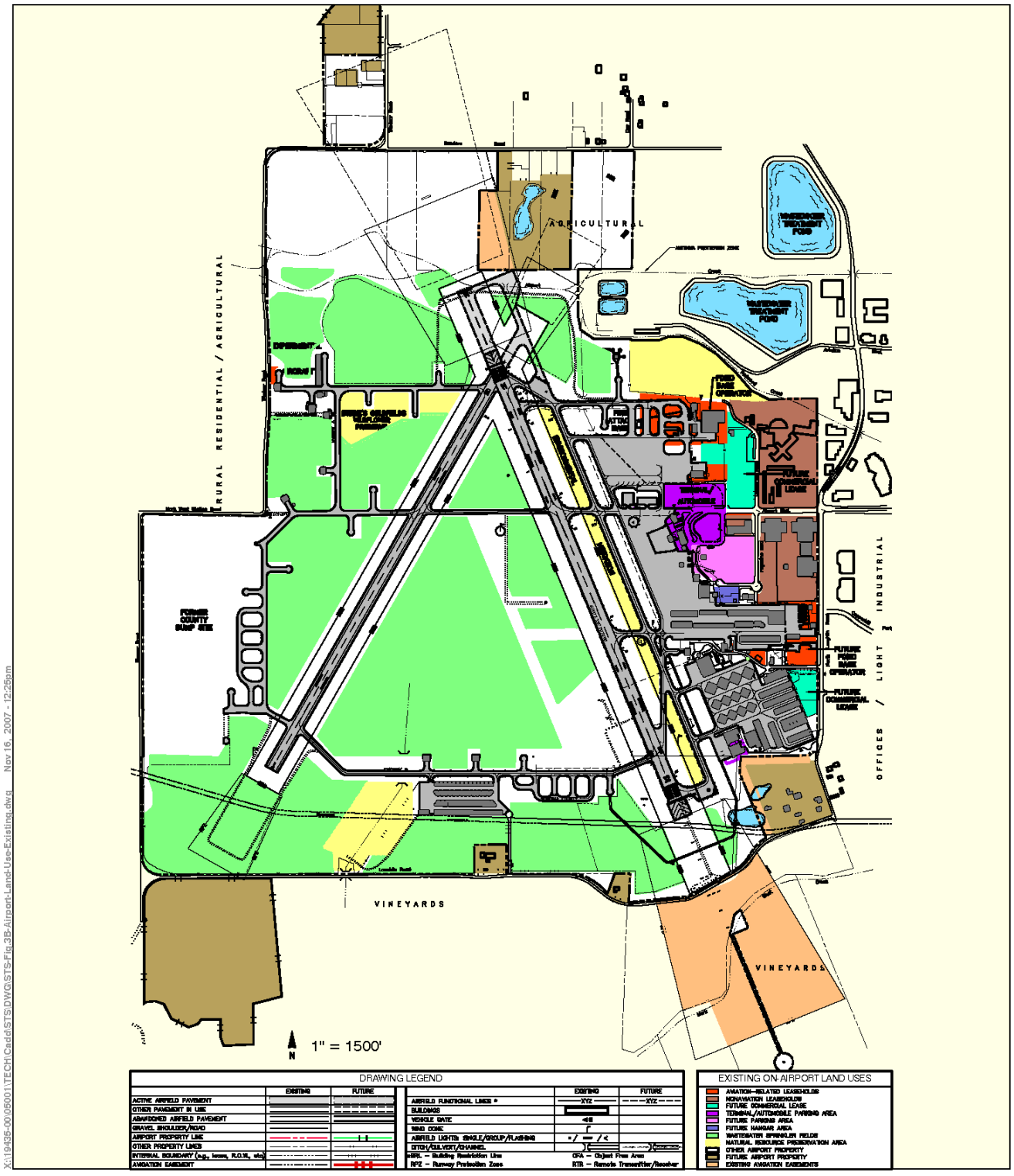


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Figure 3B

Existing Airport Land Use

Sonoma County Airport

Airport Role

The Airport's role was discussed in Chapter 2. The Airport serves as the region's principal airport, providing facilities for scheduled airline services and general aviation. It is anticipated that the Airport will continue to function as it has in the past, as a nonhub air carrier Airport serving a limited range of scheduled air carrier and commuter airlines and a broad range of general aviation activities.

Airport Classification

The FAA has established a set of airport classifications known as Airport Reference Codes (ARC) to relate airport design criteria to the operational and physical characteristics of the airplane intended to operate on a runway, taxiway, or taxilane at the Airport. The ARC has two components relating to the design aircraft: aircraft approach category and airplane design group.

AIRPORT REFERENCE CODES

Aircraft Approach Category

- Category A: aircraft approach speed less than 91 knots.
- Category B: aircraft approach speed 91 knots or more but less than 121 knots.
- Category C: aircraft approach speed 121 knots or more but less than 141 knots.
- Category D: aircraft approach speed 141 knots or more but less than 166 knots.
- Category E: aircraft approach speed 166 knots or more.

Airplane Design Group

- Group I: wingspan up to but not including 49 ft.
- Group II: wingspan 49 ft. up to but not including 79 ft.
- Group III: wingspan 79 ft. up to but not including 118 ft.
- Group IV: wingspan 118 ft. up to but not including 171 ft.
- Group V: wingspan 171 ft. up to but not including 214 ft.
- Group VI: wingspan greater than 214 ft.

Aircraft Approach Category (AAC) – Designated by a letter (A– E), this component relates to the operational characteristic of aircraft approach speed, with 'A' being the slowest and 'E' being the fastest.

Airplane Design Group (ADG) – Designated by a Roman Numeral (I–VI), the second component relates to the physical characteristic of airplane wingspan, with 'I' being the smallest and 'VI' being the largest.

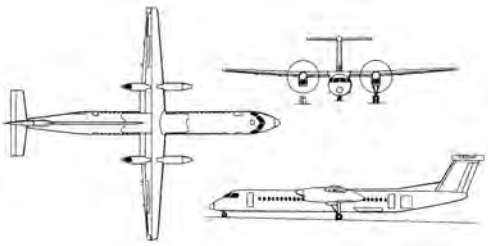
The Airport is designated as an ARC C-III Airport, based on the characteristics of its design aircraft. The appropriate design aircraft for the Airport is discussed in the following section. However, the Airport's two runways currently have different ARC designations. Runway 14-32 is designated as an ARC C-III runway because of its use by larger, high performance aircraft. Runway 1-19 is currently designated as an ARC C-II runway, but is proposed to be upgraded to ARC C-III. (See **Table 3-1** for examples of C-III aircraft). It should be noted that Runway 1-19 had been designated as an ARC C-III runway until 2005. In that year the runway was downgraded to ARC C-II because water was observed to be ponding within the Runway Safety Area (RSA). The RSA for an ARC C-II runway is narrower than for C-III. With reclassification, the ponds fell outside the RSA.

Design Aircraft

The Airport is currently designated as a Commercial Service–Non-Primary Airport in the *FAA's 2011-2015 National Plan of Integrated Airport Systems (NPIAS).* As a Commercial Service–Non-Primary Airport, the Airport is expected to provide needed passenger and aeronautical services with a wide variety of aircraft sizes and types.

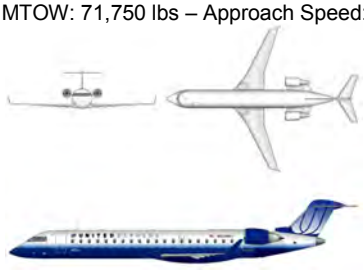
Bombardier Q-400

Wingspan: 92.25 ft – MTOW: 64,500 lbs – Approach Speed: 125 knots



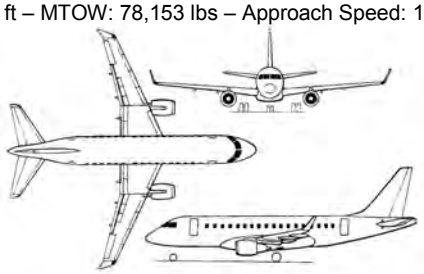
Bombardier CRJ-700

Wingspan: 76.3 ft – MTOW: 71,750 lbs – Approach Speed: 130 knots



Embraer ERJ 170

Wingspan: 85.04 ft – MTOW: 78,153 lbs – Approach Speed: 140 knots

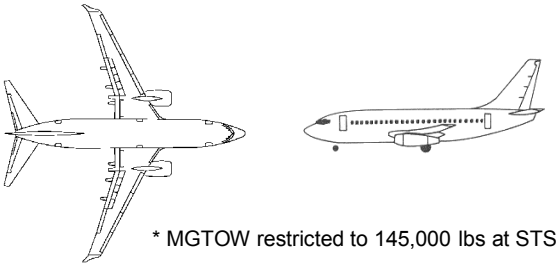


Embraer ERJ 190

Wingspan: 93.08 ft – MTOW: 108,003 lbs – Approach Speed: 140 knots

Boeing BBJ2

Wingspan: 117.4 ft – MTOW: 171,000 lbs* – Approach Speed: 132 knots



* MGTOW restricted to 145,000 lbs at STS

MTOW = Maximum Takeoff Weight

Table 3-1

Comparison of ARC C-III Aircraft

Sonoma County Airport

The majority of aircraft operations at the Airport are generated by single-engine and twin-engine, general aviation aircraft that fall within Aircraft Approach Categories A and B, and Aircraft Design Group I and II. Most of these aircraft have maximum certificated takeoff weights (MTOW) of 12,500 pounds or less. However, there are a significant number of operations by high performance turbojet and turbofan business aircraft with MTOWs greater than 60,000 pounds. Most of these aircraft are categorized as ARC C-III.

Also included in this category are a number of turboprop and regional jet airline aircraft. Typical aircraft in ARC C-III include the following:

Bombardier Q-400	Boeing BBJ	Bombardier CRJ-700
Bombardier CRJ-900	Embraer ERJ 170	Embraer ERJ 190

The design aircraft is defined by the FAA as the most critical type of aircraft using the Airport or that is expected to use the Airport on a regular basis (at least 500 annual operations: 250 departures and 250 arrivals).[2] It is desirable to design as many of the Airport elements as practical to meet the requirements of the most demanding ARC (i.e., approach speed and wingspan) and runway length requirements. For this reason, the selected design aircraft at the Airport is the Embraer ERJ 190. The ERJ 190 was selected as the design aircraft because it is typical of the 98 to106 seat regional jets that are expected to serve the Airport in the future. The characteristics of this aircraft establish the Airport's ARC as C-III. The ARC C-III is also consistent with the operational characteristics of the majority of larger business/corporate aircraft using the Airport on a regular basis. A discussion on runway length requirements for these aircraft is included in later sections of this chapter.

Other design standards are typically applied to based aircraft storage areas (T-hangars and tie-downs) and restricted tenant-use facilities that would not be used by larger aircraft. **Table 3-2** summarizes the FAA design standards associated with ARC classifications applicable at the Airport.

Wind Coverage

One of the primary factors influencing runway orientation and the number of runways is wind. Ideally, a runway should be aligned with the prevailing wind to minimize the crosswind component for aircraft operating at the Airport. Generally, smaller airplanes are more affected by wind and have greater difficulty compensating for crosswinds. The desirable wind coverage for an airport is 95 percent usability, based on the total number of weather observations.

[2] The Airport also receives use by large business aircraft of 90,000 pounds or more (e.g., Gulfstream GV) and occasional operations by commercial airliners used as corporate aircraft weighing in excess of 174,000 pounds (e.g., Boeing Business Jet (BBJ)). However, the numbers of operations by these aircraft do not exceed 405 annual operations

.

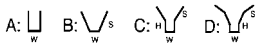
Table 3-2
Airport Design Standards

Item	FAA Airport Design Standards[1]		Runway 1-19	Runway 14-32
Airport Reference Code (ARC)	C-II	C-III	C-II	C-III
Aircraft Approach Speed (AAS)	<141 kts	<141 kts	<141 kts	<141 kts
Airplane Wingspan (ADG)	<79 ft.	<118 ft.	<79 ft.	< 118 ft.
Aircraft Weight Group (lbs)	>12,500	>12,500	>12,500	>12,500
Approach Visibility Minimums	<¾ mile	Visual or ≥¾ mile	Visual or ≥¾ mile	<½ mile
Runway Design				
Width	100 ft.	100 ft.	100 ft.	150 ft.
Blast Pad Width	120 ft.	140 ft.	120 ft.	150 ft./200 ft.
Length beyond Runway End	150 ft.	200 ft.	150 ft.	150 ft./200 ft.
RSA Width	400 ft.	500 ft.	400 ft.[11]	500 ft.[11]
Length beyond Runway End	1,000 ft.	1,000 ft.	1,000 ft.	1,000 ft.[12]
Obstacle Free Zone[2]				
Shape[3]	C	C	A	C
Width (W)	400 ft.	400 ft.	400 ft.	400 ft.
Vertical Height (H) [4, 5] /Slope[6]	53 ft. / 6:1	NA / NA	NA / NA	49 ft. / 6:1
OFA Width	800 ft.	800 ft.	800 ft.	800 ft.
Length beyond Runway End	1,000 ft.	1,000 ft.	1,000 ft.	1,000 ft.[12]
Gradient (maximum)	1.5%	1.5%	1.5%	1.5%
Runway Setbacks: From Runway Centerline to:				
Parallel Taxiway Centerline [7]	400 ft.	400 ft.	NA	400 ft.
Hold Line	250 ft.	250 ft.	250 ft.	250 ft.
Aircraft Parking Line	500 ft.	500 ft.	*	*
Building Restriction Line [8]	495 ft.	745 ft.	400 ft.	750 ft.
Helipad for:				
Small Helicopters (≤6,000 lbs.)	500 ft.	500 ft.	500 ft.	500 ft.
Medium Helicopters (≤12,000 lbs.)	500 ft.	500 ft.	500 ft.	500 ft.
Heavy Helicopters (>12,000 lbs.)	700 ft.	700 ft.	700 ft.	700 ft.
Taxiway Design				
Width	35 ft.	50 ft.	50 ft.	50 ft.
Safety Area Width	79 ft.	118 ft.	79 ft.	118 ft.
Taxiway and Taxilane Setbacks				
From Taxiway Centerline to:				
Parallel Taxiway/Taxilane [9]	105 ft.	152 ft.	NA	>152 ft.
Fixed or Movable Object	66 ft.	93 ft.	66 ft.	>93 ft.
From Taxilane Centerline to:				
Fixed or Movable Object	58 ft.	81 ft.	58 ft.	**

[1] Source: FAA Advisory Circular 150/5300-13, Change 10, *Airport Design* (September 2006)

[2] Object Free Zone normally extends 200 feet beyond end of runway; additional length required for runways with approach light systems.

[3] Runway Obstacle Free Zone Cross Section Shapes:

[4] Height increases 3 feet per 1,000 feet of airport elevation 

[5] Indicated dimensions for runways with approach visibility minimums <3/4 mile are for Category I instrument runways. Criteria for Category II and Category III runways are more restrictive

[6] Maximum of 0.8% in first and last quarters of runway.

[7] Indicated runway separation is for planning purposes. FAA air traffic control criteria permit simultaneous operations by light, single-engine propeller airplanes with runways as close as 300 feet apart and by twin-engine propeller airplanes with runway separation of 500 feet (FAA Order 7110.65N).

[8] The FAA no longer has fixed-distance standards for the BRL Location. The indicated setback distances are based on providing 7:1 transitional slope and RVZ and protected areas clearance over a 35-foot building situated at the same base elevation as the adjacent runway and can be adjusted in accordance with local conditions.

[9] Assumes same size airplane uses both taxiway and adjacent taxilane. Distance can be reduced if secondary taxiway is limited to use by smaller airplanes.

[10] For runways with approach visibility minimums of ¾ mile or more, but less than 1 mile, runway protection zone dimensions are 1,000 feet width at inner end, 1,510 feet width at outer end, and a length of 1,700 feet.

[11] For Airport Reference Code C-I and C-II, a runway safety area width of 400 feet is permissible, but must be 500 feet for ARC C-III.

[12] At approach end of Runway 32; 941 feet

* Refer to Taxiway Centerline to fixed or moveable object setback

** Design varies within individual building areas

Similarly, instrument approach procedures should be aligned with the prevailing wind that occurs during bad weather (instrument meteorological conditions). Runways 14-32 and 1-19 exceed the wind coverage requirements for ARC C-II and C-III. A crosswind runway is not needed at the Airport.

Wind Coverage Requirements:

An airport must demonstrate the ability to provide 95% wind coverage with minimum crosswind velocities.

- 10.5 knots for ARC A-I and B-I.
- 13 knots for ARC A-II and B-II.
- 16 knots for ARC A-III, B-III, and C-I through D-III.
- 20 knots for ARC A-IV through D-VI.

Sonoma County Airport
All Weather

Runway	ARC	Crosswind	% Wind Coverage
14-32	C-III	16 knots	99.3
1-19	C-II	16 knots	98.0

Instrument Approach Procedures

As is the case with runway orientation, it is desirable to align instrument approaches with the prevailing winds that would normally be encountered during inclement weather. This alignment is so that the final portion of the approach can be conducted into a headwind. However, factors other than wind often play a role in determining the best approach to an airport. This is typically defined as an approach that will provide the lowest minimums.

Runway 32		
Instrument Approach	Cloud Ceiling (feet)*	Visibility Minimums (mile)
ILS	200	1/2
VOR	581	1/2
GPS	481	1
Runway 14		
Instrument Approach	Cloud Ceiling (feet)*	Visibility Minimums (mile)
VOR/DME	521	1
GPS	441	1
*Height above airport elevation		

The Airport is presently served by one Category I precision instrument approach and four non-precision approaches. The lowest approach minimums for the Airport (ILS Runway 32) are cloud ceiling at 200 feet above the Airport elevation and ½- statute mile visibility. Two of the non-precision approaches are also to Runway 32 (VOR or GPS), two are to Runway 14 (VOR/DME or GPS), and all five approach procedures allow aircraft to circle-to-land for all runways and has a special use CAT II approach with minimums at 200 and 1,800 foot RVR.

At some point in the future, depending on Airport needs and funding availability, the Airport proposes to upgrade the existing Category I precision instrument approach to a Category II precision instrument approach. A CAT II ILS approach would afford the Airport lower minimums (100-foot ceiling and 1,200-foot runway visual range [RVR] visibility), but would require special certifications for operators, pilots, aircraft and airborne/ground equipment.

Airfield Capacity

The capacity of an airport, or throughput, is the number of aircraft operations the runway/taxiway system can accommodate during a single-hour before operational delays become unreasonable. As demand approaches capacity, individual aircraft delay is increased. Because the magnitude and scheduling of user demand is relatively unconstrained, reductions in aircraft delay can best be achieved through airport improvements that increase airfield capacity. Therefore, airfield capacity analysis is necessary to determine the timing and scope of airfield improvements such as new runways and taxiways.

The Airport is not affected by prolonged periods of demand-induced aircraft delay. For purposes of long range planning, airfield capacity was estimated on an annual basis or annual service volume (ASV) using the FAA's Airport Design software. Calculation of ASV is dependent upon various physical and operational factors listed to the right. The determination revealed the Airport's ASV to be 230,000 annual operations. As a rule of thumb, the planning for new facilities should be initiated when airport demand reaches 60 percent of its capacity, or, in this case, 138,000 operations, so that implementation may begin near the 80 percent capacity threshold. Based on operational forecasts, this could occur at the Airport before 2015.

Annual Service Volume (ASV) is a reasonable estimate of an airport's annual capacity. It accounts for:

- Differences in runway use
- Aircraft mix
- Weather conditions
- The amount of training activity

FAR Part 77 Definitions

Object - An object is defined as any structure (i.e., building, power pole, tree, terrain etc.) that is at a height above the runway elevation.

Obstacle - An existing object of natural growth, or terrain, at a fixed geographical location, or which may be expected at a fixed location within a prescribed area, with reference to which vertical clearance is or must be provided to pilots during flight operation.

Obstruction - An obstacle becomes an obstruction when it penetrates an imaginary surface described by current Federal Aviation Regulations (Part 77) and/or when it exceeds other policy limitations on height.

Hazard - Dependent upon the type of obstruction, mitigation is needed to reduce the risk of harm to people and property on the ground, as well as to pilots while in flight.

Removal of Hazard - Obstructions that cannot be mitigated with obstruction lighting or other means may need to be demolished or removed. For example, trees would be topped/removed, but a building would be demolished or relocated to meet clearance requirements.

Navigable Airspace

The U.S. Code of Federal Regulations (CFR) 14, Part 77, *Objects Affecting Navigable Airspace*, establishes standards for determining obstructions in navigable airspace. The Airport is responsible for keeping the area around the Airport free of any obstructions that could create hazards for air navigation, under terms of grant assurances and other agreements with the FAA.

Terrestrial surveying was used to identify trees and tall vegetation near the runways and in the approaches to the runway ends. Tree topping and vegetation removal followed to eliminate existing obstructions. The proposed shifting of the ends of Runway 14 and 19 will cause a proportionate shift in the airspace surfaces. The result will be that some trees and other vegetation that are near the existing airspace surfaces will penetrate the surfaces associated with the new runway ends. This will require removal of some close-in vegetation and topping of more distant trees. Over the 20-year lifespan of this plan trees and vegetation will growth into the airspace surfaces. This growth will need to be topped or removed to provide safe clearances for aircraft landings and takeoffs.

RUNWAYS

This section highlights the design standards applied to each runway as well as improvements necessary to enhance safety and provide desired capacity improvements A pivotal topic that is addressed first in this section is the need to alter the intersection of the two runways to address safety issues raised by the FAA's Runway Safety Action Team. A second key safety issue is the need to meet the Congressional mandate to address nonstandard runway safety areas (RSAs) by 2015. RSA's are discussed within the sections for each runway that follow.

Decoupling the Runway Ends

The Runway Safety Action Team (RSAT) is a multidisciplinary group of FAA staff whose role is to identify ways to improve safety on airfields (i.e., on runways, taxiways and aprons, not inside buildings). The RSAT's Runway Safety Action Plan dated March 12, 2010 contains a number of recommendations related to airfield configuration, taxiway alignments, airfield signs and pavement markings. The most critical recommendations were to decouple the ends of the runways where they overlap and reconfigure the taxiways serving these runway ends.

In the context of this Master Plan *decoupling* means to separate the runway ends so that each is distinct. As can be seen in Figure 3C the ends of Runway 14 and 19 overlap. Because of this overlap, only the end of Runway 14 is marked in its actual location; the marking for Runway 19 is shifted about 200 feet so that it is visible. This makes it unclear to pilots where the end of the runway is located. Decoupling would involve shifting the runway ends so that the markings showed the actual runway end.

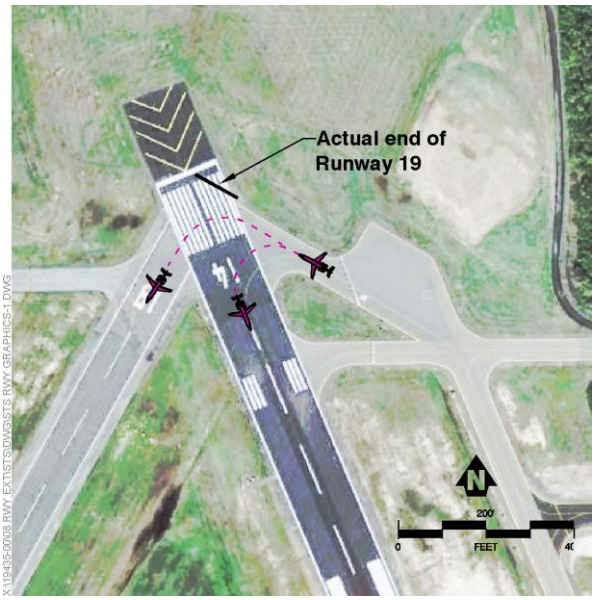


Figure 3C: Co-located Runway Ends

Decoupling the runways requires extension of Runway 19 a minimum of 200 feet. This amount is needed to provide space for the runway markings. Runway 14 would need to be extended about 885 feet to be decoupled from Runway 19. The extension is needed to provide a right-angle entrance taxiway at the apex of Runway 14 that provides sufficient room to hold a taxiing aircraft clear of the Object Free Area (discussed below) for Runway 19 and allow circulation of aircraft at the apex of Runway 14.

The RSAT also recommended that the taxiways that connect to the runway ends of Runway 14 and 19 be modified. Taxiways that connect to runway ends typically join to the runways at right angles (i.e., 90°). Where Taxiway Y connects to the apex of Runway 19 and 14, the turn to Runway 19 is about 90°. However, the turn to Runway 14 requires a 143° turn. This contributes to the pilot confusion that regularly (but infrequently) results in aircraft cleared for departure on Runway 14 to depart on Runway 19. The RSAT recommends that separate right-angle entrance taxiways be joined to the new decoupled runway ends. The resultant configuration is shown in **Figure 3D** and is reflected in this *Airport Master Plan*.

Runway 14-32

The primary runway, Runway 14-32, serves all of the Airport's users. The runway is constructed of asphalt-concrete. For planning purposes, the design aircraft for this runway is the ERJ 190. This aircraft falls within ARC C-III.

The following are key elements associated with Runway 14-32, including: runway length and width, pavement strength, obstacle free zone, runway safety area, runway object free area and the runway protection zones.

Runway Length and Width – Runway length requirements for specific aircraft are primarily dependent upon airfield elevation and temperature (the average high temperature for the hottest month). Runway 14-32 has a length of 5,115 feet, which according to the FAA's Airport Design program can accommodate roughly 75 percent of airplanes at 65 percent of their useful load (i.e., fuel, passenger, luggage) weighing up to 60,000 pounds over a distance of approximately 1,000 miles. The length of Runway 14-32 is sufficient for the current mix of aircraft operating at the Airport, although it does impose limitations for some jet aircraft, particularly during hot weather or for longer range operations.

The FAA runway design program indicated that a runway length of 6,000 feet would be needed to accommodate the regional jets weighing over 60,000 pounds anticipated to use the Airport over the 20-year planning horizon. The runway length question was previously investigated in the *Charles M. Schulz-Sonoma County Airport: Airport Layout Plan Narrative Report and Technical Study*.[3] Consequently, it is recommended that Runway 14-32 be extended 885 feet to the northwest to provide a 6,000-ft. runway to meet the needs of passenger jet aircraft performance specifications. Taxiway Y would also be extended further to the northwest and join the new runway end. Below is a depiction of the proposed extensions of Runway 14 and Taxiway Y. Note that the amount of extension needed to accomplish decoupling of the two runways is the same as needed to support scheduled passenger service using regional jets.

Pavement Strength – Airport pavements are constructed to support anticipated aircraft loads over a structural life of 20 years. The reported values are based on an equivalent number of annual departures by the design aircraft. It should be noted that this value is not a physical limitation (i.e., pavement failure will not necessarily occur when a heavier aircraft uses the runway), but is an indication of the pavement's ability to realize its structural life.

The published weight bearing capacity for Runway 14-32 is 60,000 pounds single-wheel gear configuration, 95,000 dual-wheel gear configuration, and 150,000 pounds dual-tandem-wheel gear configuration. The runway can accommodate occasional use by even heavier aircraft.

The design aircraft for purposes of determining pavement strength is the aircraft requiring the thickest pavement section based on aircraft weight, number of annual departures, and landing gear configuration.

[3] *Charles M. Schultz-Sonoma County Airport Layout Plan Narrative Report and Technical Study*, August 2004. Appendix C contains the relevant portions of this report as it relates to the alternative runway configuration. Alternative A-1 was adopted by the Sonoma County Board of Supervisors as the preferred Master Plan runway alternative.

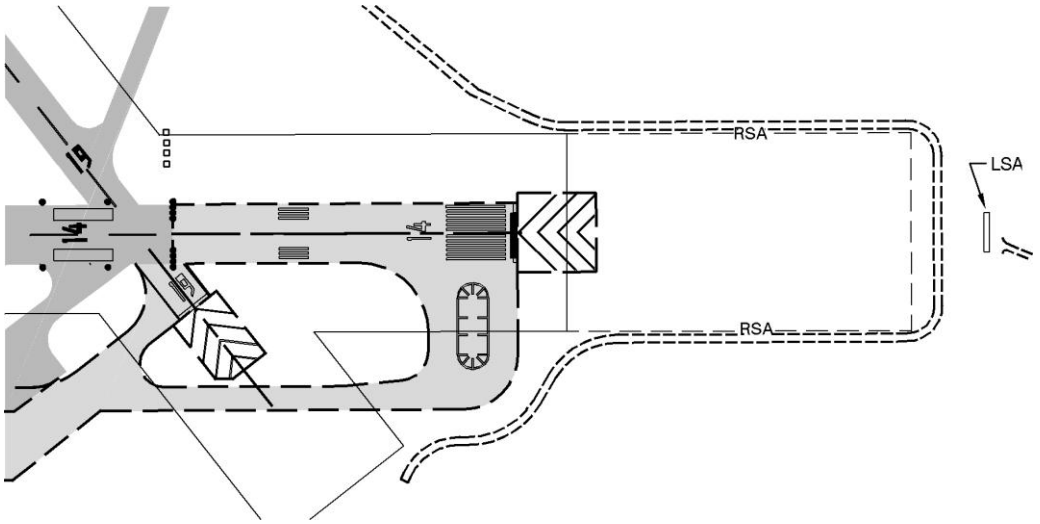


Figure 3D. Proposed Runway 14 and Taxiway "Y" Extensions

Obstacle Free Zone (OFZ) – The dimensions of OFZs vary depending upon the size of aircraft served (small or large) and the visibility minimums of any associated instrument approach. Since Runway 14-32 serves aircraft weighing more than 12,500 pounds, the Runway OFZ width is 400 feet (200 feet either side of centerline at an elevation equal to the nearest runway centerline elevation) and extends 200 feet beyond each runway end. An Inner-approach OFZ extends the OFZ over the approach lighting systems at each end with a 50:1 slope extending outward and upward from the runway end elevation to a point 200 feet from the last light of the approach lighting system. Finally, an Inner-transitional OFZ protects airspace to the sides of the runway and Inner-approach OFZ. The Inner-transitional OFZ rises vertically 51.8 feet from the edge of the OFZ before rising at a 6:1 slope away from the centerline to a height 150 feet above the established Airport elevation. Runway 14-32 currently meets these standards.

The **Runway Safety Area (RSA)** is a graded area surrounding and upon which the runway surface is constructed intended to enhance the safety of airplanes in the event of an unintended excursion from the runway's paved surface. This area must be:

- Cleared and graded with no potentially hazardous humps, ruts, depressions, or other surface variations,
- Adequately drained to prevent water accumulation,
- Capable of supporting snow removal equipment, rescue and firefighting equipment, and occasional aircraft passage without causing structural damage to the aircraft,
- Free of objects, except for those that need to be located in the RSA because of their function, and then, to the extent practical, mounted on low impact (frangible) structures.
- Capable, under normal (dry) conditions, of supporting airplanes without causing structural damage to the airplanes or injury to their occupants.

Runway Safety Area (RSA) – FAA design standards for ARC C-III facilities, like Runway 14-32 specify that the RSA be 500-feet-wide for the full runway length and extend 1,000 feet beyond each runway end. The RSA standards specify that there be 600 feet of RSA before the landing threshold and 1,000 feet beyond the departure end of the runway. Neither end of Runway 14-32 currently meets the length requirement. The differing means of achieving compliance with FAA standards at each runway end is discussed in the paragraphs that follow.

In early 2006, RSA improvements were made to Runway 14-32 to provide as much of the standard RSA as could be currently achieved. Even with these

improvements, only 850 feet of the approach end of Runway 14 is in compliance with the RSA standard. This is due to the placement of the ILS localizer antenna within the area that should meet RSA standards. The relocation of the localizer antenna outside the RSA and additional grading would bring it into compliance with FAA standards.

The proposed extension of Runway 14-32 to the northwest will require relocation of the localizer antenna and its associated equipment building. The design includes provision of a standard graded RSA with the localizer and equipment building located outside of the RSA. The preceding Figure 3D shows the proposed configuration.

At the approach end of Runway 32, a 0.13 acre portion of the RSA extends off Airport property over Laughlin Road. This small area does not comply with the RSA standard. Unlike other design standards, RSA standards cannot be modified or waived. FAA regional offices must analyze and maintain a written determination for all RSAs in their district. In the case of nonstandard RSAs, the determination will include the best practicable alternative for improvement until it meets all standards. However, the FAA also recognizes that 100% RSA compliance may not always be practicable. The RSA at the approach end of Runway 32 is 98.9% compliant with the FAA RSA standard. The FAA has indicated that it will accept use of Declared Distances to address the substandard RSA for this runway end. As is described in the next paragraph, this will mean that no physical changes are required to meet RSA standards.

Where a runway does not have a standard graded RSA, the FAA may authorize the use of Declared Distance as an alternative means of meeting RSA standards. Runway 32 currently meets the standard for landings. However, departures on Runway 14 (towards the Runway 32 end) will have 100 feet less than required (see **Figure 3E**). Using the Declared Distances concept involves officially notifying pilots that the RSA is shorter than standard. This information would be made available to pilots through publication in the FAA's *Airport/Facility Directory*. The *Airport/Facility Directory* is the official source of information on an airport for pilots. It is updated every 56 days. A declared distances table would be included with the information for the Airport to inform pilots that the runway length available for departures on Runway 14 is less than the physical length of the runway. The *Airfield/Facility Directory* will indicate (after the runway is extended) that Runway 14 has 5,900 feet available for departures.

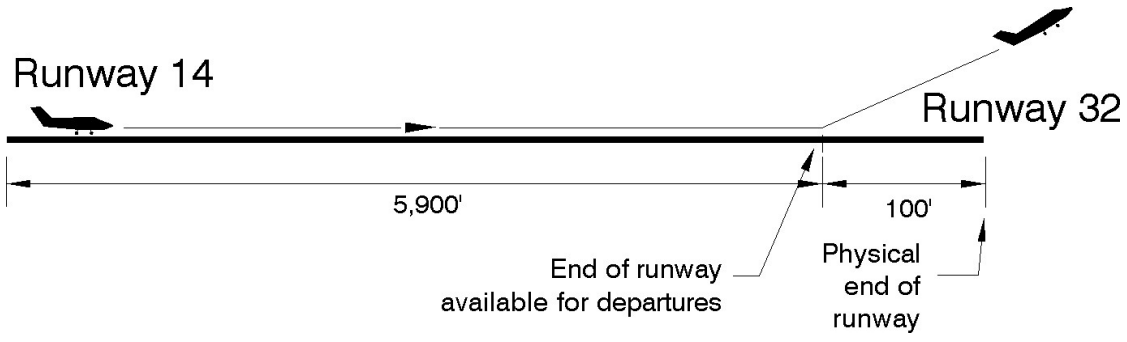


Figure 3E. Declared Distances on Runway 14

Use of declared distances is a standard method of meeting RSA requirements. However, in the future it would be appropriate to work with the FAA to reevaluate whether the agency would fund relocation of Laughlin Road. Widening the curve where Laughlin Road passes south of Runway 14-32 would enable construction of a standard graded RSA at the south end of this runway.

The **Runway Object Free Area (OFA)** is a two-dimensional ground surface surrounding runways. The OFA clearing standards preclude above ground objects protruding above the RSA edge elevation, except those required to be located within the OFA for navigation, ground maneuvering, aircraft taxi, and aircraft holding purposes. No other objects are permitted, specifically, parked airplanes and agricultural operations.

Runway Object Free Area (ROFA) – FAA design standards for ARC C-III mandates an 800-foot wide OFA extending the full length of the runway and 1,000 feet beyond each runway end. Except for an inconsequential part (0.02 acre) of the southwest corner of the OFA, Runway 14-32 complies with this standard.

Runway Protection Zones (RPZs) – The RPZ is a trapezoidal-shaped area extending outward into the approach area beyond each runway end. The purpose of the RPZ is to enhance the protection of people and property by clearing them of incompatible objects and activities. Fee-simple acquisition is recommended whenever feasibly practicable. Specifically prohibited land uses include: residences, places of public assembly, fuel storage facilities, and proposed uses that can potentially attract wildlife or generate dust/smoke.

RPZ dimensions are based on approach visibility minimums to each runway end and the runway approach category. The Runway 32 approach end RPZ has a 1,000-foot inner width, a 1,750-foot outer width, and a 2,500-foot length beginning 200 feet beyond the runway end. Approximately 50 acres of the RPZ extend off-airport and are currently maintained as compatible farmland. FAA guidance strongly recommends that airports own the lands within RPZs.

Avigation easements restrict heights and land uses permitted in the RPZ area. Avigation easements have been obtained by the Airport over land within Runway 32 approach end RPZ to protect against future encroachment of surrounding, potentially incompatible uses. The Airport plans to acquire 4.5 additional acres in avigation easements (see Airport Layout Plan).

Runway 14 is restricted to approach visibility minimums not lower than ¾-mile; therefore, the Runway 14 approach end RPZ is somewhat smaller in size: 1,000-foot inner-width, 1,510-foot outer-width, and 1,700-foot length beginning 200 feet beyond the runway end. Approximately 33.8 acres of the existing Runway 14 RPZ is off airport. The planned extension of Runway 14 would extend the existing RPZ further to the northwest. The Airport plans to acquire these lands through a fee title acquisition to protect against future encroachment in the approach/departure area (see ALP).

Runway 1-19

Runway 1-19 is constructed of asphalt-concrete. It is designed to accommodate aircraft in ARC C-II (i.e., wingspans less than but up to 79 feet, approach speeds of less than 141 knots), but can accommodate ARC C-III aircraft without any physical changes to the runway. However, to do so will require some modifications to the runway setbacks and widening of the RSA from 400 to

500 feet. As noted previously in the chapter, the RSA had historically been set at 500 feet, but was reduced due to the presence of wetlands lateral to the runway.

The following are major elements associated with Runway 1-19, including: runway length and width, pavement strength, obstacle free zone, runway safety area, runway object free area, and the runway protection zones.

Runway Length and Width – Runway 1-19 is 5,003 feet long by 100 feet wide. These dimensions are generally adequate for the types of operations occurring today. However, to accomplish decoupling of the runway ends, an extension of 200 feet at this runway's northern end is proposed.

Pavement Strength – Like the primary runway, the pavement sections are currently rated at: 60,000 pounds single-wheel landing gear, 95,000 pounds dual wheel landing gear, and 150,000 pounds dual tandem landing gear. The strength ratings are based on the mix and volume of aircraft currently using the runway. These ratings are adequate for the 20-year period.

Obstacle Free Zone (OFZ) – Since the runway serves aircraft weighing more than 12,500 pounds, the Runway OFZ width is 400 feet (200 feet either side of the runway centerline at an elevation equal to the nearest runway centerline elevation) and extends 200 feet beyond each runway end. Runway 1-19 currently meets these standards for both ARC C-II and C-III.

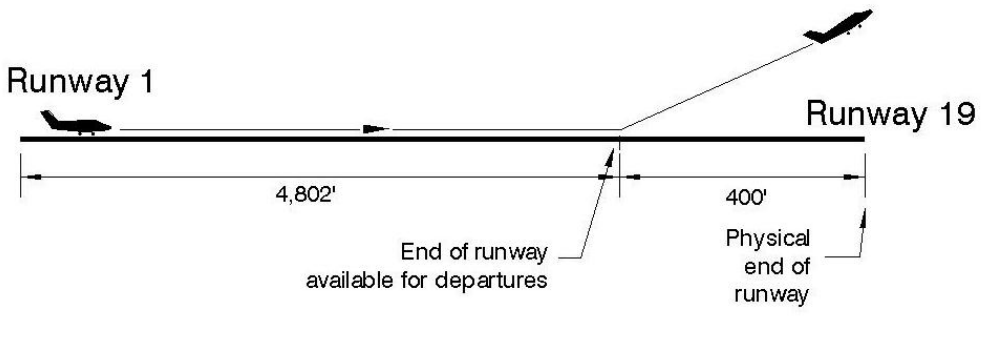


Figure 3F. Declared Distance for Runway 1

Runway Safety Area (RSA) – The RSA is a graded area surrounding the runway which is intended to enhance the safety of airplanes in the event of an unintended excursion from the runway's paved surface. For ARC C-II runways with approach visibility minimums of ¾ statute miles or higher, the standard RSA dimension is 500 feet wide extending 1,000 feet beyond the stop-end of the runway. However, the current width of Runway 1-19 RSA is 400 feet. This 400-foot RSA width for Runway 1-19 is permitted in accordance with *FAA Advisory Design Circular 150/5300-13, Change 15* for ARC C-I and C-II runways. For ARC C-III the RSA must be 500-feet wide.

Runway 1 currently meets the required distance beyond the stop-end of the runway (i.e., the north end) requirement through the application of Declared Distances. Runway 19 meets the required distance beyond the stop-end of the runway requirement without the need for declared distances. After the runway is extended to the north, Declared Distances will continue to be used for departures on Runway 1.

Table 3-3 summarizes the current and future status of both runways in terms of compliance with FAA's RSA standards.

Table 3-3
Runway Safety Area Compliance

Runway End	CURRENT STATUS		FUTURE STATUS	
	Width x Length Beyond Approach End of Runway	Compliance Status	Width x Length Beyond Approach End of Runway	Compliance Status
1	▪ Required: 400' x 1,000' ▪ Actual: 400' x 1,000'	Compliant, with standard graded RSA	▪ Required: 500' x 1,000' ▪ Actual: 500' x 1,000'	Compliant, with standard graded RSA
19	▪ Required: 400' x 1,000' ▪ Actual: 400' x 698'	Compliant, with published declared distances	▪ Required: 500' x 1,000' ▪ Actual: 500' x 698'	Compliant, with published declared distances
14	▪ Required: 500' x 1,000' ▪ Actual: 500' x 850'	Noncompliant	▪ Required: 500' x 1,000' ▪ Actual: 500' x 1,000'	Compliant, with standard graded RSA
32	▪ Required: 500' x 1,000' ▪ Actual: 500' x 900'	Noncompliant	▪ Required: 500' x 1,000' ▪ Actual: 500' x 900'	Compliant, with published declared distances

Runway Object Free Area (ROFA) – FAA design standards for ARC C-II mandates an 800-foot wide OFA extending the full length of the runway and 1,000 feet beyond each runway end. Runway 1-19 complies with this standard.

Runway Protection Zones (RPZs) – Currently, Runway 1-19 RPZs have a 500-foot inner width, 700-foot outer width, and 1,000-foot length beginning 200 feet beyond each runway end. About half of an acre underlies the Runway 19 RPZ that is currently not owned by the Airport, but is agricultural land. Likewise, approximately one- tenth of an acre within the Runway 1 RPZ is off airport. All land outside of Airport property, but within Runway 1-19 RPZs (8.9 acres) are planned for fee title acquisition. With the upgrading of Runway 1-19 to ARC C-III, the RPZ standard dimensions will increase to 1,700 feet for length, and 1,010 feet wide at the outer end. The 500-foot inner width is unchanged.

TAXIWAY SYSTEM

Taxiways link independent Airport facilities and require careful planning for optimum Airport utility. The taxiway system should provide for free movement to and from runways, terminal/cargo, and parking areas.

Runways 1-19 and 14-32 form an apex that intersects at the approach ends of Runways 19 and 14. An extensive taxiway system has been constructed at the Airport to support the orientation of these runways. The taxiway system consists of 10 taxiways/exit taxiways designated as A- F, H, and W- Z. All of these taxiways are 50 feet wide. The taxiways are designed to accommodate the current mix of aircraft that utilize the Airport (i.e., airline, general aviation, business jets, and fire attack).

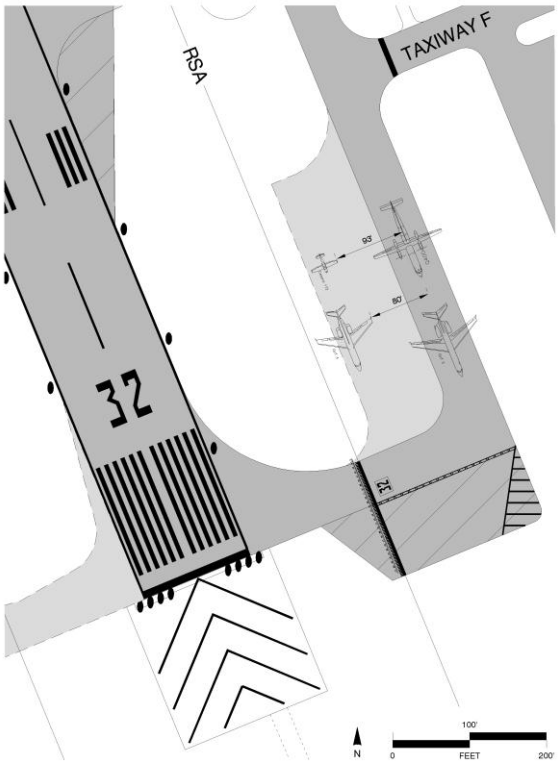


Figure 3G. Runway 32 Taxiway Detail

Taxiway Y is designated as a parallel taxiway. This is because it links all aircraft operations from the east side building area to the primary Runway 14-32. The taxiway is used by all aircraft currently operating out of the Airport. Except for Taxiways D, W, and U, all of the other taxiways have connections to Taxiway Y and provide access from five aircraft parking/storage aprons (designated A-E) to Runway 14-32. The Airport plans to extend Taxiway Y approximately 885 feet to the northwest to allow aircraft access to the proposed end of extended Runway 14.

Because it connects with Runway 32 at other than a right-angle, Taxiway Z will be decommissioned between Taxiway Y and Runway 32. It will be replaced with a new segment connecting Taxiway D to the end of Runway 32. Also, a new run-up area will be required south of new Taxiway F. This run-up area should be large enough to allow ARC C-III aircraft to pass one another, but not so large as to allow wingtip encroachment into the RSA.

Access to Runway 1-19 from the west side of the Airport is from Taxiways A, B, W, and U. Taxiways A and B traverse Runway 1-19 and Runway 14-32. The western sections of Taxiway A and B were sealed and recoated in early 2006. Taxiways A, B, and U mainly serve Experimental Aircraft Association (EAA) operations on the Airport's west side. Taxiway W, located on the west side of the Airport, is currently used by the Sonoma County Sheriff's Department for vehicle training activities and occasionally, for auto club rallies. Because of the non-aeronautical use of Taxiway W, this Master Plan proposes development of an inboard parallel taxiway to connect Taxiways B and D. This new proposed taxiway is tentatively designated Taxiway "V". With the development of the proposed new Taxiway V, it is also proposed to realign Taxiway D where it connects to Runway 1 (see inset opposite). Between the runways Taxiway B will be widened to 50 feet to accommodate use by larger aircraft during construction of the extensions of the two runways. Widening Taxiway B will also enable Runway 1-19 to continue to be readily used by larger aircraft whenever the Runway 14-32 is temporarily closed in the future.

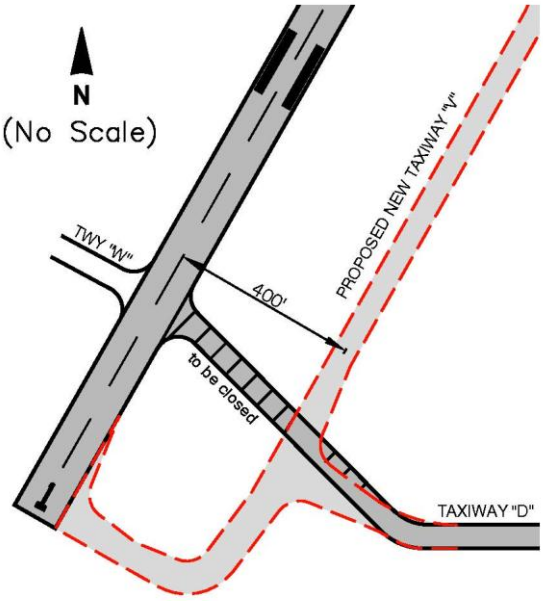


Figure 3H. Runway 1 Taxiway Detail

On the southern boundary of the Airport, Taxiway D supports Apron F. Taxiway D connects to Runway 1 and Runway 32, providing aircraft access to the west and east sides of the Airport.

Runway Hold Lines

Runway holding position lines (hold lines) identify the location on a taxiway where a pilot is to stop when not cleared to proceed onto the runway. All taxiways intersecting runways must have hold lines located at an appropriate distance from the runway centerline. The appropriate setback distance is determined by the design aircraft and the type of approach to the runway. For angled taxiways, the distance is measured from the edge of the hold line closest to the runway. Except for certain unique situations, the hold lines are to be installed perpendicular to the taxiway centerline. A discussion follows for Runways 14-32 and 1-19.

Runway 14-32 Hold Lines

As previously discussed, Runway 14-32 is designated as ARC C-III and has a precision approach serving Runway 32. The standard location for holding position markings is 250 feet. There are six holding position markings on the parallel taxiway, including exit taxiways that intersect Runway 14-32. An Instrument Landing

System (ILS)/Precision Obstacle Free Zone (POFZ) holding position is marked on the southeastern end of Taxiway Y. The function of the ILS/POFZ hold line is to delineate where aircraft should stop when other aircraft are utilizing the vertically guided approach to Runway 32. No part of the fuselage or the tail of an aircraft may infringe on the ILS/POFZ hold line. Holding position markings are established at the required setback for a C-III runway.

Runway 1-19 Hold Lines

Runway 1-19 is designated as ARC C-II. The standard setback for holding position markings is 250 feet. All taxiways intersecting Runway 1-19 meet or exceed this design standard. No changes are recommended.

AIR TRAFFIC CONTROL TOWER

The air traffic control tower (ATCT) facilities, function, and airspace were described in Chapter 1. Air traffic controllers must have a clear view of all arrival paths, departure paths and all ground (aircraft and vehicular) movements under their jurisdiction. In this regard, controller line-of-sight is an important factor for evaluating Airport improvements and certain off Airport development projects.

For operational and security reasons, this Master Plan recommends that the ATCT ultimately be relocated to a point between the runways or, alternatively, west of Runway 1-19, to enhance visibility between the tower, movement areas, and aircraft arriving or departing from the Airport. The ALP includes the controller critical site lines and other criteria that help define the areas available for building development; runway visibility zones, aircraft parking limits, and building restriction lines. It also shows one potential site for the relocation of the ATCT, and one alternative site. The ultimate site for the relocated tower will be determined by a site selection and analysis study conducted by the FAA.

AIRFIELD LIGHTING AND SIGNAGE

This section describes any changes to airfield lighting that may be necessary over the next 20 years. For purposes of this section, airfield lighting consists of the airport beacon, approach lighting, visual approach aids, runway lighting, taxiway lighting and miscellaneous airfield lighting.

Airport Beacon

A beacon is an integral part of an airfield lighting system. The beacon projects a beam of light in two directions, 180 degrees apart. The optical system consists of one green lens and one clear lens. At civil airports such as this Airport, the rotating mechanism is designed to rotate the

beacon to produce alternate clear and green flashes of light with a flash rate of 24-30 flashes per minute. The main function of the beacon is to indicate the location of a lighted airport (i.e., runways, taxiways etc.). At the Airport, the beacon is controlled by the ATCT and is located on top of the ATCT. No changes are planned.

Approach Lighting

Currently, Runway 32 is served by a Medium-Intensity Approach Lighting System (MALSR) with Runway Alignment Indicator Lights. No changes are recommended to this system. A future Omnidirectional Approach Lighting System (ODALS) is reserved for Runway 14 that would correspond with an enhanced GPS-based approach procedure. ODALS would reduce the future visibility requirement from 1 statute mile to ¾-statute miles.

Visual Approach Aids

Runway 14 is equipped with Visual Approach Slope Indicator (VASI) and Runway End Identifier Lights (REILS) lights that provide pilots with a visual reference of the approach profile during the final approach. For the same purpose, Runway 19 uses Precision Approach Path Indicator (PAPI) lights. As part of the planned extension of Runway 14-32, the existing VASI will be replaced with a PAPI.

Runway and Taxiway Lighting

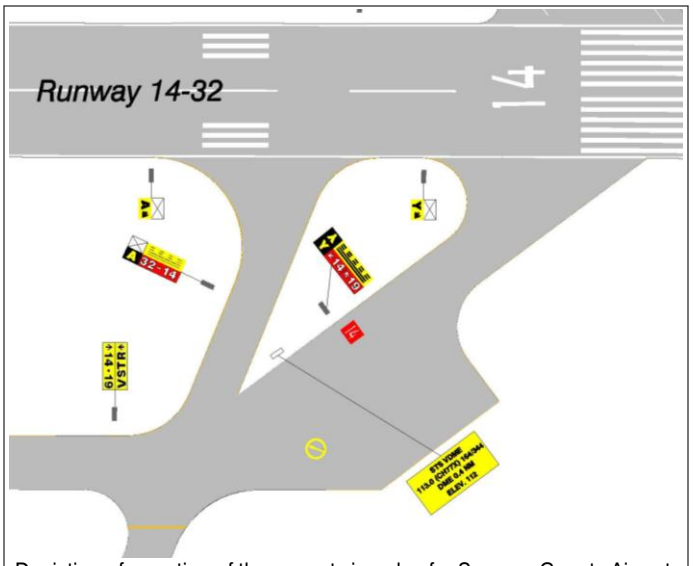
The runway and taxiway edge lighting on Runway 14-32 are adequate. Other than routine maintenance and electrical upgrades, no changes are recommended to the Runway 14-32 lighting system. However, Runway 1-19 is unlighted. Medium Intensity Runway Lights (MIRL) are recommended for Runway 1-19 because this is the back-up runway to Runway 14-32, and because it can be used as an alternative runway for night operations to reduce noise impacts. The addition of edge lights to Runway 1-19 is also essential to minimize closures of Runway 14-32 during construction of the proposed runway extensions.

Miscellaneous Airfield Lighting

Miscellaneous airfield lights include a variety of airfield elements including: wind indicators, obstruction lights, etc. Three wind cones serve Runway 14-32. All wind cones have obstruction lighting to assist pilots operating at night. Other objects penetrating navigable airspace may also require obstruction lighting in accordance with any airspace evaluations performed for obstacles penetrating Part 77 surfaces.

Airfield Signage

The Airport is certificated under the U.S. Code of Federal Regulations (C.F.R.) 14, Part 139 which requires a Sign Plan in the Airport Certification Manual. The Sign Plan must show the sign system needed to identify hold positions and taxiing routes on the movement area for air carrier aircraft in accordance with FAA Advisory Circular 150/5340-15, *Standards for Airport Sign Systems.*



Depiction of a section of the current sign plan for Sonoma County Airport.

The airfield signage plan will need to be updated regularly, requiring occasional modifications to airfield signs as needed to comply with current safety standards and address concerns in the *Runway Safety Action Plan.*

NAVIGATIONAL AIDS

Several ground-based navigational aids (NAVAIDs) were described in Chapter 1. Associated with these facilities are NAVAIDs critical areas that must be maintained clear of any object that can reflect the electronic signals and degrade navigational performance. Three of these critical areas exist at the Airport: the Very High Frequency Omnidirectional Range (VOR), the Runway 32 ILS glideslope antenna, and the Runway 32 ILS localizer antenna. All of these facilities are operated and maintained by the FAA. In the future, the Airport plans to upgrade the current Category I ILS to Category II special operations status.

VOR/DME and Critical Area

A VOR/DME (Santa Rosa – 113.0 MHz/Channel 77) is located on the west side of Runway 14-32. VOR/DME's radiate azimuth and distance information for enroute navigation and nonprecision instrument approach procedures. The VOR signals are susceptible to distortion caused by reflections. Although a complex mathematical analysis is required to determine the true effect that an object will have on signal reception quality, the FAA has adopted planning guidelines for object setbacks. The VOR/DME at the Airport meets FAA design standards. No changes are recommended.

Runway 32 Localizer Antenna

The existing ILS localizer (LOC) antenna serving Runway 32 is located about 850 feet northwest of the departure end of Runway 32 and within the Runway 32 departure end RSA. The large wooden structure (which is not airway-marked and is not frangible) that the LOC is mounted upon is considered to be an obstruction/hazard to aircraft operations. The LOC will be relocated as part of the planned extension of Runway 14-32 to the northwest. The LOC will be relocated to a point some 1,950 feet northwest of the current runway departure end. For planning purposes, this recommended relocation of the localizer antenna is depicted on the Airport Layout Plan (ALP). The localizer antenna must be relocated outside the RSA even if the runway is not extended.

Runway 32 Glideslope Antenna

A glideslope antenna serves Runway 32. The glideslope signal is used to establish and maintain an aircraft's decent rate until visual contact confirms the runway alignment and location. No changes are recommended.

Automated Surface Observing System (ASOS)

An Automated Surface Observing System (ASOS) is installed in the infield area of the Airport. The ASOS provides real-time weather information for pilots using the Airport. Weather information provided by the ASOS includes: altimeter setting, wind speed, wind direction, temperature, dew point, cloud cover, ceiling and precipitation. This information is available over a discrete Airport radio frequency (120.55 MHz when the ATCT is closed), via the telephone (707-573-8393), and internationally via the national aviation weather reporting network. This real-time weather information is of primary importance to pilots utilizing the Airport under Instrument Meteorological Conditions.

OTHER AIRFIELD DESIGN ISSUES

This section defines other airfield design setbacks not addressed in other sections, including: runway visibility zones, taxiway object free areas, aircraft parking limit lines, airport imaginary surfaces (C.F.R. 14 Part 77) and building restriction lines. When combined with the setbacks discussed in earlier sections (runway safety areas, runway object free areas, obstacle free zones, and controller line-of-sight, these restrictions establish the areas available for future aviation and non-aviation development discussed in Chapter 5.

Runway Visibility Zones

It is necessary to provide a clear line-of-sight from any point five feet above one runway centerline to any point five feet above an intersecting runway centerline within the runway visibility zone (RVZ). At towered airports, controllers provide the primary means of resolving runway conflicts, making the RVZ particularly important at airports without a 24-hour operating control tower.

Runway Visibility Points	
When the distance between the intersection and the runway end is:	Then the visibility point is:
≤ 750'	The runway end
>750' but < 1500'	750' from the runway intersection
≥ 1500'	Equidistant from the runway end and intersection

When Runway 14-32 is extended to the north in the future, the RVZ will shift slightly to the north and northwest. No existing structures will restrict the line-of-sight within the shifted RVZ. The shifted RVZ will not impose any significant restrictions to Airport development since the areas affected by the shift are largely designated to meet runway setback requirements. Additionally, the future RVZ will be enhanced as part of the ATCT relocation project.

Taxiway/Taxilane Clearance Standards Distance from centerline to fixed or movable object:		
Airplane Design Group (ADG)	Taxiway	Taxilane
ADG-I	44.5'	39.5'
ADG-II	65.5'	57.5'
ADG-III	93.0'	81.0'

Taxiway/Taxilane Object Free Areas

The purpose of Taxiway/Taxilane Object Free Areas (TOFAs) is to provide adequate wingtip clearance for the design aircraft. Additionally, taxiways are major throughways in which aircraft taxi at higher speeds while taxilanes are generally narrow corridors within or adjacent to aircraft parking areas where aircraft taxi at low speeds. Consequently, Taxiway OFAs are wider than Taxilane OFAs. The parallel Taxiway Y serving Runway 14-32 provides clearances for ADG III aircraft (wingspans of less than 118 feet). The westward sections of Taxiway A and B are designed to meet clearances for small general aviation aircraft; ADG I (wingspans of less than 49 feet).

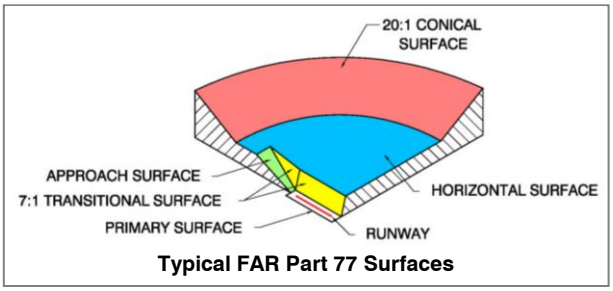
Taxilanes are more restrictive and may be striped according to individual tenant needs. Public use taxilanes may be restricted to ADG I through III, depending on the needs and purpose of a particular parking arrangement.

Aircraft Parking Limits

Aircraft Parking Limit (APL) lines are established to define where it is appropriate to park aircraft. Depending on the configuration of an airfield, APL lines may be set with respect to a runway or taxiway and in some cases, other required clear areas (NAVAID critical areas and RVZ). Due to the airfield configuration, the APL lines at the Airport are set with respect to both the taxiway OFAs and runway setback requirements. All APL lines are depicted on the ALP.

Airport Imaginary Surfaces

C.F.R. 14 Part 77, *Objects Affecting Navigable Airspace*, establishes standards for determining obstructions in navigational airspace. This airspace is defined for each airport by a series of imaginary surfaces. The dimensions and slopes of these surfaces depend on the configuration and approach categories of the runway system. Generally, the most critical among the imaginary surfaces are the primary surface and the approach surface.



Typical FAR Part 77 Surfaces

As noted earlier, the Airport has a published precision instrument approach to Runway 32 and non-precision instrument approaches to Runways 14 and 32. The GPS approach to Runway 14 has visibility minimums not lower than 1-statute mile. The established procedures to both runways serve the Airport well.

An Airport Airspace Plan depicting the imaginary surfaces associated with the lowest visibility minimums planned for the Airport, objects penetrating those surfaces, and the proposed disposition of those objects is being prepared as part of the ALP set to be provided to the FAA.

Building Restriction Lines

The building restriction line (BRL) generally defines the limits of development of all on-airport structures, except facilities required by their function to be located near runways and taxiways. Areas not suitable for building areas include existing and ultimate RPZs, runway and taxiway object free areas, runway visibility zones, NAVAIDs critical areas, instrument approach obstacle clearance surfaces and controller line-of-sight. After these restrictions are taken into account, the ALP considers the height restrictions associated with airport imaginary surfaces. Where no other restriction exists at the Airport, the BRL has been established at a minimum distance of 750 feet from the centerline of Runway 14-32. This distance is the former FAA standard for runways having precision instrument approaches. At this distance, a 35-foot tall building situated at the same elevation as the runway would not penetrate the 7:1 transitional surface of FAR Part 77. Because several of the existing buildings are set approximately along this line and not closer, the effect is to create a visually uniform "flight line" that faces the runway. Continued application of the established 750-foot BRL location for Runway 14-32 is recommended, where practical.

The BRL is established 500 feet from the centerline of Runway 1-19, on both sides of the runway. At this distance, the BRL clears the 7:1 transitional surface of FAR Part 77 and allows for a 35-foot tall building at the same elevation of the runway.

Service Roads

Service roads are an important component of both routine and emergency airport operations. Airport operations staff need to reach all parts of the airport on a daily basis to conduct

inspections and maintenance activities. When responding to emergencies, service roads can provide quick access to areas of the airport less readily reachable from a runway or taxiway.

SECURITY CONSIDERATIONS

Following the terrorist acts of September 11, 2001, increased emphasis has been placed on all facets of on-Airport security. It is noted that the Airport has a variety of security functions already in place due to the presence of airline operations. The airfield is patrolled regularly by Sonoma County Sheriff's Department personnel and County Airport operation personnel. Special use facilities such as CAL FIRE attack operations and REACH have been provided with segregated facilities, making unauthorized access to these aircraft and equipment more difficult. The Airport is currently in compliance with all Transportation Security Agency requirements for a Part 139 air carrier airport.

Airport Perimeter Fencing

In 2006, the Airport's perimeter fence and gate access system were upgraded. Access through any of the gates is permitted utilizing a secure key system. In the future, it may be desirable to provide lighting at all gate entrances and security cameras at key access points.

FUTURE AIRPORT DEVELOPMENT

To ensure an efficient and logical pattern of airfield development at the Airport over the long term and to prevent introduction of incompatible land uses, the Airport should continue to acquire additional land as needed for approach protection, land use compatibility, and other operational and safety reasons.

In the future, it is proposed that the Airport will grow to 1,177.2 acres held in fee simple, a net increase in size of 129.1 acres (see Figure 3A). This additional 129.1 acres would be needed for the runway protection zones (RPZs) and approach protection areas associated with the potential extensions of Runways 14 and 19. The number of acres covered by avigation easements would be reduced from 62.4 to 57.0 acres. This reduction would occur from the conversion of 5.4 acres of existing avigation easements to fee simple acquisition.

Figure 3I depicts proposed future Airport land uses. The underlying existing on-Airport land uses in the legend remain, but an overlay has been added to better illustrate the Airport's functional areas. These areas are defined as follows:[4]

[4] When added together, the functional areas total 1,036.4 acres. The remaining 11.7 acres are taken up by sections of roadways and taxiways that have not been classified.

Aeronautical (A)

The Aeronautical land use category affords the opportunity for a wide range of existing, new or expanded aviation and aviation-related uses, including, but not limited to:

- General and corporate aviation facilities, including air ambulance, air cargo, air taxi and air charter services
- Fixed base operations (FBO) facilities
- Governmental operations (CAL FIRE, County Sheriff, ARFF, Airport operations and maintenance)
- Aircraft maintenance and repair facilities
- Aircraft hangars, tiedowns, and aircraft parking
- Fuel storage and dispensing facilities and equipment
- Commercial aviation suppliers and services
- Navigational aids and radio communications equipment and facilities
- Access roads and automobile parking
- Land to be acquired for future aeronautical use

Aeronautical/Non-Aeronautical (A/NA)

This category of use is designed to provide flexibility for future development. Depending on demand or other market factors the areas designated A/NA may be developed for either aeronautical or non-aeronautical purposes. For aeronautical uses, see the definition of Aeronautical above. For non-aeronautical use see the following definition for Non-Aeronautical.

Non-Aeronautical (NA)

The Non-Aeronautical land use category identifies the areas designated for non-aviation revenue producing commercial uses on leased Airport land. Such uses include, but are not limited to:

- Public and semi-public facilities
- Office/industrial/research facilities
- Automobile parking

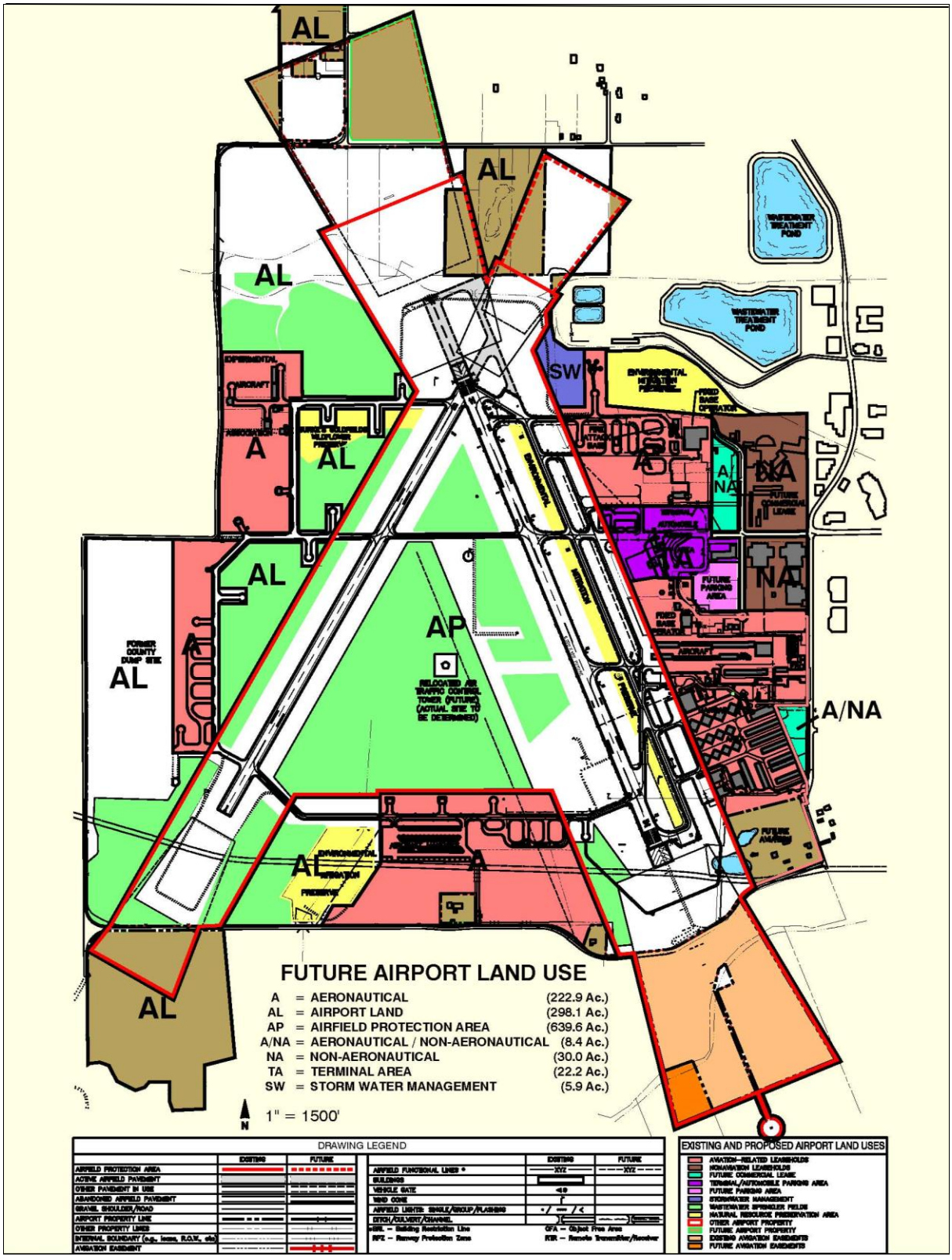


Figure 3I

Future Airport Land Use

Airfield Protection Area (AP)

The Airfield Protection Area is defined primarily by FAA safety standards and obstruction clearance criteria. It includes runways and their associated taxiways, safety areas and existing and proposed runway protection zones (RPZs). Allowable uses are determined by their aeronautical function. Some non-aeronautical uses are also allowed if they do not interfere with Airport safety and operational efficiency. Allowable uses include, but are not limited to:

- Air traffic control, and air navigation and communications facilities and equipment
- Visual and electronic landing aids, including lights and supporting equipment
- Wind and weather monitoring facilities and equipment
- Environmental mitigation
- Waste water sprinkler fields
- Agricultural/ non-public open space uses
- Access and service roads

Airport Land (AL)

Areas included within the Airport property boundaries that are not designated for any specific development, but which may support a variety of individual or combined uses, including, but are not limited to:

- Approach protection
- Safety buffer zones
- Navigational aids and radio communications equipment and facilities
- Environmental mitigation
- Waste water sprinkler fields
- Agricultural/non-public open space uses

Terminal Area (TA)

The Terminal Area land use classification provides for the location and operation of the commercial air passenger terminal and its related functions. Ancillary uses include, but are not limited to:

- In-terminal retail sales, food service, and car rental counters/offices
- Administrative/security offices
- Automobile parking
- Rental car parking and storage
- Transit connections

Storm Water Management (SW)

This land use class identifies an area or areas for the containment and detention of Airport storm water runoff.

4

Building Area Development

OVERVIEW

The building area of an airport encompasses all of the airport property not devoted to runways, major taxiways, required clear areas, setbacks, and other airfield-related functions. Common uses of building area land at airports similar to the Airport, i.e., those offering both commercial and general aviation services, are listed in the box to the right.

This chapter discusses the factors that affect the siting and development of building area facilities at the Airport. Two separate types of facility needs are examined: commercial aviation and general aviation. The focus is on providing direction for the appropriate development and use of these Airport building areas.

Typical Airport Building Area Functions

- Air passenger terminal
- Automobile parking
- Rental car pick-up and drop-off
- Administration building or airport offices
- Fixed base operations (FBO) facilities
- Based aircraft tie downs and storage hangars
- Transient aircraft parking
- Pilots' lounge / flight preparation room
- Fuel storage and dispensing equipment
- Aircraft Rescue and Firefighting (ARFF) facility
- Aircraft washing area
- Air traffic control tower

Figure 4A, the Terminal Area Concept Plan and the Airport Layout Plan (ALP) are presented at the end of this chapter.

DESIGN FACTORS

Many factors will influence the planning and, later, the development decisions associated with the Airport's commercial and general aviation building areas. Most of these factors can be grouped under four basic headings:

Demand — The forecasts developed in Chapter 2 indicate that additional aviation-related facilities are warranted. In particular, additional air passenger terminal and based aircraft storage facilities will be needed to handle the projected demand.

Setback Distances — The boundary of the airport building area is determined in large part by the necessary setback distances from an airport's runways and taxiways. As discussed in the preceding chapter, the following design criteria are recommended:

- A minimum of 750 feet from the centerline of Runway 14-32, and 500 feet from Runway 1-19 to any future buildings, or fixed or immovable objects;
- A minimum of 93 feet from primary taxiway centerlines to aircraft parking positions and buildings, and 81 feet from taxilane centerlines;

- A minimum of 85 feet between new facing T-hangars, and 100-120 feet between new facing box or corporate hangars (depending on design aircraft wing spans).

These setbacks meet the standards to accommodate regular use by aircraft with wingspans of up to 118 feet (ARC C-III aircraft) on all primary taxiways. Occasional use by aircraft with greater wingspans should be acceptable, provided that the pilots of the larger aircraft exercise appropriate care while maneuvering on the taxiways and apron areas. The lesser dimensions will accommodate light single- and twin-engine aircraft on the taxilanes in the general aviation building area, as well as most small- medium-sized business jets.

Additionally, structures must be sited so as not to block required sight lines for pilots along the runways, and air traffic controllers in the existing and planned airport traffic control tower. Sight line standards for runways and air traffic control towers are contained in FAA Advisory Circular 150/5300-13, *Airport Design*.

Accessibility — An important design consideration is the ease of access to individual portions of the terminal and general aviation building areas from both the runway/taxiway system (airside) and public roads (landside). The general airfield layout is expected to remain unchanged, except for the proposed extensions of Runways 14 and 19 and their associated taxiways. However, modifications to the terminal area access road, general circulation system and parking lots will be required for development of a new air passenger terminal.

Development Staging — Another important factor in the preparation of a building area plan is the timing of future development. The objective is to have a plan that is flexible enough to adapt to changes in type and pace of facility demands, is cost-effective, and also makes sense at each stage of development. Sometimes, the best location for facilities in the short-term may conflict with the optimum long-range plan.

PASSENGER TERMINAL

The existing Airport terminal building is a single-story building located at the western end of Airport Boulevard. The passenger terminal has a total gross floor area of approximately 14,600 square feet: a 7,600 square foot lobby, a 4,400 square foot waiting area, and a 2,400 square foot passenger holdroom (this figure does not include overhangs or covered walkways). The lobby area includes the airline ticket office, bag check area, rest rooms, and a restaurant. The restaurant takes up 3,900 square feet, or 27 percent of the existing terminal building.

Both short-term and long-term passenger automobile parking is located immediately to the east and north of the terminal building. There are currently about 715 parking spaces at the Airport. Of these, 459 are long-term parking spaces and 122 are short-term parking spaces. There are an additional 132 employee and business-related parking spaces in the terminal area, including 47 for rental cars. There are also 2 terminal curbside parking places reserved for buses.

Passenger Terminal Space Requirements

A well designed passenger terminal, in terms of size and layout, contributes to the efficiency of an airport's operation and for the passenger, a less stressful travel experience. These factors should be of prime consideration in designing and building a new passenger terminal at the Airport. Typically, the space requirements of a terminal facility are a function of peak hour demand activity, which is determined from the seating capacity and boarding load factors of aircraft serving the airport.[7] Currently, the Bombardier Q-400 with a seating capacity of 76 passenger seats is the only regularly scheduled commercial airliner using the Airport.[8] In the future it is anticipated that larger aircraft (from 100 to 150 passenger seats) may use the Airport. This analysis uses the 104-seat Embraer ERJ 190 to represent future conditions. Table 4-1 summarizes projected peak hour passenger levels for current conditions and two projected future scenarios.

Table 4-1

Projected Peak Hour Total Passengers

Scenario	Peak Hour Enplaned Passengers	Peak Hour Deplaned Passengers	Peak Hour Total Passengers
1 Q-400 (Current)	76	76	152
Projected			
2 Q-400	152	152	304
2 ERJ 190 & 1 Q-400	284	284	568

The existing terminal building and passenger holdroom are currently operating at close to their functional capacity levels. Two or more aircraft loading/unloading passengers at the same time will result in substantial overcrowding of both the terminal building and holdroom.

Terminal Space Requirement Recommendations

This section looks at the requirements to accommodate the above peak hour passenger demand levels and related parking requirements. Table 4-2 summarizes these requirements.

[7] The design peak hour represents 25% of the enplanements for the average day of the peak travel month (ADPM). The peak month is normally considered to represent 10 percent of total annual enplanements.

[8] A 100% load factor is assumed for the peak hour calculations. Peak hour operations at lower load factors would result in higher levels of efficiency and service within the terminal.

From Table 4-2 it can be seen that from an ideal terminal design standpoint the existing Airport air passenger terminal is about one-third the size normally required to accommodate 152 total enplaning and deplaning passengers during the peak hour through one gate position.[9] A terminal of approximately 33,700 square feet would be required to accommodate these 152 peak hour enplaning/deplaning passengers. This, of course, assumes a desire for a high level of passenger service and convenience, and a variety of passenger amenities in addition to the basic requirements for ticketing, baggage handling, security and holdroom functions. It also assumes the inclusion of 5,400 square feet of Airport administrative and TSA security offices, and community meeting, conference and exhibit rooms. It does not assume that the terminal would have only one gate position. A minimum of two gate positions would be required for redundancy, but only one gate position would be utilized during the peak hour period. Similarly, with two gates positioned utilized during the peak hour, a third gate position would have to be available for backup, and so on.

A three-gate terminal designed to accommodate 304 enplaning/deplaning passengers during the peak hour through two occupied gate positions would require an approximately 48,500 square foot terminal building.[10] This also includes the above 5,400 square feet of Airport administrative and TSA security offices, as well as community meeting, conference and exhibit rooms. With a four-gate terminal, having three gates occupied during the peak hour, a terminal area on the order of 78,000 square feet, including amenities, would be desirable.[11] Figure 4A, Terminal Area Concept Plan, depicts the site for a new passenger terminal northwest of the existing passenger terminal. This site could accommodate a terminal with up to five aircraft gate positions and is located such that the existing terminal building could continue to operate until the new terminal became operational. The ultimate design of the new terminal will be the subject of a separate study, as will its ultimate space requirements and phasing. This study will also determine what should be done with the existing terminal buildings.[12] Both the existing aircraft rescue and fire fighting (ARFF) building and the air traffic control tower (ATCT) are proposed to be relocated. The relocation of these two facilities will be the subjects of separate studies.

In association with the new terminal site, a new access roadway would be constructed and the existing parking lots would be reconfigured. The new access roadway would be two one-way lanes into the terminal area from Airport Boulevard, expanding to three lanes in front of the terminal(s), and back to two lanes as it turns back around to reconnect with Airport Boulevard.

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[9] The existing terminal building has a nominal capacity of around 75,000 annual enplaned passengers. However, more passengers could be accommodated, but with a lower level of service and comfort. Horizon Air's current Airport service with five flights a day with 76-seat Q-400 aircraft is equivalent to about 66,500 annual passenger enplanements.

[10] A 49,000 square foot terminal would accommodate close to 146,000 annual enplaned passengers and provide a high level of passenger amenities and services. This Master Plan forecasts 200,000 annual passenger enplanements in 2010.

[11] A 78,000 square foot terminal would accommodate almost 273,000 annual enplaned passengers with a high level of service. This Master Plan forecasts 262,373 annual enplanements in 2020.

[12] Possible uses include car rental agencies, a Federal inspection services (FIS) facility for international (Mexico, Canada) flights, stand alone restaurant, or demolition for future terminal expansion.

	Scenario		
	One Q-400	**Two Q-400s**	**Two ERJ 190s and One Q-400**
Peak Hour Enplaned Passengers[1]	76	152	284
Peak Hour Deplaned Passengers	76	152	284
Total Peak Hour Passengers	**152**	**304**	**568**
AIRLINE / AIRSIDE SPACE			
Airline Ticketing			
ATO Counter – Lineal feet	22	36	48
ATO Office	240	1,200	1,400
Baggage Make-up	500	2,000	3,400
Baggage Claim			
Baggage Input	180	1,200	2,200
Subtotal Airline Space	**920**	**4,400**	**7,000**
CONCESSIONS			
Rental Car			
RAC Counter – Lineal feet	29	36	48
RAC Office Space	215	700	900
Restaurant	3,900	3,900	6,000
Gift Shop	0	500	750
Other Lease Space	1,000	1,500	2,000
Subtotal Concessions	**5,115**	**6,600**	**9,650**
PUBLIC SPACE			
Public Circulation	2,000	12,000	22,500
Public Lobby / Seating	800	2,600	4,500
ATO Queue Area	450	720	960
RAC Queue Area	225	360	480
Security Screening Area	860	1,000	1,800
Baggage Claim PAX Area	480	2,400	4,400
Baggage Claim Device – Lineal feet	65	160	240
Passenger Hold Room (Secured)	1,820	4,800	8,750
Gates	1	2	3
Restrooms (Unsecured)	855	1,800	3,200
Restrooms (Secured)	250	900	1,600
Subtotal Public Space	**7,740**	**26,580**	**48,190**
SUPPORT SPACE			
Airport Administration/Security	0	3,600	3,600
Public Meeting/Conference/Exhibit Rooms	0	1,800	1,800
Mechanical / Electrical / Janitorial / Storage	270	1,200	1,200
Subtotal Support	**270**	**6,600**	**6,600**
Subtotal	**14,045**	**44,180**	**71,440**
Building Structure / Non-usable Space	**600**	**4,260**	**6,660**
Grand Total Square Feet	**14,645**	**48,440**	**78,100**

Notes: All figures represent square feet unless otherwise noted.
Calculations based on 100% peak hour load factor.

Sources: FAA AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*;
FAA AC 150/5360-9, *Planning and Design of Airport Terminal Facilities at Non-Hub Locations*; Mead & Hunt, Inc.

Table 4-2

Preliminary Terminal Space Requirements
Sonoma County Airport

Although not detailed on the concept plan, there would be bus and taxi access to the terminal curbsides, as well as areas for passenger drop-off and pickup. A separate rental car pick-up/drop-off and storage lot is envisioned for the office building where the Airport administrative office is currently located. Parking for 1,400-1,500 cars would be provided in a combination of short-term and long term parking lots. The ultimate parking requirements and parking lot layouts will be the determined as part of the terminal design study.

Safety and Security

Safety and security requirements for airports that offer scheduled airline service are far more elaborate than at airports that only have general aviation. Since 1970, the FAA has had the statutory authority to issue airport operating certificates to airports served by commercial air carriers. Requirements for obtaining and maintaining the certificate are contained in Federal Aviation Regulations Part 139, *Certification and Operations: Land Airports Serving Certain Air Carriers*.

The purpose of the certification process is to ensure that commercial passenger service airports meet certain safety standards. These standards include requirements for airport design, construction, maintenance, operations, fire fighting and rescue equipment, runway and taxiway guidance signs, control of vehicles, management of wildlife hazards, and record keeping.

In February of 2004, the FAA issued new Part 139 certification standards that extend the requirements of Part 139 to include airports accommodating air carrier aircraft with more than 10 seats. The Airport has a Part 139 operating certificate. To obtain a Part 139 operating certificate, the following must be in place:

- Perimeter fencing and access controls.
- Runway and taxiway guidance sign system.
- Operational surfaces required to meet Part 139 requirements.
- Airport Operations and Emergency Manuals.
- Aircraft fire fighting and rescue (ARFF) equipment.
- Aircraft fire fighting and rescue equipment building.
- Passenger terminal building.
- Qualified airport operations and fire fighting personnel.

Prior to November 2001, commercial service airport security was regulated by the FAA's Civil Aviation Security Division. Federal Aviation Regulations Part 107 established security requirements. The Aviation and Transportation Security Act of 2001 established the Transportation Security Administration (TSA) which now oversees security at commercial

service airports. In order to accommodate commercial passenger operations at the Airport, the Airport has modified their existing passenger terminal facility to meet TSA requirements for passenger and baggage screening, hold areas, and administrative areas.

Air Traffic Control Tower

The principal FAA function at the Airport is operation of the Airport Air Traffic Control Tower (ATCT). From 0700 local time (LT) through 2000 LT, ATCT staff provides ground and local air traffic control services in the immediate vicinity of the Airport. Air traffic controllers must have a clear view of all arrival paths, departure paths and all ground (aircraft and vehicle) movements under their jurisdiction. In this regard, controller line-of-sight is an important factor for evaluating airport improvements and certain off airport development projects.

The ACTC is located immediately south of the airline terminal building. During heightened threat levels, the FAA requires a 300-foot clear area around the tower. This could result in the closing of the terminal access roadway and much of the short-term parking lot. For operational and security reasons, it is recommended that the tower ultimately be relocated. The best site for the relocated tower will be determined by an independent study.

Aircraft Rescue and Fire Fighting (ARFF)

As mentioned above, because the Airport provides commercial airline service, it must be certified under Federal Aviation Regulation Part 139. This means that qualified airport operations and fire fighting personnel, equipment, and vehicles are required to be located on Airport. The ARFF building at Sonoma County Airport is located north of the terminal building. The ARFF facility houses a new, state-of-the-art fire fighting vehicle, and rescue equipment. The ARFF facility was constructed in the 1970s. It does not meet current airport design and safety standards and should be replaced. The building will need to be relocated before the new passenger terminal is constructed. However, in the event the passenger terminal is not constructed, the ARFF facility will still need to be replaced.

OTHER FACILITY REQUIREMENTS

Numerous facilities are essential to accommodation of future demands for both aviation-related and nonaviation use of the Airport building areas. Identifying these needs is an essential component of facility planning. Airport staff, pilots, and other airport users provided input to this assessment of the future building area facility requirements at the Airport.

Aircraft Parking and Storage

Aircraft parking and hangar storage constitutes the most extensive aviation-related use of building area land at the Airport. Additional space will be required to meet future demands. In

2011, there are about 356 aircraft based at the Airport. This Master Plan forecasts an estimated 64 more aircraft will be based by the end of the 20-year planning period. Several types of facilities will be needed to accommodate this demand.

Aircraft Parking Apron

Airports need paved apron areas for parking the portion of their based aircraft fleet that is not hangared, as well as for short-term use by transient aircraft visiting the airport. Including the airline apron (B), there are seven apron areas at the Airport designated as A (transient), C (FBO), D, E, and F. Facilities are available for approximately 596 based and transient aircraft Airport-wide, including 246 County-owned hangars of varying sizes in the southeast quadrant of the Airport (Aprons D and E) and twenty County-owned small hangars in the Apron F area at the south end of the Airport, along with privately-owned hangars. There are an additional 58 fixed-wing aircraft, including jets located in private hangar facilities and 13 aircraft on tiedowns on the east side (including 3 CAL FIRE aircraft). Twelve helicopters are based on the east side including those owned by the Sonoma County Sheriff's Department and REACH. On the west side, the EAA maintains facilities for 36 aircraft, including 19 in hangars and 16 on tiedowns.

Aircraft Hangars

As is the case at most general aviation airports, the demand for aircraft parking space at the Airport is primarily for hangars. Aircraft storage hangars can be grouped into five general categories, of which all five are currently found at the Airport:

T-Hangar

T-Hangars—T-hangars are the most common form of aircraft storage at most general aviation airports including the Airport. The back-to-back arrangement of the individual T-shaped bays is efficient from a structure-size standpoint, but requires taxilane access on both sides of the building. For reasonable economy of construction, T-hangar buildings preferably should contain at least 10 aircraft bays. Hangars of this type are located on Apron D and Apron E.

Executive Hangar

Rectangular "Executive" Hangars—Rectangular-shaped hangar units are well-suited to locations where access is practical to only one side of the building. The hangar bays are larger than typical T-hangar units and usually are designed to accommodate twin-engine airplanes or small business jets. Alternatively, they sometimes are used for storage of two or three smaller aircraft. The buildings may

consist of either single or multiple bays. Some executive hangars have small office areas attached. Hangars of this type are located on Apron E and F.

Corporate Hangars

Conventional "Corporate" Hangars—Corporate hangars are large, free-standing structures intended to house business jets or multiple smaller aircraft. A size of 10,000 square feet is common at many general aviation airports, although the buildings can be somewhat smaller or considerably larger. Office and pilots' lounge areas typically are attached. Hangars of this type are mostly located on the southeast side of the Airport, on Apron E.

Shade Hangars—Shade hangars are similar to T-hangars except that they do not have doors or interior partitions. They help keep the sun and rain off the aircraft, but do not provide the security afforded by an enclosed T-hangar. Shade hangars can be constructed advantageously on existing apron pavement in that water drainage through the building is not a concern. Compared to T-hangar construction where existing pavement must be removed and the site regraded, shade hangars may cost only half as much. On raw ground, the differential between the two types is only about 20%. Another good application of shade hangars is in locations where the mass of an enclosed building would act as a visual barrier. The shade hangars at the Airport are located on Apron D.

Shade Hangar

Portable Hangar

Individual "Portable" Hangars—Portables are small, individual hangars designed to be constructed elsewhere and transported to the airport. They typically are T-shaped, but can be rectangular. An advantage of portables is that they can economically be added in increments of just one unit at a time (the cost per unit, though, is similar to or even higher than the cost of an individual unit in a multiple-unit T-hangar building). Most often they are owned individually rather than by the airport or a hangar developer. Portables also have the advantage of being capable of installation almost anywhere on the airport, including on existing apron pavement or on unpaved areas. A chief disadvantage is that their inconsistency of appearance and often poor maintenance can make them unattractive. Except for five portable hangars located on Apron D, all of the portable hangars at the Airport are located on Apron F.

Tiedown Apron

Spaces for based and smaller transient aircraft are normally equipped with tiedown anchors and chains or ropes to prevent the aircraft from being blown around by strong winds.

Over the 20-year time frame of the *Master Plan*, a reasonable assumption for planning purposes is that hangar space will be required for essentially all of the 64 additional aircraft expected to be based at the Airport.[13] The greatest need is anticipated to continue to be for T-hangars. Alternatively, shade hangars may be desirable for a portion of this demand. Portable hangars should continue to be excluded from the Airport except under extraordinary circumstances. Only aprons D and E have any potential hangar development space available, and this is very limited. Apron F is currently built out. Both Kaiser Air and the Sonoma Jet Center plan to develop additional hangar facilities on their leaseholds and a private developer is looking at building some new hangars south of Flightline Boulevard immediately east of Sonoma Jet Center and north of Apron D. In addition, there are some infill and redevelopment opportunities around Aprons D and E. The only other area currently suited for hangar development is the area around Apron F. This site has enough available land to accommodate virtually all of the projected hangar demand. An eighteen acre site immediately south of Apron E has been proposed for acquisition. This parcel would logically serve the extension of Apron E and would be ideal for large box and corporate hangar development. In addition to new hangar development, several hangar buildings on Apron D are nearing the end of their useful life and should be redeveloped.

AVIATION SUPPORT FACILITIES

Although aircraft parking occupies the majority of aviation-related building area land at general aviation airports, various other facilities serve essential supporting functions. Among the aviation support facilities that exist and/or may be necessary at the Airport are the following:

Airport Administration Building

Many general aviation airports have an administration building that houses not only the airport management offices, but also a pilots' lounge, rest rooms, and other facilities for pilots and the general public. Sometimes a coffee shop or restaurant is included. Because of space limitations the Sonoma County Airport administrative offices are no longer located in the passenger terminal building. The Airport offices are currently located at 2282 Airport Boulevard, east of the short-term parking lot. Other occupants of the building include FAA personnel, KLUV radio station, and LightGuard. This building may

[13] This also assumes that some occupants of existing hangars and tiedowns will want new hangars and that others will occupy the older hangars vacated by those moving into new hangars.

be demolished as part of the overall terminal development program and the site used for rental cars or parking. The Airport administrative offices would be relocated into the new terminal building.

Fixed Base Operations (FBO) Facilities

Fixed base operators constitute the commercial side of general aviation business. They provide a wide variety of facilities and services for pilots and their aircraft (see adjacent box). Busy airports usually have multiple FBOs, while smaller ones may have only one or none. The primary FBOs at an airport commonly offer many of these facilities and services; specialized FBOs may supply just one. Also, at many airports, the airport operator provides some or all of the hangar facilities and fueling services. FBOs often develop and own their facilities on land leased from the airport, but in many cases both the facilities and the land are leased. Sites for primary FBOs should be situated where they are easily visible and accessible both from the airport's airside and from adjacent roads. Specialty FBO sites can be in more isolated locations, although vehicle access without the need to go through a security gate is desirable.

Examples of FBO Facilities and Services

- Aircraft rental and charter
- Flight instruction
- Flight preparation room, pilots' lounge, and rest rooms
- Pilots' supplies
- Aircraft and avionics maintenance and repair
- Aircraft fueling
- Based aircraft hangar and tiedown space rental
- Transient aircraft parking

Facilities and services provided by the FBOs at the Airport are listed in Chapter 1, Table 1-

As noted in Chapter 1, the Airport has two primary and several specialty fixed base operators. Plans for long-term development of the Airport's building area should allow for expansion of the existing primary FBOs, as well as establishment of additional specialty FBOs.

Other Support Facilities

Aircraft Fueling Facilities—Pilots can obtain fuel from two FBO facilities on the Airport. All fuel is stored in above-ground tanks. One FBO offers 100 low-lead AvGAS from a card lock self-serve facility located to the east of the "Redwood" hangar. Both FBOs also provide 100LL and Jet-A fuel dispensed from fuel trucks. Fuel is available 24 hours a day. The long term availability of 100LL remains uncertain and there is no clear replacement for this fuel.

Aircraft Wash Rack—The Airport has one designated aircraft washing facility that meets today's standards for run-off pollution control. Any significant new apron development should provide for an additional state-of-the-art aircraft wash rack.

Air Cargo Facility—At present, there is no designated air cargo handling facility at the Airport. Two sites on the Airport (on Aprons D and E) are used by FedEx and UPS, respectively, for small package shipments. As cargo volumes increase, some of the cargo will be transported as belly cargo in the baggage compartments of air carrier aircraft. The integrated cargo carriers (e.g., FedEx and UPS) should have their own consolidated air cargo operations area, particularly

if strict TSA cargo security requirements are implemented. An area in the vicinity of Apron F has been identified as a potential site for this purpose. However, other infill options exist on the east side of the Airport. This topic should be reevaluated when the cargo carriers indicate that they anticipate introducing the larger cargo aircraft.

The locations of these and other proposed improvements are depicted on the *Draft* ALP at the end of this chapter.

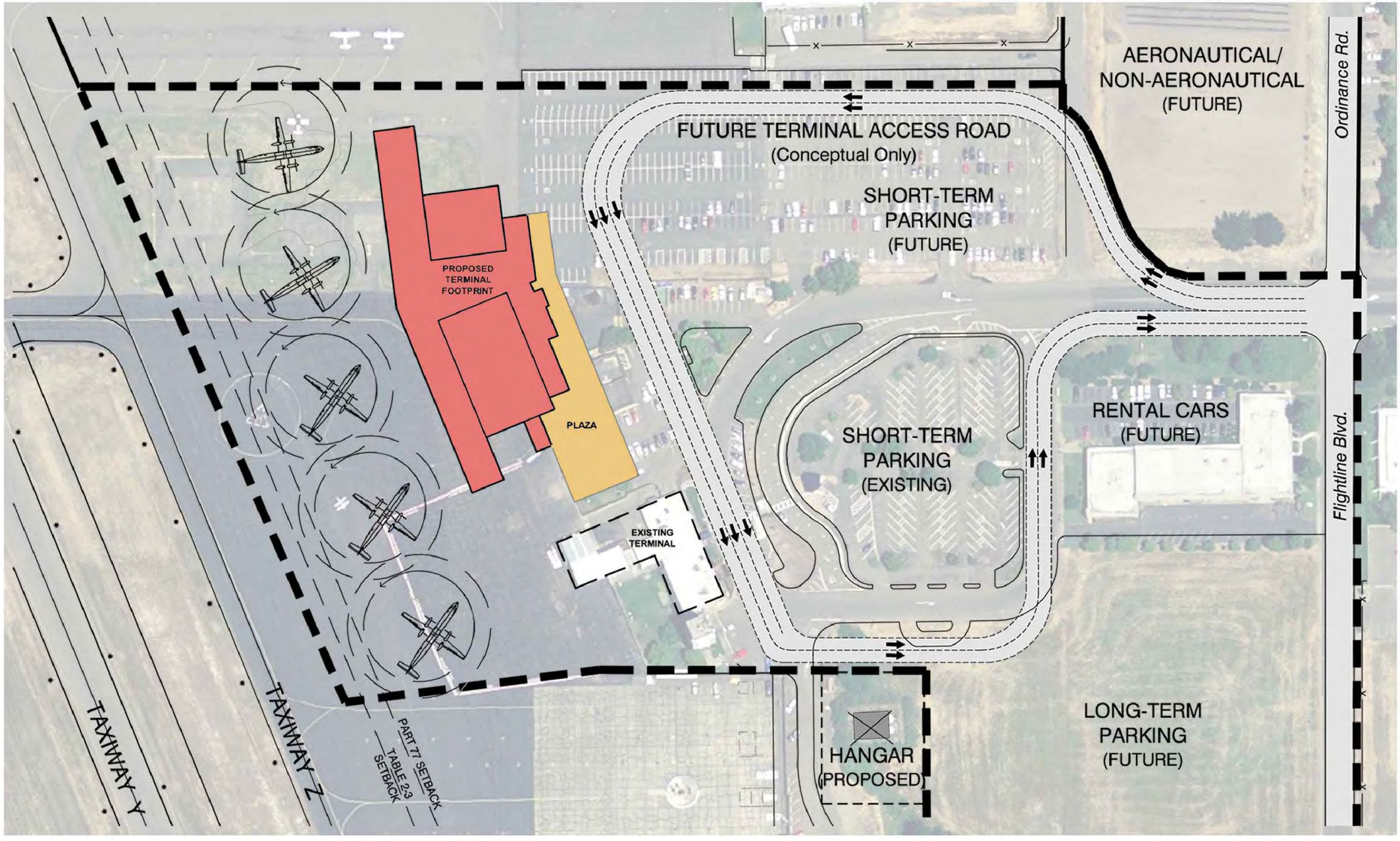

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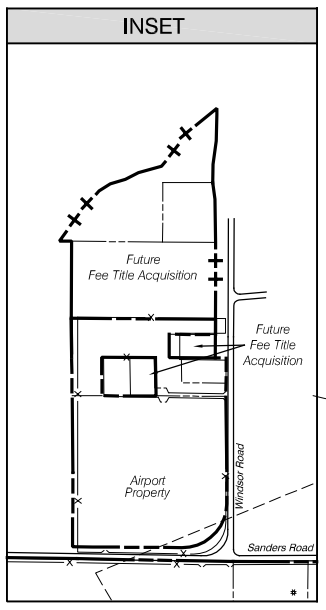
Figure 4A

Terminal Area Concept Plan
Sonoma County Airport

Prepared By: Mead&Hunt *www.meadhunt.com*



DRAWING LEGEND

	EXISTING	FUTURE
ACTIVE AIRFIELD PAVEMENT		
OTHER PAVEMENT IN USE		
PAVEMENT TO BE REMOVED		
DIRT OR GRAVEL ROAD		
AIRPORT PROPERTY LINE		
OTHER PROPERTY LINES		
AVIGATION EASEMENT		
EASEMENT		
ENVIRONMENTAL MITIGATION PRESERVE		
CRITICAL AIRFIELD AREAS *	XYZ	XYZ
BUILDING		
BUILDING TO BE REMOVED		
FENCE		
VEHICLE GATE		
WIND CONE		
AIRFIELD LIGHTS: SINGLE/GROUP/FLASHING		
VOR/DME		
UTILITY POLE / POWER LINE		
TOPOGRAPHIC CONTOURS	XXX	
WATERWAY / CULVERT		
AIRPORT REFERENCE POINT		
SECTION CORNER		

* Critical Areas:

APL - Aircraft Parking Limits
BRL - Building Restriction Line
RSA - Runway Safety Area
OFA - Object Free Area
RPZ - Runway Protection Zone
HPZ - Helipad Protection Zone
OFZ - Obstacle Free Zone
RVZ- Runway Visibility Zone
GCA - Glideslope Critical Area
LCA - Localizer Critical Area
VCA - VOR Critical Area
RTRCR - Runway Visual Range Critical Area
ATCTCA - Air Traffic Control Tower Critical Area

BUILDING & FACILITY LEGEND

EXISTING FACILITIES - AIRFIELD AREA	EL.
1 Segmented Circle & Lighted Wind Cone	
2 VOR/DME	
3 Visual Approach Slope Indicator (VASI)	
4 Localizer Antenna Array (Runway 32 ILS)	
5 Glide Slope Antenna (Runway 32 ILS)	
6 Runway Approach Lights (MALSR)	
7 Middle Marker	
8 Runway Visual Range Sensors	
9 ASOS Sensor Mast	
10 Ceilometer	
11 VOR FAA Certified Ground Check Point	
12 Wastewater Sprinkler Fields	
13 Remote Transmitter/Receiver	
14 Emergency Vehicle Bridge	
15 Precision Approach Path Indicator (PAPI)	

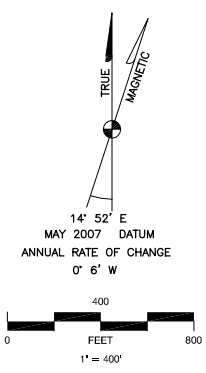
EXISTING FACILITIES AIRPORT BUILDING AREA	EL.
21 Airline Terminal & Auxiliary Boarding Lounge	
22 ARFF Building (to be relocated)	
23 FAA Air Traffic Control Tower with Rotating Beacon (to be relocated)	
24 Automobile Parking	
25 Electrical Vault	
26 FAA Electrical Vault & Standby Generator (to be relocated)	
27 Lighted Helipad (to be relocated)	
28 Helicopter Parking (to be relocated)	
29 FBO Office Building	
30 Maintenance Hangar	
31 Fuel Island & Underground Tanks (Inactive)	
32 Fuel Facility- Aboveground Tanks (to be removed)	
33 Corporate Hangar	
34 Executive or Box Hangar Building	
35 T-Hangar Building	
36 Shade Hangar	
37 Portable Hangars	
38 CDF Sonoma Air Attack Base Office	

EXISTING FACILITIES NON-AVIATION & OFF-AIRPORT	EL.
61 Office/Light Industrial Building (Nonaviation/Aviation)	
62 Sonoma County Road Maintenance Yard	
63 Sonoma County North County Detention Center	
64 Wastewater Treatment Pond	
65 Residence and/or Farm Buildings	
FUTURE FACILITIES	**EL.**
71 Public Automobile Parking (Expanded)	
72 Corporate Hangar Sites	
73 ATCT Alternative Site	
74 Passenger Terminal Site	
75 Localizer Antenna Array (Runway 32 ILS)	
76 Corporate Hangar	
77 FBO	
78 Specialized Aviation Service Organization (SASO)	
79 ARFF / Maintenance Facility	
80 Cargo Area	
81 Runway Visual Range Sensors (RVR)	
82 ODALS	
83 Runway 1-19 MIRLS	

AIRPORT DATA

		EXISTING	FUTURE
AIRPORT SERVICE LEVEL (NPIAS)		Commercial Service	No Change
AIRPORT REFERENCE CODE		C-III	No Change
CRITICAL AIRCRAFT		Business Jet	Regional Jet
AIRPORT REFERENCE POINT (e)	Latitude	38° 30' 32.4" N	38° 30' 34.5" N
	Longitude	122° 48' 46.4" W	122° 48' 46.4" W
AIRPORT ELEVATION (Above Mean Sea Level)		125'	No Change
MEAN MAX. TEMP. (Hottest Month)		84° F (July)	No Change
AIRPORT and TERMINAL NAVIGATIONAL AIDS		VOR/DME	No Change
GPS APPROACH TO AIRPORT		Yes	No Change
AIRPORT ACREAGE	Fee Simple	1,046.6	1,186.8
	Easement	62.4	57.0
BASED AIRCRAFT SPACES	County Tiedowns	262	No Change
	T-/Shade Hangars	261	328
TRANSIENT AIRCRAFT SPACES		73	82
ARFF INDEX		A	B

SEE SHEET 2 FOR DATA BLOCKS & NOTES



SUBMITTED BY:
County of Sonoma

DRAFT

By _____ Date _____

FAA Approval Space

PRELIMINARY
FOR REVIEW AND COMMENT ONLY

NO.	REVISION	SPONSOR	DATE
4	Airport Master Plan Update	MEAD & HUNT, INC.	11/07
3	New Construction: Supplemental Windsocks and RW 19 PAPIs	MEAD & HUNT, INC.	02/07
2	Update Mag. Declination, Add Future RVR, SIDA, and Future Acquisition	MEAD & HUNT, INC.	08/06
1	RSA Compliance and New Construction	MEAD & HUNT, INC.	01/06

CHARLES M. SCHULZ - SONOMA COUNTY AIRPORT
SANTA ROSA, CALIFORNIA

AIRPORT LAYOUT PLAN

MEAD & HUNT
133 Aviation Boulevard, Suite 100
Santa Rosa, California 95403
(707) 526-5010
Fax (707) 526-9721
www.meadhunt.com

County of Sonoma

DESIGN: MRM/CB | DRAWN: TE/GJ/HH | DATE: May 2, 2007 | SHEET 1 OF 2

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5 Finance and Implementation

IMPLEMENTATION

The previous chapters have presented discussions and plans for development of the airfield, terminal, and building areas at Sonoma County Airport. This chapter addresses how these plans might be implemented. The first section of this chapter presents a proposed Capital Improvement Program (CIP). Potential funding sources available for its implementation are also presented. Lastly, some of the actions required to be taken in conjunction with Master Plan approval are discussed.

CAPITAL IMPROVEMENT PROGRAM

The proposed 20-year CIP for the Airport is set forth in Table 5-1. The listed projects include both proposed improvements, as described in previous chapters, and recommended major maintenance work for the airfield previously programmed. The total anticipated investment over the next 20 years would be approximately $158 million). Federal funds would total about $142 million with the Airport's contribution at about $7 million. In this budget, the Airport's contribution includes funds generated from Passenger Facility Charges (PFC) (discussed below). Depending upon funding availability some of the short-range projects could slip into the mid-ranges.

The project costs listed in the CIP represent order-of-magnitude estimates in 2011-dollar values and include design engineering and other related costs and contingencies. The estimates are intended only for preliminary planning and programming purposes. More detailed engineering design and, in some cases, market analyses should be performed before proceeding with the projects.

Financial Factors

Development Costs—Any development within the airport building area must be financially sound. The relative cost of one development alternative versus another is a major factor in the planning process. Cost calculations must consider not just construction costs, but also the revenues that would be lost—even if only temporarily—if new development eliminates existing revenue-producing uses.

		Estimated Costs (in 2011 dollars)		
		Total	**Federal**	**County**
Short-Term Projects (within 5 years)				
2011-2013				
1	Land Acquisition for RSA Improvements	$ 2,500,000	$2,375,000	$125,000
2	Environmental Mitigation for RSA Improvements	$8,600,000	$8,170,000	$430,000
3	Design RSA Improvements	$2,000,000	$1,900,000	$100,000
4	Seal Coat Runway 1-19 and Lighting	$1,200,000	$1,140,000	$60,000
5	Construct Taxiway V and Lighting	$4,050,000	$3,847,500	$202,500
6	Construct Taxiway D at Runway 1	$780,000	$741,000	$39,000
7	Construct Taxiway D at Runway 32	$1,080,000	$1,026,000	$54,000
8	Overlay and Widen Taxiway B and Lighting	$600,000	$570,000	$30,000
9	Extend Runway 19	$2,160,000	$2,052,000	$108,000
10	Extend Runway 14	$8,580,000	$8,151,000	$429,000
11	Construct Runway 14 Holding Apron	$4,440,000	$4,218,000	$222,000
12	Construct Runway 1 Service Road	$360,000	$342,000	$18,000
13	Construct Runway 14/19 Service Road	$570,000	$541.500	$28,500
14	Construct Runway 32 Service Road	$300,000	$285,000	$15,000
15	Relocate Localizer	$750,000	$712,500	$37,500
	Subtotal	$37,970,000	$36,071,500	$1,898,500
2014				
16	ARFF Building Environmental	$ 500,000	$475,000	$25,000
17	ARFF Building Design	$ 750,000	$712,500	$37,500
18	Land Acquisition	$2,500.000	$2,375,000	$125,000
	Subtotal	$3,750,000	$3,562,500	$187,500
2015				
19	Design/Construct Vehicle Parking Facility	$2,500,000	$2,375,000	$125,000
20	ARFF Building Construction	$7,000,000	$6,650,000	$350,000
	Subtotal	$9,500,000	$9,025,000	$475,000
2016				
21	Design/Construct Taxiway D and Runway 32 Run-up Apron and Demolish Taxiway Z	$1,365,000	$1,296,750	$68,250
22	Design/Construct Apron C / Air Carrier Ramp	$1,400,000	$1,330,000	$70,000
	Subtotal	$2,765,000	$2,626.750	$138,250
	TOTAL OF SHORT-TERM PROJECTS	**$53,985,000**	**$48,560,750**	**$2,699,250**

Table 5-1

Capital Improvement Program (CIP)

Sonoma County Airport

		Estimated Costs (in 2011 dollars)		
Mid-Term Projects		**Total**	**Federal**	**County**
2017 - 2021				
23	Design/Construct Runways, Parallel Taxiways and Taxiway D Seal Coat	$1,550,000	$1,472,500	$77,500
24	Design/Construct Laughlin Road Realignment	$3,500,000	$1,425,000	$75,000
25	Terminal Environmental	$3,000,000	$2,850,000	$150,000
26	Terminal Design and Construction	$45,000,000	$42,750,000	$2,250,000
27	Design/Construct Runway Visual Range Indicators	$350,000	$332,000	$17,500
28	Design/Construct Centerline Lighting	$1,500,000	$1,425,000	$75,000
29	Design/Construct Upgrade Electrical Vault	$150,000	$142,500	$7,500
	TOTAL OF MID-TERM PROJECTS	**$55,050,000**	**$50,397,000**	**$2,652,500**
Long-Term Projects				
(2022 – 2027)				
30	Design/Construct Apron F Reconstruction	$1,200,000	$1,140,000	$60,000
31	Design/Construct Apron F Expansion	$7,000,000	$6,650,000	$350,000
32	Design/Construct Nob Hill Apron (Apron E)	$3,500,000	$1,425,000	$75,000
33	Design/Construct Runway and Taxiway Overlay	$12,000,000	$11,400,000	$600,000
34	Design/Construct Apron D Rehabilitation	$2,000,000	$1,900,000	$100,000
35	Design/Construct Taxiway A Rehabilitation	$870,000	$826.500	$43,500
	Subtotal	$26,570,000	$23,341,500,	$1,228,500
2028				
36	ATCT Environmental	$ 500,000	$475,000	$25,000
37	Design/Construct ATCT	$9,000,000	$8,550,000	$450,000
38	Land Acquisition	$2,500,000	$2,375,000	$125,000
39	Hangar Development	$5,000,000	$4,750,000	$250.000
40	Design/Construct Ordinance Road Rehabilitation	$ 750,000	$712,500	$37,500
41	Design/Construct Taxiway A Rehabilitation	$1,000,000	$950,000	$50,000
42	Future Aeronautical Site Development	$3,500,000	$1,425,000	$75,000
	Subtotal	$22,250,000	$19,237,500	$762,750
	TOTAL OF LONG-TERM PROJECTS	**$48,820,000**	**$42,579,000**	**$1,991,250**
	TOTAL OF ALL PROJECTS	**$157,855,000**	**$141,536,750**	**$7,343,000**

Source: Mead & Hunt (May 2011)

Table 5-1, continued

Capital Improvement Program
Sonoma County Airport

Development Increments—One means to help ensure financially sound development is to avoid constructing facilities too far in advance of the demand. As noted in Chapter 2, the growth in numbers of based and transient aircraft at the Airport is expected to be moderate over the 20-year time horizon of the Master Plan. The growth rate for the principal measure of demand—the size of the airport's based aircraft fleet—is expected to average less than 1% per year. The reality, though, is that increases in the fleet size are more likely to occur in larger increments than the two or three per year that this average growth rate would suggest.

Development Staging—The challenges to staging of development over an extended time period are twofold. One challenge is to minimize costly "phase one" construction that may not be fully utilized for many years. Balanced against this objective is the need to ensure that early development is not located in a manner that, while perhaps less expensive initially, hinders later phases of development. The goal is to have a plan that is flexible enough to adapt to changes in type and pace of facility demands, is cost-effective, and also is functional at each stage of development.

CAPITAL FUNDING SOURCES

There are a variety of resources from which funding and financing for general and commercial aviation airport facilities and improvements can be obtained. These resources include federal grants, bonds, airport sponsor self-funding, and private investment.

Federal Aviation Administration Grants

Currently, the most common source of federal aid for airport facilities is the Airport Improvement Program (AIP) administered by the FAA. Reauthorized in 2004, the current AIP is the latest evolution of a funding program originally authorized by Congress in 1946 as the Federal Aid to Airports Program (FAAP).

The AIP is based upon a user trust fund concept, allocating aviation-generated tax revenues for specified airport facilities on a local matching share basis. The program currently provides for 95% federal participation and 5% local participation on eligible airport projects. However, this funding bill expired on September 30, 2007 and has been extended on short-term bills (20 as of June 2011). Future authorizations may entail only a 90/10 percent split.

Under the AIP, there are both *entitlement* and *discretionary* grants. There are two types of entitlement grants in the current program. General aviation airports can qualify for up to $150,000 annual entitlement. Commercial service airports in the "Primary" category qualify for large entitlement grants based upon the volume of passengers enplaned at the airport in the prior year. Discretionary grants are awarded on a competitive basis based upon need. As a commercial service airport, the Airport qualifies for both entitlement and discretionary funding.

State Aviation Grants

The State of California operates a grant program similar in concept to the Federal AIP program. As a commercial service airport, the Airport is excluded from this program.

State Annual Grant

General aviation airports are eligible to receive a $10,000 annual grant. These funds can be used for airfield maintenance and construction projects, as well as airfield and land use compatibility planning. It is possible to accumulate these funds for up to five years. As a commercial service airport, the Airport does not qualify for these funds.

State Loan Program

The Caltrans Division of Aeronautics also administers a revolving loan program. Loans are available to provide funds to match AIP grants or develop revenue-producing facilities (e.g., aircraft storage hangars). The Airport qualifies for this program.

Other Grant Programs

Airport projects can also sometimes qualify for grant funding from nonaviation sources. Although not commonly available, airports have received grants from a variety of federal and state programs, including: economic development, community development, and rural infrastructure.

Bonds

Bond funds are a potential source of revenue to support development of larger projects. Given the high underwriting costs and availability of federal grant funds for most of the Airport's projects, there is a limited potential for this type of funding be used. Those projects with a reliable revenue stream (e.g., paid parking lots and tenant space in the terminal) are the most likely candidates for bond funding. Where suitable projects exist, airports are sometimes able to participate in bonds being issued by county or regional agencies.

Airport Sponsor Self-Funding

At commercial service airports the size and character of Sonoma County, airport sponsor self-funding is principally provided by a combination of airport-generated income and retained earnings. Funding of airport improvements that are not grant eligible and providing the local matching share for grants-in-aid from these sources is the simplest and often most economical method because direct interest costs are eliminated. The special case of PFCs is discussed below.

Passenger Facility Charges

Since 1992, airports have been authorized to charge airline passengers a fee, known as a passenger facility charge, which the airlines collect as an add-on to the airfare. The maximum fee was originally

set at $3.00 per leg of a flight, up to a maximum of $12.00. Beginning in 2000, Congress authorized an increase in the maximum PFC rate to: $4.50 per segment, with a cap of $18.00 for a roundtrip. Congress is currently considering raising the maximum PFC amount, but to what extent is not currently known. These taxes must be pledged to specific capital improvements that will: (1) preserve or enhance safety, capacity or security of the national air transportation system; (2) reduce noise; or (3) enhance competition between or among air carriers. Every PFC is tied to specific capital improvement projects that have been approved by the FAA. The fee expires when all of the money needed for the approved projects has been raised. However, new projects may be approved under a separate application.

The Airport is ~~not~~ currently charging a PFC, for a variety of projects including: passenger terminal renovation, security upgrades, safety equipment, and reimbursement of the local share of previous grants. The Airport expects to continue using funds from this program to fund various CIP projects in the future.

Private Investment

Private sector investment is an important source of funding for some types of airport improvements. At Sonoma County Airport, private funding is most likely to be used to construct aircraft storage hangars and fixed base operator facilities.

The most common sources of funding for private sector development are commercial lending institutions and insurance companies. In the case of private development on public lands, these types of financing may be difficult and expensive to obtain because the borrower can encumber only the improvements as loan collateral, attention to leasing policies and tenant contract negotiations. It is essential that agreements be reached with the tenants that provide for adequate airport revenues and facility development, while encouraging private investment and satisfying tenants' borrowing requirements. Specifically, the lease term should be sufficient to allow reasonable investment amortization over the period of the agreement.

Those capital expenditures that are most appropriately constructed with private funds have been excluded from the list of proposed capital projects identified in this *Master Plan* (see Table 5-1).

NEXT STEPS

Environmental Review

Environmental review under the provisions of the California Environmental Quality Act (CEQA) will be required before this plan can be adopted. An Environmental Impact Report (EIR) is being prepared to provide the data necessary to evaluate the environmental effects of the project under State law.

An Environmental Assessment (EA) is also being prepared under the provisions of the National Environmental Policy Act (NEPA). This EA will provide the FAA with the information required to

assess the environmental effects of the project. It is possible that an Environmental Impact Statement (EIS) may be required. This determination is up to the FAA.

Sonoma County General Plan 2020 Air Transportation Element

For reasons of consistency, the assumptions developed in the *Sonoma County Airport Master Plan* and the *Sonoma County General Plan 2020 Air Transportation Element* (ATE) must be the same. The ATE should be revised to ensure that any assumptions or other information projected to the year 2020 are consistent with the activity forecasts contained in this Master Plan. Additionally, definitions should be updated to reflect current aviation industry practices. Appropriate revisions to the ATE to provide the needed consistency have been developed during preparation of the EIR for the Master Plan. Adoption of the ATE revisions by the Board of Supervisors at the time that this Master Plan is approved would ensure consistency between the two documents.

Comprehensive Airport Land Use Plan

In January 2001, the Sonoma County Airport Land Use Commission (ALUC) adopted the *Comprehensive Airport Land Use Plan Update* for Sonoma County. The plan presents noise, safety and airspace policies for the Sonoma County airports, including the Airport. The safety zones in this plan were defined to encompass areas that are regularly overflown at and below traffic pattern altitude. Noise policies were linked to the CNEL 55dB noise contour produced for the plan. Airspace policies were tied to the airspace surfaces defined in Federal Aviation Regulations Part 77.

The written policies in the Comprehensive Airport Land Use Plan Update are consistent with the guidance contained in the *California Airport Land Use Planning Handbook* (December 1993 edition). However, the Handbook was updated in 2002 and the safety zone configurations revised. For this reason alone the CLUP should be reevaluated by the ALUC. State ALUC law requires that the draft Airport Master Plan be reviewed by the ALUC for consistency with the CLUP. Because this Master Plan proposes changing the lengths of Runways 1-19 and 14-32, and new noise contours are available, the Airport Noise and Safety Zone Maps for the Airport should be revised.

Appendix A

Air Carrier and Commuter Airline Forecasts, Methodologies and Assumptions

PREFACE TO THE 2011 UPDATE

The Airport Master Plan forecasts for the original version of this document were prepared during the years when scheduled passenger service was not available at Sonoma County Airport. Because of the lack of service, a simple project of historical trends was not possible. Instead four future scenarios were developed using a combination of data from the Federal Aviation Administration and trends from similar airports. Since this forecast was prepared scheduled passenger service was restarted. The volume of passenger quickly neared the historical peak for this Airport. However, soon thereafter the country entered a recession. These countervailing factors continued to make it inappropriate to use trend analysis or other common forecasting methods when updating this Plan. Instead, this updated Master Plan will continue to use these forecasts with one change. The recession is assumed to delay realization of these forecasts by 5 years. That is, the forecasts shown in Chapter 2 assume a delay of 5 years to realize the forecasts presented in this Appendix.

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 late 2001. Because of this condition none of the more traditional approaches[1] 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 concluded 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.[2] 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."[3] 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.

[1] 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.

[2] 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.

[3] 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.

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/allocations allowed by the ATE. Scheduled air carrier airlines would use no more than seven ADD allocations (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 allocations. Commuter airlines would use no more than seven of the twenty-one allocations (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 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 following projected activity levels:

TABLE 1. 2010 Baseline Scenario		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.[4] This is well within the proposed ATE

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

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.[5]

Moderate Growth Scenario

The following table sets forth the assumptions derived for the moderate growth[6] scenario of the scheduled air carrier dominant forecast.

TABLE 2.
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 above 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

[5] A "High Growth" scenario was not developed because it would be inconsistent with FAA projected load factors and growth rates for comparable airports (i.e., non-hub, towered airports).

[6] 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"

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 allocations 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.[7]

Low Growth Scenario

The following table sets forth the assumptions derived for the low growth[8] scenario of the scheduled air carrier dominant forecast.

TABLE 3.
Scheduled Air Carrier Dominant

	(Low Growth Scenario)	2015	2020	2025	2030
AIR CARRIER	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	4,4,019	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 above 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

[7] The ATE's assumptions in this regard are not consistent with current airline industry trends.
[8] The low growth scenario is based on FAA TAF load factors and projected TAF growth rates through 2020, and extrapolated for 2025 and 2030.

passengers. Although overall well within the ADD allocations 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.[9]

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.

Moderate Growth Scenario

The following table sets forth the assumptions derived for the moderate growth[10] scenario of the commuter airline dominant forecast. The following table sets forth the assumptions used in this scenario:

TABLE 4.
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

[9] The ATE's assumptions in this regard are not consistent with current airline industry trends.
[10] 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"

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.[11]

Low Growth Scenario

The following table sets forth the assumptions derived for the low growth[12] scenario of the commuter airline dominant forecast:

TABLE 5.
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.[13]

[11] The ATE's assumptions in this regard are not consistent with current airline industry trends.
[12] 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"
[13] The ATE's assumptions in this regard are not consistent with current airline industry trends.

Table 6 presents a summary of the preceding enplanements forecasts.

TABLE 6.
Enplanement Forecasts Summary

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 1 is a graphical representation of the historical enplanements and forecast low growth and moderate growth enplanements projections for STS.[14] 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 1.
STS Annual Enplanements

FORECAST EVALUATION

An effective technique used in evaluating demand forecasts is that of the outside view, also known as reference-class forecasting.[15] This technique removes any built-in bias toward the outcome of a project by ignoring the details of the project at hand, as it involves no attempt at forecasting the events that would influence the project's future course. Instead, it examines the experiences of a class of similar projects, lays out a rough distribution of outcomes for this

[14] 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.
[15] Harvard Business Review, "Delusions of Success: How Optimism Undermines Executives' Decisions," Vol. 81, No. 7, July 2003.

reference class, and then positions the subject project in that distribution. This process typically involves five steps:[16]

1. Select a reference class.
2. Assess the distribution of outcomes.
3. Make an intuitive prediction of your project's position in the distribution.
4. Assess the reliability of your prediction.
5. Correct the intuitive estimate.

Reference Class

To determine the appropriate reference class to evaluate the STS air carrier and commuter airline forecasts, it was first necessary to see where STS would rank among other comparable airports in the region. Table 7 compares seventeen certificated air carrier airports in Northern and Central California with STS in terms of numbers of runways, the longest runway at each airport, and the number of boarding (enplaned) passengers at each airport for calendar year (CY) 2004.[17]

The national ranking for each airport in terms of annual enplaned passengers for CY 2004 is also indicated. For purposes of comparison, Sonoma County's General Plan Air Transportation Element (ATE) 2005 limit of 286,500 passenger enplanements is used to mark STS's anticipated place in the reference class. In this case, had the ATE expectations been realized, STS would have fallen well below the 2004 enplanement levels for the Fresno Yosemite International Airport (FAT) and the Santa Barbara Municipal Airport (SBA) and above the 2004 enplanement levels for the Monterey Peninsula Airport (MRY) and the San Luis Obispo County Regional Airport (SBP).

These data are also shown graphically in Figure 2.[18] On the basis of this information, it was determined that STS was closest to the reference class represented by the Monterey Peninsula Airport (MRY) and the San Luis Obispo County Regional Airport (SBP) (see Figure 2).

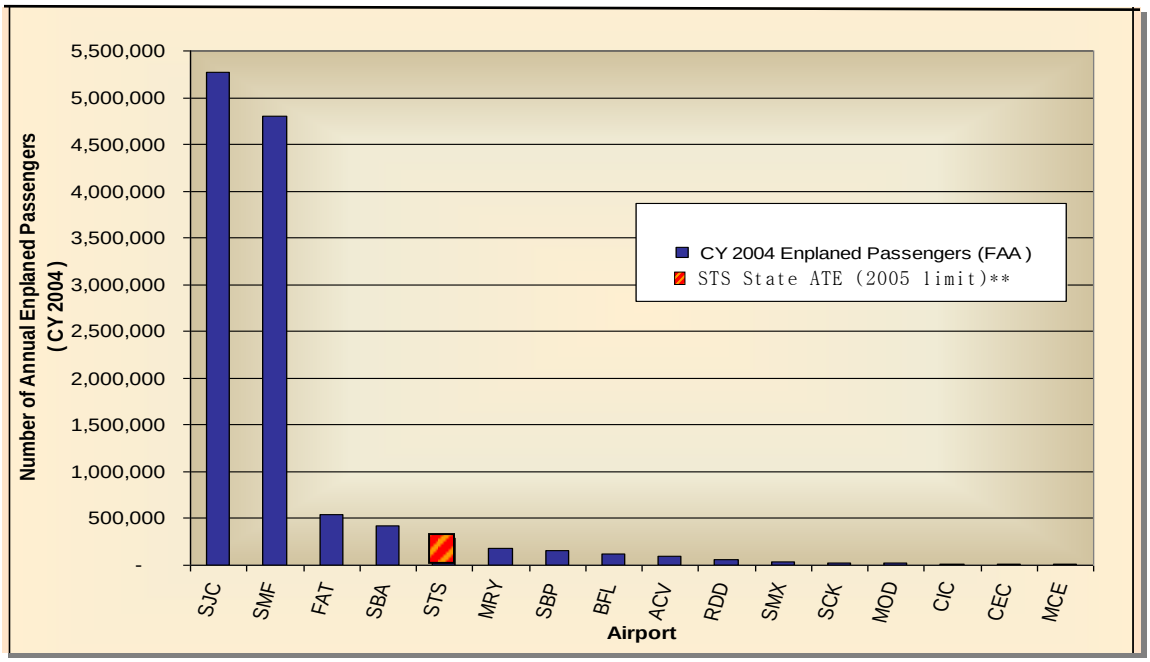
[16] Daniel Kahneman and Amos Tversky, "Intuitive Predictions: Biases and Corrective Procedures," TIMS Studies in Management Science, Volume 12 (1979).
[17] 2005 enplaned passenger limit per County General Plan Air Transportation Element (ATE) for comparison purposes only. STS had no scheduled airline or commuter passengers in 2004.
[18] Note that SFO and OAK have been removed from Figure 2 due to graphical limitations.

TABLE 7.
Northern and Central California Air Carrier Airports

Airport Name (3-Letter Identifier)	Number of Runways (*)	Longest Runway (ft.)	CY 2004 Enplaned Passengers (FAA)[2]	National Ranking (2004)
San Francisco International (SFO)	4	11,870	15,605,822	13
Oakland International (OAK)	4, (1)	10,000	6,923,690	31
San Jose International (SJC)	3, (2)	11,000	5,269,849	37
Sacramento International (SMF)	2	8,601	4,795,970	41
Fresno Yosemite International (FAT)	2	9,222	538,394	115
Santa Barbara Municipal (SBA)	3, (1)	6,052	417,285	128
Charles M. Schulz-Sonoma County (STS)[1]	**2, (1)**	**5,115**	**(286,500)**	**N/A**
Monterey Peninsula (MRY)	2, (1)	7,616	183,785	181
San Luis Obispo County Regional (SBP)	2, (1)	6,100 (2007)	158,107	191
Bakersfield Meadows Field (BFL)	2, (1)	10,857	118,046	205
Arcata-Eureka (ACV)	2, (1)	6,000	96,289	213
Redding Municipal (RDD)	2	7,003	60,978	248
Santa Maria Public (SMX)	2, (1)	6,304	38,082	290
Stockton Metropolitan (SCK)	2, (1)	10,650	20,636	DNA
Modesto City-County (MOD)	2, (1)	5,911	19,798	333
Chico Municipal (CIC)	2, (1)	6,724	17,561	345
Crescent City (CEC)	2	5,002	12,472	371
Merced Municipal (MCE)	1	5,903	6,144	447

[1] 2005 enplaned passenger limit per County General Plan Air Transportation Element (ATE) for comparison purposes only. STS had no scheduled airline or commuter passengers in 2004.
[2] Historical enplanements per Federal Aviation Administration "Primary Airport Enplanements Activity Summary (CY 2004)"
(*) Number of air carrier runways, if all runways not usable by air carriers.

FIGURE 2.
Northern and Central California Air Carrier Airports*



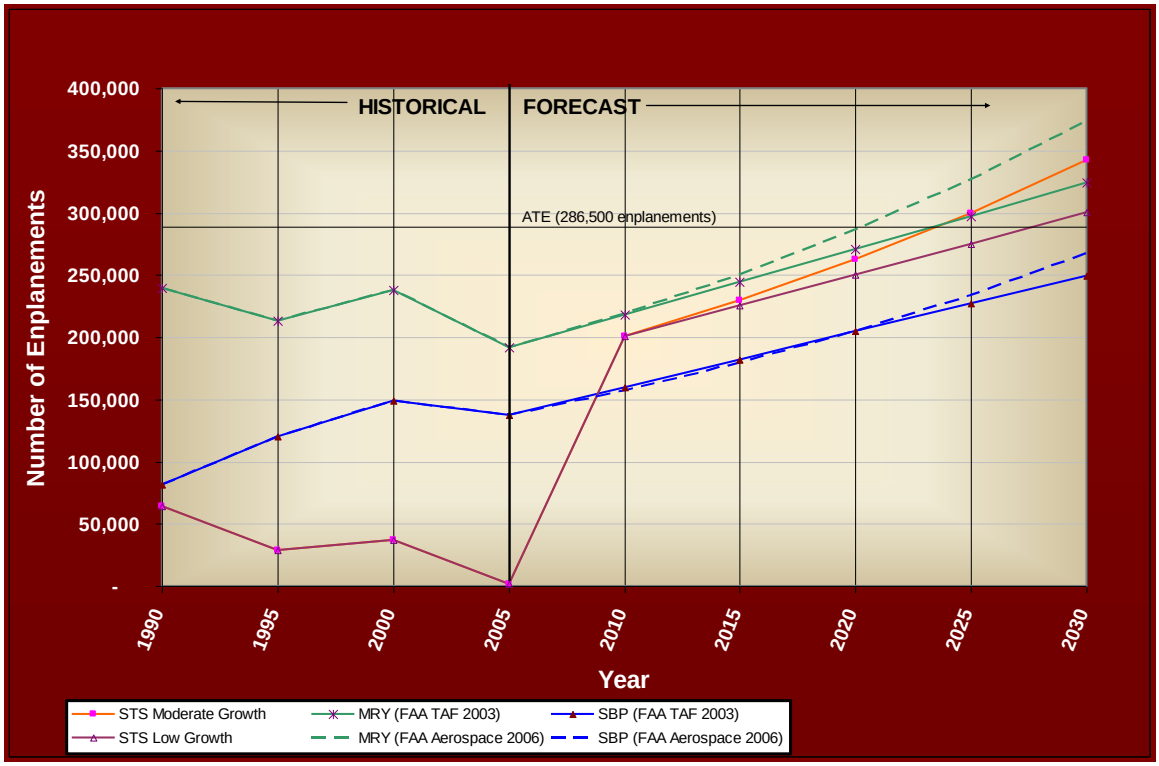
* SFO (15.6 million annual enplanements) and OAK (6.9 million enplanements) omitted due to graphical limitations
** 2005 ATE limit (286,500 annual passenger enplanements)

For purposes of this analysis, the selected reference class consists of enplanement data and forecasts for the Monterey and San Luis Obispo County airports. These two 14 CFR Part 139 certificated airports have comparable catchment area populations, numbers of airlines, and markets served to those projected for the Sonoma County Airport. Both airports are non-hub towered airports similar to STS.

Distribution of Outcomes

The following graph (Figure 3) depicts historical and forecast enplanement data for the two reference class airports as derived from FAA Terminal Area Forecasts from 1990 to 2020.[19] The graph also shows the same data for the two STS commercial air service scenarios. As can be seen from the historical section of the graph, there was no consistent growth pattern for enplanements at the three airports between 1990 and 2005. Both the Monterey Peninsula Airport and the Sonoma County Airport experienced declining passenger enplanements during this period, while the San Luis Obispo Airport experienced steady growth through 2000 and a small decline between 2000 and 2005.

FIGURE 3.
Annual Enplanements Comparison



The FAA TAF and Aerospace forecasts project a consistent rate of enplanements growth for the two reference class airports from 2005 through 2020, and these growth rates have been carried forward through 2030. The Sonoma County Airport is projected to experience strong resurgent

[19] Federal Aviation Administration, "Terminal Area Forecast Summary, Fiscal Years 2004-2020." March 2005. The TAF growth rates for the two airports were projected through 2030 for purposes of this analysis.

growth between 2005 and 2010, and then taper off with enplanement growth rates comparable to the two other airports.

Prediction of Project Position

From Figure 3 it can be seen that the STS moderate growth and low growth scenarios are situated about halfway between the curves for the Monterey Peninsula Airport and the San Luis Obispo County Airport. The two STS enplanement scenarios are within the range established by the two reference class airports and have comparable rates of growth for future conditions. Of the two STS forecast scenarios, the moderate growth scenario is most closely aligned with that of the Monterey Peninsula Airport as projected from the FAA aerospace forecasts, while the STS low growth scenario remains close to the curve defined by the FAA's TAF forecast for MRY.

Reliability Assessment

No two airports are exactly alike, and one should not expect the forecasts for one airport to conform exactly to those of another. The forecast information depicted on the above graph for Sonoma County Airport places the two enplanement scenarios within the range of forecasts established for the two other comparable air carrier airports.

Corrections

Given that the two STS enplanement forecast scenarios fall within the range defined by the two reference class airports, and given that the projected growth rates are roughly comparable, no further modifications or corrections to the forecasts appear warranted.

The relationship between the General Plan Air Transportation Element and these forecasts is discussed below.

1992 General Plan Air Transportation Element

The 1992 ATE was based on the assumption that "demand for only a part, about 40 percent, of the air passenger travel to and from Sonoma County is projected to be served by commuter and scheduled airline operations at the Sonoma County Airport."[20] Hence, ATE Section 5.5 (Commercial Air Passenger Services) provides that there will be two components to commercial air passenger services at STS: (1) commuter airlines; and (2) scheduled airlines.

Commuter Airline Service. According to the 1992 ATE, commuter airlines should be able to provide Sonoma County air passengers with convenient connections to major airline service points in the Bay Area. This service was considered to be important in that it was to accommodate future aviation demand to and from the County, and provide a time-saving alternative to surface transportation on the Highway 101 corridor to SFO and OAK.[21] The ATE

[20] Section 3.1.

[21] The ATE defines a Commuter Airline as an airline engaged "in regularly scheduled air service, carrying persons or property on intrastate routes." The ATE does not classify Commuter Airlines on the basis of aircraft size (i.e., numbers of seats). Hence, Regional Jets with a capacity of 70-100 passengers flown by Certificated Commuter Air Carriers (14 CFR 135) on interstate routes would be counted as Scheduled Airline Service under the ATE, while larger Certificated Air Carrier (14 CFR 121) aircraft with up to 150 seats flown on intrastate routes would be classified as a Commuter Air Carrier. This discrepancy and the fact that commuter airline connections to Bay Area air carrier airports (i.e., SFO, OAK, and SJC) from STS are no longer considered practicable due to capacity, policy and environmental constraints at these airports, require that the ATE be updated to reflect these considerations.

projected that annual commuter airline passengers would reach 50,000 by 2005.[22] The ATE's underlying assumption in this case was that commuter airlines would be operating up to 14 flights per day by twin-engine turboprop-type aircraft averaging fifteen passenger seats at a 65 percent average load factor.[23] The ATE acknowledges that fewer operations would be required to carry the same number of passengers using larger aircraft or higher load factors.

Scheduled Airline Service. The 1992 ATE anticipated that scheduled airline service at STS would consist of passenger service to one or more major air passenger markets outside the Bay Area. The most likely points for such service were thought to be in Southern California. The ATE projected that scheduled airline passengers would reach 523,000 by 2005.[24] The ATE's underlying assumption in this case was that air carrier airlines could be operating up to 15 flights per day by jet aircraft averaging eighty passenger seats at a 66 percent average load factor.[25] However, because of air quality considerations, the ATE was adjusted to accommodate no more than 14 air carrier flights per day.[26]

1992 ATE Goals and Objectives. Based on the above classes of service and passenger forecasts, the 1992 ATE set as its goal the "establishment and maintenance of commuter and scheduled airline services at the Sonoma County Airport and to provide for the production of adequate airport facilities to serve passengers which is safe, efficient, and compatible with the surrounding community" (Goal AT-5).

Objective AT-5.1
Provided for commercial air services, including scheduled and commuter airlines at the Sonoma County Airport not to exceed 573,000 annual passengers or 15,200 annual operations by 2005.

Objective AT-5.2
Provided a balance between scheduled and commuter airline services, not to exceed 21 departure slots per day, as follow:

Slots 1-8 reserved for scheduled air carriers, but may be used by commuters. The slots are revocable and subject to reallocation upon application by a scheduled air carrier to initiate or increase exiting service.

Slots 9-14 reserved for commuter air carriers, but may be used by scheduled air carriers.

Slots 15-21 reserved exclusively for commuter air carriers.

Scheduled air carriers may not use more than 14 of the 21 daily departure slots.

The 1992 ATE also incorporated several policies designed to achieve its commercial air passenger services goals and objectives. Notable among these are that the runway length is limited to the existing length of the longest runway (approximately 5,000 feet), and that any

[22] Without actually saying so, the ATE implies that another 75,000 annual commuter passengers would be making surface trips to Bay Area commercial service airports.
[23] Current commuter airline industry practices have virtually eliminated 15-passenger seat aircraft and load factors are projected to be in the range of 70% and higher.
[24] The ATE indirectly assumed that another 784,500 air carrier passengers would be making surface trips to Bay Area airports. The combined total of Sonoma County area air passengers anticipated to make surface vehicle trips to Bay Area commercial service airports by 2005 was 859,500 out of a potential 1.43 million total passengers.
[25] Current scheduled airline industry practices are toward larger aircraft (i.e., more seats) and higher load factors.
[26] ATE Objective 5.2.

proposed improvement projects to accommodate air passenger services must be consistent with 15,200 annual air carrier operations and 573,000 annual passengers.[27] A review of the ATE policies is also required when average daily passenger enplanements reach 650 over a period of one year (474,500 annual passengers). [28]

Sonoma County General Plan 2020 Air Transportation Element (Draft)

Sonoma County is currently in the process of updating the County General Plan ("Sonoma County General Plan 2020") to provide policy guidelines for the unincorporated areas of the county to direct growth and development to the year 2020. Included in the General Plan update process is an updated General Plan Air Transportation Element. A review of the Public Hearing Draft 2020 Air Transportation Element (undated) indicates that virtually all of the commuter and scheduled airline service assumptions, and goals and objectives used in the 1992 ATE have been carried forward with the exception of the 2005 date, which has been updated to 2020. However, the Public Hearing Draft ATE now includes the following policy guidelines:

Policy AT-5a: *Revise, update and maintain the Sonoma County Airport Master Plan to accommodate 15,200 annual operations by commuter and scheduled airlines by 2020. The Master Plan shall provide for commercial air carrier services not to exceed a total of 21 departures per day with scheduled air carriers utilizing no more than 14 of the 21 departures.*

Policy AT-5b: *Commercial air carrier services at the Sonoma County Airport shall not exceed a total of 21 departures per day. Each of the 21 departures shall constitute a departure slot. The 21 departure slots shall be allocated between commuter and scheduled air carriers as follows:*

(1) Slots 1-8 are reserved for scheduled air carriers; may be used by commuter air carriers, but use is revocable and subject to reallocation upon application by a scheduled air carrier to initiate or increase service.
(2) Slots 9-14 are reserved for commuter carriers, but may be used by scheduled air carriers.
(3) Slots 15-21 are reserved exclusively for commuter air carriers.
(4) At no time shall scheduled air carriers utilize more than 14 of the 21 departure slots.

Policy AT-5c: *Runway length at the Sonoma County Airport for the existing and any new runway which may be constructed shall be limited to no longer than the present length of approximately 5,000 feet. Existing runways will not be substantially strengthened except as needed to perform necessary or routine maintenance. Operations by commercial air carriers shall be limited to those aircraft types that may safely and efficiently operate within this facility constraint and which do not exceed an operating weight of 95,000 pounds.*

Policy AT-5d: *Any air carrier initiating or expanding commuter or scheduled airline passenger service or commercial freight service at the Sonoma County Airport shall be required to enter into a license, lease, or operating agreement with the County of Sonoma. Licenses, leases and operating agreements shall implement and be required to conform to the policy directives of the General Plan. Licenses, leases and operation agreements shall include provisions for slot reallocation.*

[27] The less than optimal length of the primary runway at STS has been cited as an issue by a number of prospective scheduled air carriers interviewed by the County. The desired runway length is 6,000 feet.
[28] Objective ATE-5.3.

Policy AT-5e: *Any proposed improvement projects to accommodate air passenger services shall be consistent with the year 2020 projections of 15,200 annual operations and 573,000 annual passengers.*

Policy AT-5f: *A review by the Board of Supervisors shall occur at such a time that the "review threshold" of 650 enplaned passengers per day averaged over a one year period (474,500 annual passengers) is reached. The review anticipated by this section is not intended to require an amendment to the Air Transportation Element nor is it intended to require review of this element in its entirety; rather it is intended to trigger Board consideration of the impacts and infrastructure of the Sonoma County Airport as it relates to its immediate environs.*

NEXT STEPS

This report describes 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 adopt the forecasts as the master plan's official commercial air service forecast. Secondly, because the currently adopted ATE had projected certain activity levels for 2005 based on aircraft fleet mix and boarding load factors developed in 1992 and since then many things have changed in the airline industry, the ATA must be amended. For example, the 15-passenger commuter airliners and 50-passenger regional jets used as the bases for the ATE projections will not likely ever see substantial service at the Sonoma County Airport.

Similarly, the definition of a commuter airliner 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.

Appendix B

Glossary of Terms Used In Airport Master Planning

PREFACE

Many technical terms and expressions are used in airport master planning and noise management programs. This glossary has been prepared for the members of the Charles M. Schulz-Sonoma County Airport Master Plan Update Community Advisory Committee and interested members of the public. The definitions in this glossary were compiled from various sources including government publications such as Federal Aviation Administration (FAA) Advisory Circulars, FAA Orders, the Federal Aviation Regulations (FARs) and professional literature.

ABOVE GROUND LEVEL (AGL): An elevation datum given in feet above ground level.

AIR CARRIER: A person who undertakes directly by lease, or other arrangement, to engage in air transportation. (Federal Aviation Regulations Part 1 [FAR 1]) (Also see Certificated Air Carrier)

AIR CARRIERS: The commercial system of air transportation, consisting of the certificated air carriers, air taxis (including commuters), supplemental air carriers, commercial operators of large aircraft, and air travel clubs. (Federal Aviation Administration [FAA Census])

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on IFR flight plans within controlled airspace, principally during the en route phase of flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be provided to VFR aircraft. (Aeronautical Information Manual [AIM])

AIR TAXI: A classification of air carriers which directly engage in the air transportation of persons, property, mail, or in any combination of such transportation and which do not directly or indirectly utilize large aircraft (over 30 seats or a maximum payload capacity of more than 7,500 pounds) and do not hold a Certificate of Public Convenience and Necessity or economic authority issued by the Department of Transportation. (Also see commuter air carrier and demand air taxi.) (FAA Census)

AIR TRAFFIC CONTROL (ATC): A service operated by appropriate authority to promote the safe, orderly, and expeditious flow of air traffic. (FAR 1)

AIRCRAFT ACCIDENT: An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. (National Transportation Safety Board [NTSB])

AIRCRAFT APPROACH CATEGORY: A grouping of aircraft (Categories A–E) based on 1.3 times their stall speed in their landing configuration at their maximum certificated landing weight. (Airport Design)

AIRCRAFT OPERATION: The airborne movement of aircraft in controlled or non-controlled airport terminal areas and about given en route fixes or at other points where counts can be made. There are two types of operations — local and itinerant. (FAA Stats)

AIRCRAFT PARKING LINE LIMIT (APL): A line established by the airport authorities beyond which no part of a parked aircraft should protrude. (Airport Design)

AIR/FIRE ATTACK BASE: An established on-airport base of operations for the purposes of aerial suppression of large-scale fires by specially-modified aircraft. Typically, such aircraft are operated by the California Department of Forestry and/or the U.S. Forest Service.

AIRPLANE DESIGN GROUP: A grouping of airplanes (Groups I–V) based on wingspan. (Airport Design)

AIRPORT: An area of land or water that is used or intended to be used for the landing and takeoff of aircraft, and includes its buildings and facilities, if any. (FAR 1)

AIRPORT ELEVATION: The highest point of an airport's usable runways, measured in feet above mean sea level (MSL). (AIM)

AIRPORT HAZARD: Any structure or natural object located on or in the vicinity of a public airport, or any use of land near such airport, that obstructs the airspace required for the flight of aircraft in landing or taking off at the airport or is otherwise hazardous to aircraft landing, taking off, or taxiing at the airport. (Airport Design)

AIRPORT LAND USE COMMISSION (ALUC): A commission established in accordance with the California State Aeronautics Act in each county having an airport operated for the benefit of the general public. The purpose of each ALUC is "to assist local agencies in ensuring compatible land uses in the vicinity of all new airports and in the vicinity of existing airports to the extent that the land in the vicinity of those airports is not already devoted to incompatible uses." An ALUC need not be created if an alternative process, as specified by the statutes, is established to accomplish the same purpose. (California Public Utilities Code, Section 21670 et seq.)

AIRPORT LAYOUT PLAN (ALP): A scale drawing of existing and proposed airport facilities, their location on the airport, and the pertinent clearance and dimensional information required to demonstrate conformance with applicable standards.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport. (Airport Design)

AIRPORT REFERENCE POINT (ARP): A point established on an airport, having equal relationship to all existing and proposed landing and takeoff areas, and used to geographically locate the airport and for other planning purposes. (Airport Design)

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport or on the movement area. (AIM)

AIRWAY/FEDERAL AIRWAY: A Class E airspace area established in the form of a corridor, the centerline of which is defined by radio navigational aids. (AIM)

ALERT AREA: A special use airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft. (AIM)

APPROACH LIGHT SYSTEM (ALS): An airport lighting system which provides visual guidance to landing aircraft by radiating light beams in a directional pattern by which the pilot aligns the aircraft with the extended runway centerline during a final approach to landing. Among the specific types of systems are:

- **LDIN—**Lead-in Light System.
- **MALSR—**Medium-intensity Approach Light System with Runway Alignment Indicator Lights.
- **ODALS—**Omnidirectional Approach Light System, a combination of LDIN and Runway End Identifier Lights (REILS).
- **SSALR—**Simplified Short Approach Light System with Runway Alignment Indicator Lights. (AIM)

APPROACH SPEED: The recommended speed contained in aircraft manuals used by pilots when making an approach to landing. This speed will vary for different segments of an approach as well as for aircraft weight and configuration. (AIM)

AUTOMATED SURFACE OBSERVING SYSTEM (ASOS): Airport electronic equipment which automatically measures meteorological parameters, reduces and analyzes the data via computer, and broadcasts weather information which can be received on aircraft radios in some applications, via telephone.

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system which senses and indicates the direction to a low/medium frequency (L/MF) nondirectional radio beacon (NDB) ground transmitter. (AIM)

AUTOMATIC TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information in selected terminal areas. (AIM)

BACK COURSE APPROACH: A non-precision instrument approach utilizing the rearward projection of the Instrument Landing System (ILS) localizer beam.

BALANCED FIELD LENGTH: The runway length at which the distance required for a given aircraft to abort a takeoff and stop on the runway (accelerate-stop distance) equals the distance required to continue the takeoff and reach a height of 35 feet above the runway end (accelerate-go distance).

BASED AIRCRAFT: Aircraft stationed at an airport on a long-term basis.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on airports.

CEILING: Height above the earth's surface to the lowest layer of clouds or obscuring phenomena that is reported as "broken", "overcast", or "obscuration" and is not classified as "thin" or "partial". (AIM)

CERTIFICATED ROUTE AIR CARRIER: An air carrier holding a Certificate of Public Convenience and Necessity issued by the Department of Transportation authorizing the performance of scheduled service over specified routes, and a limited amount of nonscheduled service. (FAA Census)

CIRCLING APPROACH/CIRCLE-TO-LAND MANEUVER: A maneuver initiated by the pilot to align the aircraft with a runway for landing when a straight-in landing from an instrument approach is not possible or is not desirable. (AIM)

COMMERCIAL OPERATOR: A person who, for compensation or hire, engages in the carriage by aircraft in air commerce of persons or property, other than as an air carrier. (FAR 1)

COMPASS LOCATOR: A low power, low or medium frequency (L/MF) radio beacon installed at the site of the outer or middle marker of an ILS. (AIM)

COMPASS ROSE: A circle, graduated in degrees, printed on some charts or marked on the ground at an airport. It is used as a reference to either true or magnetic direction. (AIM)

COMMUNITY NOISE EQUIVALENT LEVEL (CNEL): The noise rating adopted by the State of California for measurement of airport noise. It represents the average daytime noise level during a 24-hour day, measured in decibels and adjusted to an equivalent level to account for the lower tolerance of people to noise during evening and nighttime periods.

COMMUTER AIR CARRIER: An air taxi operator which performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week and places between which such flights are performed. (FAA Census)

CONTROLLED AIRSPACE: A generic term that covers the different classifications of airspace (Class A, Class B, Class C, Class D and Class E airspace) and defines dimensions within which air traffic control service is provided to Instrument Flight Rules (IFR) flights and to Visual Flight Rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- **Class A**—Generally, that airspace from 18,000 feet MSL up to and including 60,000 feet MSL (Flight Level 600), including the airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous states and Alaska. Unless otherwise authorized, all persons must operate their aircraft under IFR.
- **Class B**—Generally, that airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers (some Class B airspaces areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace. The cloud clearance requirement for VFR operations is "clear of clouds".
- **Class C**—Generally, that airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C airspace area is individually tailored, the airspace usually consists of a surface area with a 5 nm radius, and an outer area with a 10 nm radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace. VFR aircraft are only separated from IFR aircraft within the airspace.
- **Class D**—Generally, that airspace from the surface to 2,500 feet above the airport elevation (chartered in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures may be Class D or Class E airspace. Unless otherwise authorized, each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace. No separation services are provided to VFR aircraft.
- **Class E**—Generally, if the airspace is not Class A, Class B, Class C, or Class D, and it is controlled airspace, it is Class E airspace. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Also in this class are Federal airways, airspace beginning at either 700 or 1,200 feet AGL used to transition to/from the terminal or en route environment, en route domestic, and offshore airspace areas designated below 18,000 feet MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 MSL over the United States, including that airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska. Class E airspace does not include the airspace 18,000 feet MSL or above.

DEMAND AIR TAXI: Use of an aircraft operating under Federal Aviation Regulations, Part 135, passenger and cargo operations, including charter and excluding commuter air carrier. (FAA Census)

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway. (AIM)

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid. (AIM)

FEDERAL AVIATION REGULATIONS (FAR) PART 77: The part of the FAR that deals with objects affecting navigable airspace.

FAR PART 77 SURFACES: Imaginary surfaces established with relation to each runway of an airport. There are five types of surfaces: (1) primary; (2) approach; (3) transitional; (4) horizontal; and (5) conical.

FEDERAL AVIATION ADMINISTRATION (FAA): The United States government agency that is responsible for insuring the safe and efficient use of the nation's airspace.

FIXED BASE OPERATOR (FBO): A business operating at an airport that provides aircraft services to the general public, including but not limited to sale of fuel and oil; aircraft sales, rental, maintenance, and repair; parking and tiedown or storage of aircraft; flight training; air taxi/charter operations; and specialty services, such as instrument and avionics maintenance, painting, overhaul, aerial application, aerial photography, aerial hoists, or pipeline patrol.

FLIGHT SERVICE STATION (FSS): FAA facilities which provide pilot briefings on weather, airports, altitudes, routes, and other flight planning information.

FRACTIONAL OWNERSHIP: A company or individual buys, or leases, a fractional interest in one aircraft just as they might acquire a partial interest in one condo unit. They can use their own aircraft or another similar or identical aircraft a certain number of hours or days per year. The economics of each situation differs depending on the number of people who will use the aircraft, the value of their time to the company, and the dollars saved in airline tickets, hotels, etc.

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except air carriers. (FAA Stats)

GENERIC VISUAL GLIDE SLOPE INDICATOR (GVGI): A generic term for the group of airport visual landing aids which includes Visual Approach Slope Indicators (VASI), Precision Approach Path Indicators (PAPI), and Pulsed Light Approach Slope Indicators (PLASI). When FAA funding pays for this equipment, whichever type receives the lowest bid price will be installed unless the airport owner wishes to pay the difference for a more expensive unit.

GLIDE SLOPE: An electronic signal radiated by a component of an ILS to provide descent path guidance to approaching aircraft.

GLOBAL POSITIONING SYSTEM (GPS): A relatively new navigational system which utilizes a network of satellites to determine a positional fix almost anywhere on or above the earth. Developed and operated by the U.S. Department of Defense, GPS has been made available to the civilian sector for surface, marine, and aerial navigational use. For aviation purposes, the current form of GPS guidance provides en route aerial navigation and selected types of nonprecision instrument approaches. Eventual application of GPS as the principal system of navigational guidance throughout the world is anticipated.

HELIPAD: A small, designated area, usually with a prepared surface, on a heliport, airport, landing/takeoff area, apron/ramp, or movement area used for takeoff, landing, or parking of helicopters. (AIM)

INSTRUMENT APPROACH PROCEDURE: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually. It is prescribed and approved for a specific airport by competent authority. (AIM)

INSTRUMENT FLIGHT RULES (IFR): Rules governing the procedures for conducting instrument flight. Also term used by pilots and controllers to indicate a type of flight plan. (AIM)

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids: (1) Localizer; (2) Glide Slope; (3) Outer Marker; (4) Middle Marker; (5) Approach Lights. (AIM)

INSTRUMENT OPERATION: An aircraft operation in accordance with an IFR flight plan or an operation where IFR separation between aircraft is provided by a terminal control facility. (FAA ATA)

INSTRUMENT RUNWAY: A runway equipped with electronic and visual navigation aids for which a precision or non-precision approach procedure having straight-in landing minimums has been approved. (AIM)

ITINERANT OPERATION: An arrival or departure performed by an aircraft from or to a point beyond the local airport area.

LARGE AIRCRAFT: An aircraft of more than 12,500 pounds maximum certificated takeoff weight. (FAR 1)

LIMITED REMOTE COMMUNICATIONS OUTLET (LRCO): An unmanned, remote air/ground communications facility which may be associated with a VOR. It is capable only of receiving communications and relies on a VOR or a remote transmitter for full capability.

LOCALIZER (LOC): The component of an ILS which provides course guidance to the runway. (AIM)

LOCAL OPERATION: An arrival or departure performed by an aircraft: (1) operating in the traffic pattern, (2) known to be departing or arriving from flight in local practice areas, or (3) executing practice instrument approaches at the airport. (FAA ATA)

LORAN: An electronic ground-based navigational system established primarily for marine use but used extensively for VFR and limited IFR air navigation.

MARKER BEACON (MB): The component of an ILS which informs pilots, both aurally and visually, that they are at a significant point on the approach course.

MEAN SEA LEVEL (MSL): An elevation datum given in feet from mean sea level.

MEDIUM-INTENSITY APPROACH LIGHTING SYSTEM (MALS): The MALS is a configuration of steady-burning lights arranged symmetrically about and along the extended runway centerline. MALS may also be installed with sequenced flashers; in this case, the system is referred to as MALSF.

MILITARY OPERATIONS AREA (MOA): A type of special use airspace of defined vertical and lateral dimensions established outside of Class A airspace to separate/segregate certain military activities from IFR traffic and to identify for VFR traffic where these activities are conducted. (AIM)

MINIMUM DESCENT ALTITUDE (MDA): The lowest altitude, expressed in feet above mean sea level, to which descent is authorized on final approach or during circle-to-land maneuvering in execution of a standard instrument approach procedure where no electronic glide slope is provided. (FAR 1)

MISSED APPROACH: A maneuver conducted by a pilot when an instrument approach cannot be completed to a landing. (AIM)

NAVIGATIONAL AID/NAVAID: Any visual or electronic device airborne or on the surface which provides point-to-point guidance information or position data to aircraft in flight. (AIM)

NONDIRECTIONAL BEACON (NDB): A Medium Frequency (MF) or Ultra High Frequency (UHF) radio beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his bearing to or from the radio beacon and "home" on or track to or from the station. (AIM)

NONPRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which no electronic glide slope is provided. (FAR 1)

NONPRECISION INSTRUMENT RUNWAY: A runway with an instrument approach procedure utilizing air navigation facilities, with only horizontal guidance, or area-type navigation equipment for which a straight-in nonprecision instrument approach procedure has been approved or planned, and no precision approach facility or procedure is planned. (Airport Design)

OBJECT FREE AREA (OFA): A surface surrounding runways, taxiways, and taxilanes which should be clear of parked airplanes and objects except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. (Airport Design)

OBSTACLE: An existing object, object of natural growth, or terrain at a fixed geographical location, or which may be expected at a fixed location within a prescribed area, with reference to which vertical clearance is or must be provided during flight operation. (AIM)

OBSTACLE FREE ZONE (OFZ): A defined volume of airspace above and adjacent to a runway and its approach lighting system if one exists, free of all fixed objects except FAA-approved frangible aeronautical equipment and clear of vehicles and aircraft in the proximity of an airplane conducting an approach, missed approach, landing, takeoff, or departure.

OBSTRUCTION: An object/obstacle, including a mobile object, exceeding the obstruction standards specified in FAR Part 77, Subpart C. (AIM)

OUTER MARKER: A marker beacon at or near the glide slope intercept position of an ILS approach. (AIM)

PRECISION APPROACH PATH INDICATOR (PAPI): An airport visual landing aid similar to a VASI, but which has light units installed in a single row rather than two rows.

PRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which an electronic glide slope is provided, such as an ILS or precision approach radar (PAR). (FAR 1)

PRECISION INSTRUMENT RUNWAY: A runway with an instrument approach procedure utilizing an ILS, microwave landing system (MLS), or PAR. (Airport Design)

PULSED LIGHT APPROACH SLOPE INDICATORS (PLASI). PLASI systems are a visual approach aid for use in visual flight conditions. The system provides the pilot with a stabilized approach by means of a single light source from a position adjacent to the intended touchdown point of a runway or helipad.

RELOCATED THRESHOLD: The portion of pavement behind a relocated threshold that is not available for takeoff and landing. It may be available for taxiing and aircraft. (Airport Design)

REMOTE COMMUNICATIONS AIR/GROUND FACILITY (RCAG): An unmanned VHF/UHF transmitter/receiver facility which is used to expand Air Route Traffic Control Center (ARTCC) air/ground communications coverage and to facilitate direct contact between pilots and controllers. (AIM)

REMOTE COMMUNICATIONS OUTLET (RCO) AND REMOTE TRANSMITTER/ RECEIVER (RTR): An unmanned communications facility remotely controlled by air traffic personnel. RCO's serve FSS's. Remote Transmitter Receivers serve terminal ATC facilities. (AIM)

RESTRICTED AREA: Designated airspace within which the flight of aircraft, while not wholly prohibited, is subject to restriction. (FAR 1)

RUNWAY CLEAR ZONE: A term previously used to describe the runway protection zone.

RUNWAY EDGE LIGHTS: Lights used to define the lateral limits of a runway. Specific types include:

- **HIRL—**High-Intensity Runway Lights.
- **MIRL—**Medium-Intensity Runway Lights.

RUNWAY END IDENTIFIER LIGHTS (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide a pilot with a rapid and positive visual identification of the approach end of a particular runway. (AIM)

RUNWAY PROTECTION ZONE (RPZ): A trapezoidal shaped area at the end of a runway, the function of which is to enhance the protection of people and property on the ground through airport owner control of the land. The RPZ usually begins at the end of each primary surface and is centered upon the extended runway centerline. (Airport Design)

RUNWAY SAFETY AREA (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the even of an undershoot, overshoot, or excursion from the runway. (Airport Design)

SMALL AIRCRAFT: An aircraft of 12,500 pounds or less maximum certificated takeoff weight. (FAR 1)

SPECIAL USE AIRSPACE: Airspace of defined horizontal and vertical dimensions identified by an area on the surface of the earth wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. (AIM)

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned IFR air traffic control departure procedure printed for pilot use in graphic and/or textual form. SID's provide transition from the terminal to the appropriate en route structure. (AIM)

STANDARD TERMINAL ARRIVAL ROUTE (STAR): A preplanned IFR air traffic control arrival route published for pilot use in graphic and/or textual form. STARs provide transition from the en route structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area. (AIM)

STOPWAY: An area beyond the takeoff runway, no less wide than the runway and centered upon the extended centerline of the runway, able to support the airplane during an aborted takeoff, without causing structural damage to the airplane, and designated by the airport authorities for use in decelerating the airplane during an aborted takeoff. (FAR 1)

STRAIGHT-IN INSTRUMENT APPROACH — IFR: An instrument approach wherein final approach is begun without first having executed a procedure turn; it is not necessarily completed with a straight-in landing or made to straight-in landing weather minimums. (AIM)

TAXILANE: The portion of the aircraft parking area used for access between taxiways, aircraft parking positions, hangars, storage facilities, etc. (Airport Design)

TAXIWAY: A defined path, from one part of an airport to another, selected or prepared for the taxiing of aircraft. (Airport Design)

TERMINAL INSTRUMENT PROCEDURES (TERPS): Procedures for instrument approach and departure of aircraft to and from civil and military airports. There are four types of terminal instrument procedures: precision approach, nonprecision approach, circling, and departure.

TERMINAL RADAR SERVICE AREA (TRSA): Airspace surrounding designated airports wherein ATC provides radar vectoring, sequencing, and separation on a full-time basis for all IFR and participating VFR aircraft. (AIM)

THRESHOLD: The beginning of that portion of the runway usable for landing. (AIM)

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and-go is defined as two operations. (AIM)

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at, taxiing on, or taking off from an airport. The components of a typical traffic pattern are upwind leg, crosswind leg, downwind leg, base leg, and final approach. (AIM)

TRANSIENT AIRCRAFT: Aircraft not based at the airport.

TRANSMISSOMETER: An apparatus used to determine visibility by measuring the transmission of light through the atmosphere. (AIM)

UNCONTROLLED AIRSPACE: Now known as Class G airspace. Class G airspace is that portion of the airspace that has not been designated as Class A, Class B, Class C, Class D, and Class E airspace.

UNICOM (Aeronautical Advisory Station): A nongovernment air/ground radio communication facility which may provide airport information at certain airports. (AIM)

VERY-HIGH-FREQUENCY OMNIDIRECTIONAL RANGE (VOR): The standard navigational aid used throughout the airway system to provide bearing information to aircraft. When combined with Distance Measuring Equipment (DME) or Tactical Air Navigation (TACAN) the facility, called VOR-DME or VORTAC, provides distance as well as bearing information.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport landing aid which provides a pilot with visual descent (approach slope) guidance while on approach to landing. Also see PAPI.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term "VFR" is also used by pilots and controllers to indicate type of flight plan. (AIM)

VISUAL GLIDE SLOPE INDICATOR (VGSI): A generic term for the group of airport visual landing aids which includes VASI, PAPI, and Pulsed Light Approach Slope Indicators (PLASI). When FAA funding pays for this equipment, whichever type receives the lowest bid price will be installed unless the airport owner wishes to pay the difference for a more expensive unit.

VISUAL RUNWAY: A runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA-approved airport layout plan. (Airport Design)

WARNING AREA: A type of special use airspace which may contain hazards to nonparticipating aircraft in international airspace. (AIM)

SOURCES

FAR 1: Federal Aviation Regulations Part 1, Definitions and Abbreviations. (1993)

AIM: Aeronautical Information Manual, Pilot/Controller Glossary. (1993)

Airport Design: Federal Aviation Administration. *Airport Design*. Advisory Circular 150/5300-13, Change 10. (2006)

FAA ATA: Federal Aviation Administration. *Air Traffic Activity*. (1986)

FAA Census: Federal Aviation Administration. *Census of U.S. Civil Aircraft*. (1986)

FAA Stats: Federal Aviation Administration. *Statistical Handbook of Aviation*. (1984)

NTSB: National Transportation Safety Board. *U.S. NTSB 830-3.* (1989)