# SECTION 3 - AVIATION ACTIVITY FORECASTS

## 3.1 INTRODUCTION

This section presents projections of aviation activity at Stinson Municipal Airport. These projections are used for evaluating the capability of the existing Airport facilities to meet current and future demand and to estimate the extent to which facilities should be provided in the future.

Aviation activity forecasting is an analytical and subjective process. Actual activity that develops in future years may differ from the forecasts developed in this Section as a result of future changes in local conditions, the dynamics of the general aviation industry, as well as economic and political changes for the local service area and the nation as a whole. Future facility improvements should be implemented as demand warrants rather than at set future timeframes. This will allow the Airport to respond to changes in demand, either higher or lower than the forecast, regardless of the year in which those changes take place.

## 3.2 LOCAL FACTORS IN AVIATION DEMAND

Socioeconomic characteristics were collected and examined to develop an understanding of the growth within the Airport's Service Area. The types of socioeconomic data that are presented include population, employment, and personal income. The Airport's position within the local general aviation market was also examined in comparison to comparative airports in the area.

The airport service area generally refers to the geographic area served by the Airport and from within which most of the users come. For the purposes of this study, the service area for Stinson Municipal Airport consists of Bexar County, Texas.

### 3.2.1 DEMOGRAPHIC AND SOCIOECONOMIC TRENDS

The historical trends and future projections of the region's population, employment, and personal income were examined based on several data sources. Historical population data was obtained from the U.S. Census Bureau and projected future population data was obtained from the Texas State Data Center. Employment and personal income data was obtained from Woods and Poole Economics.

**Table 3.1 -** summarizes the population growth trends experienced between 1990 and 2010 for Bexar County compared with those experienced in Texas and the United States as a whole.

Table 3.1 - Population Statistics

| Year | Bexar County | Texas | United States |
|---|---|---|---|
| 1990 | 1,185,394 | 16,986,510 | 248,709,873 |
| 2000 | 1,392,931 | 20,851,820 | 281,421,906 |
| 2010 | 1,714,773 | 25,145,561 | 308,745,538 |
| *Compounded Annual Growth Rate* | | | |
| 1990 – 2010 | 1.9% | 2.0% | 1.1% |
| 2000 – 2010 | 2.1% | 1.9% | 0.9% |

*Source:* United States Census Bureau, 2011

Bexar County and the state of Texas as a whole have seen steady increases in population. The population growth rates in Bexar County and Texas between 2000 and 2010 (2.1 and 1.9 percent, respectively) have been significantly higher than the national average of 0.9 percent.

The growth in employment in Bexar County has outpaced the growth in population over the past 20 years. As shown in **Table 3.2** - , employment in Bexar County increased from 641,000 in 1990 to over 1.0 million in 2010, representing a 2.9 percent annual growth rate.

Per capita income is the third indicator used to gauge economic health of the community, the underlying assumption being that as income (and specifically discretionary income) increases, regional residents have more to spend on aviation-related goods and services. As shown in Table 3.2 - , Bexar County's per capita income is estimated to have grown at an average annual growth rate of 5.3 percent between 1990 and 2010. Overall, each of these socioeconomic indicators reflects a solid economic base for continued aviation demand.

Table 3.2 - Bexar County Employment and Per Capital Personal Income Statistics

| Year | Employment | Per Capita Personal Income (2010 Dollars) |
|---|---|---|
| 1990 | 641,401 | $16,237 |
| 2000 | 856,395 | $27,321 |
| 2010 | 1,037,147 | $37,217 |
| *Compounded Annual Growth Rate* | | |
| 1990 – 2010 | 2.9% | 5.3% |
| 2000 – 2010 | 1.9% | 3.1% |

*Source:* Woods and Poole Economics, 2009

Projections of population, employment, and per capita income developed for the Service Area indicate continued growth in the region. Population and employment growth is anticipated to continue at more conservative levels in comparison to the previous ten- and twenty-year periods. Per capita income growth is expected to continue at strong levels of nearly 5 percent annual growth throughout the study period. **Table 3.3** - shows the Service Area projections over the next 20-year period.

Table 3.3 - Service Area Demographic Projections

| Year | Population | Employment | Per Capita Personal Income (2010 Dollars) |
|---|---|---|---|
| 2011 | 1,577,588 | 1,052,312 | $39,520 |
| 2016 | 1,650,816 | 1,131,480 | $48,880 |
| 2021 | 1,716,424 | 1,216,425 | $61,481 |
| 2026 | 1,773,711 | 1,307,455 | $78,580 |
| 2031 | 1,822,118 | 1,404,856 | $101,276 |
| *Compounded Annual Growth Rate* | | | |
| 2011 – 2031 | 0.7% | 1.5% | 4.8% |

*Source:* Population Projections: Texas State Data Center (Scenario 0.5)
Employment and PCPI: Woods and Poole Economics, 2009

### 3.2.2 Local General Aviation Market

Many factors enter into the decision to base an aircraft or operate from a particular airport. These include the proximity of the airport, availability of services or amenities, the cost and availability of aircraft storage, and the level of airport congestion. A review of the comparative general aviation airports in the area is presented in **Table 3.4** - . The Airport's based aircraft currently comprises 21 percent of the total based aircraft for the region's general aviation airports. At 127,134 operations in 2011, the Airport comprises 50 percent of the total general aviation operations for the region's general aviation airports.

Table 3.4 - Regional Airport Comparison

| Airport | Longest Runway Length (feet) | Annual Operations | Based Aircraft | % of Total Aircraft in Region | ATCT |
|---|---|---|---|---|---|
| Stinson Municipal | 5,000 | 127,134 | 115 | 21% | Yes |
| New Braunfels Municipal | 5,364 | 26,000 | 121 | 22% | Yes |
| Castroville Municipal | 4,600 | 29,120 | 38 | 7% | No |
| San Geronimo Airpark | 3,000 | 10,500 | 36 | 7% | No |
| Boerne Stage Field | 4,340 | 29,400 | 116 | 21% | No |
| Bulverde Airpark | 2,890 | 24,600 | 82 | 15% | No |
| Kestrel Airpark | 3,000 | 9,900 | 33 | 6% | No |

*Source:* SSF Airport Records, FAA 5010 Master Record Forms

## 3.3 HISTORICAL AVIATION ACTIVITY

This section presents a brief review of the historical aviation activity at the Airport. The historical activity is measured in based aircraft and aircraft operations data. "Based Aircraft" are defined as those aircraft permanently stored at an airport. An "Aircraft Operation" is defined as either a landing or take-off by an aircraft. A touch-and-go (T&G) is counted as two operations.

### 3.3.1 Touch and Go Activity

T&G activity represents a significant amount of the total airport operations that occur. The Airport is currently home to three significant flight training operations: i3 Global Flight, Sky Safety, and Palo Alto College. T&G activity is primarily for the purpose of flight training, and involves aircraft flying in closed loops through the traffic pattern, and conducting a touchdown followed by an immediate rolling takeoff without stopping. This activity allows pilots to practice landing techniques while increasing runway capacity, since the runway occupancy time of a T&G operation is less than a full-stop landing. Based on conversations with the Stinson ATCT personnel, T&G activity accounts for approximately 60 percent of total operations at the Airport.[25]

### 3.3.2 Historical Based Aircraft

Historical based aircraft numbers were obtained from Airport staff, the FAA's Terminal Area Forecast (TAF), the 5010 Master Record Forms, and the previous Airport Master Plan report. Based aircraft

[25] Conversation with Air Traffic Manager, 2/17/2012

numbers at Stinson since 1990 are shown in **Table 3.5 -** and **Exhibit 3.1**. As is typical for most general aviation airports of this size, total based aircraft have fluctuated over the past 20 years. As of late 2011, there were 115 total based aircraft at Stinson Municipal Airport. There have been increases and decreases over the years which can be attributed to events such as the construction of new T-hangar facilities, relocation of flight schools to and from the Airport, and the state of the economy.

Table 3.5 - Historic Total Based Aircraft

| Year | Based Aircraft | % Change |
|---|---|---|
| 1990 | 102 | -- |
| 1991 | 82 | -20% |
| 1992 | 82 | 0% |
| 1993 | 82 | 0% |
| 1994 | 82 | 0% |
| 1995 | 82 | 0% |
| 1996 | 82 | 0% |
| 1997 | 56 | -32% |
| 1998 | 56 | 0% |
| 1999 | 98 | 75% |
| 2000 | 98 | 0% |
| 2001 | 114 | 16% |
| 2002 | 98 | -14% |
| 2003 | 98 | 0% |
| 2004 | 138 | 41% |
| 2005 | 138 | 0% |
| 2006 | 138 | 0% |
| 2007 | 82 | -41% |
| 2008 | 118 | 44% |
| 2009 | 118 | 0% |
| 2010 | 118 | 0% |
| 2011 | 115 | -3% |

*Source:* SSF Airport Records, FAA 5010 Master Record Forms, FAA Terminal Area Forecast, 2002 SSF Master Plan Study Report

### 3.3.3 HISTORICAL AIRCRAFT OPERATIONS

Historical aircraft operations since 1990 are presented in **Table 3.6 -** and **Exhibit 3.2**. Aircraft operations have increased just over 93 percent over the past 20 years, with a peak of 179,000 operations in 2002. Local operations are those conducted by aircraft remaining in the Airport's traffic pattern. Almost all local operations are training-related. Itinerant operations are those conducted by aircraft coming from outside the traffic pattern. Between 1990 and 2011, the percentage of itinerant flights at the Airport has varied between 55 percent and 67 percent, with an average of 61 percent over the period. As with based aircraft, operations have fluctuated over time, reflecting national trends in general aviation and the state of the economy.

**Exhibit 3.1 Historic Total Based Aircraft (1990 – 2011)**

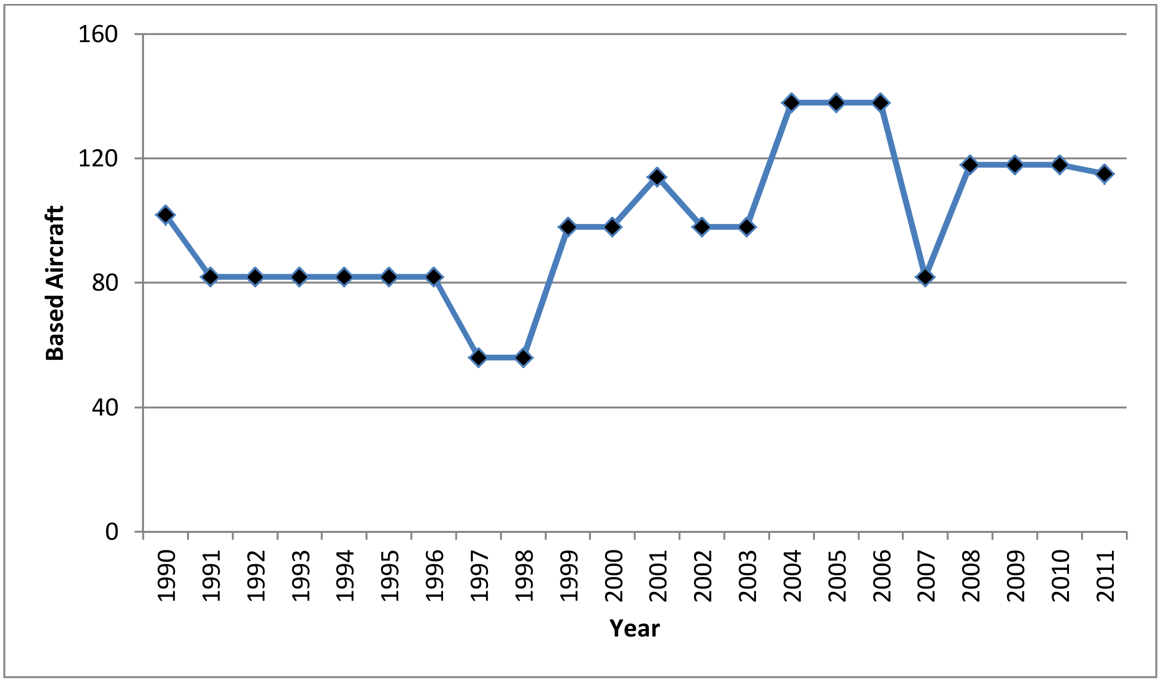
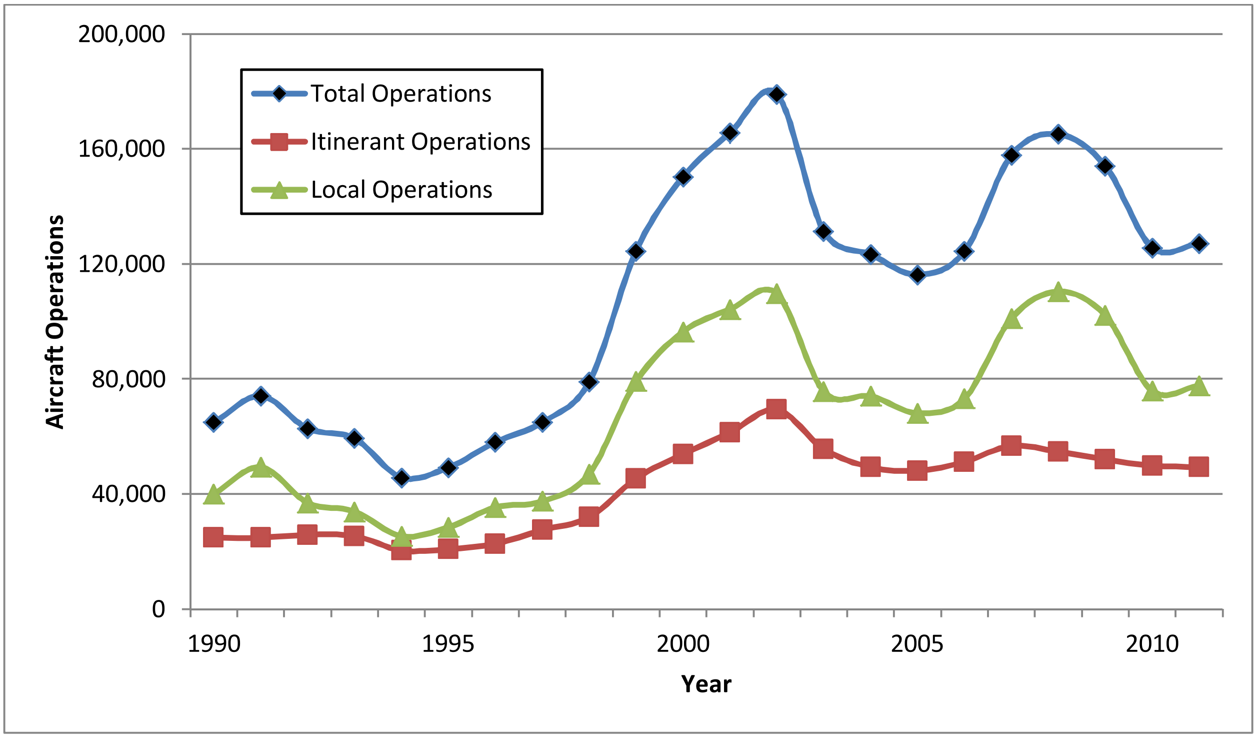



Table 3.6 - Historic Aircraft Operations

| Year | Itinerant Operations | Local Operations | Total Operations | % Change |
|---|---|---|---|---|
| 1990 | 24,839 | 40,084 | 64,923 | -- |
| 1991 | 24,790 | 49,318 | 74,108 | 14.1% |
| 1992 | 25,816 | 36,901 | 62,717 | -15.4% |
| 1993 | 25,400 | 33,888 | 59,288 | -5.5% |
| 1994 | 20,368 | 25,326 | 45,694 | -22.9% |
| 1995 | 20,837 | 28,411 | 49,248 | 7.8% |
| 1996 | 22,690 | 35,309 | 57,999 | 17.8% |
| 1997 | 27,466 | 37,453 | 64,919 | 11.9% |
| 1998 | 31,916 | 47,013 | 78,929 | 21.6% |
| 1999 | 45,344 | 79,113 | 124,457 | 57.7% |
| 2000 | 53,850 | 96,432 | 150,282 | 20.8% |
| 2001 | 61,335 | 104,208 | 165,543 | 10.2% |
| 2002 | 69,346 | 109,681 | 179,027 | 8.1% |
| 2003 | 55,648 | 75,600 | 131,248 | -26.7% |
| 2004 | 49,282 | 74,021 | 123,303 | -6.1% |
| 2005 | 48,106 | 68,115 | 116,221 | -5.7% |
| 2006 | 51,218 | 73,177 | 124,395 | 7.0% |
| 2007 | 56,746 | 101,092 | 157,838 | 26.9% |
| 2008 | 54,735 | 110,414 | 165,149 | 4.6% |
| 2009 | 51,945 | 102,072 | 154,017 | -6.7% |
| 2010 | 49,799 | 75,855 | 125,654 | -18.4% |
| 2011 | 49,419 | 77,715 | 127,134 | 1.2% |

*Source:* SSF Tower Records (2008-2010), FAA ATADS (1990-2007, 2011)

**Exhibit 3.2 Historic Aircraft Operations (1990 – 2011)**




## 3.4 BASED AIRCRAFT FORECAST

Based aircraft are those aircraft permanently stored at an airport. Based aircraft estimates over the 20-year planning period impacts future airport facility and infrastructure requirements, such as hangar storage space and apron tie-down areas. The following methodologies were utilized for selecting a preferred based aircraft forecast for the Airport.

- Population Growth – Based aircraft forecast to increase at a rate consistent with the projected growth rate of the Service Area population.
- Employment Growth – Based aircraft forecast to increase at a rate consistent with the projected employment growth rate of the Service Area.
- Personal Income Growth – Based aircraft forecast to increase at a rate consistent with the projected per capita growth rate of the Service Area.
- Market Share – Based aircraft forecast to increase at a rate corresponding to the Airport's current market share of general aviation aircraft in the state of Texas.

As of 2011, there were 115 based aircraft at Stinson Municipal Airport. **Table 3.7 -** and **Exhibit 3.3** show the results of each methodology and compare them to the FAA Terminal Area Forecast for Stinson Municipal Airport, and the previous baseline and high growth forecasts from the 2002 Master Plan. Growth rates in the based aircraft projections for the 2011-2031 timeframe range from 0.7 percent to 4.8 percent per year.

By the end of 2012, 24 additional aircraft will relocate to the Airport in conjunction with the addition of a new hangar facility for Alpha Tango Flying Services. In January 2012, U.S. Helicopters closed its facility, resulting in a reduction of 3 helicopters[26]. These two activities result in a net addition of 21 based aircraft at the Airport in 2012. This influx of aircraft was taken into account when developing projections of future based aircraft, resulting in a 2012 based aircraft count of 136.

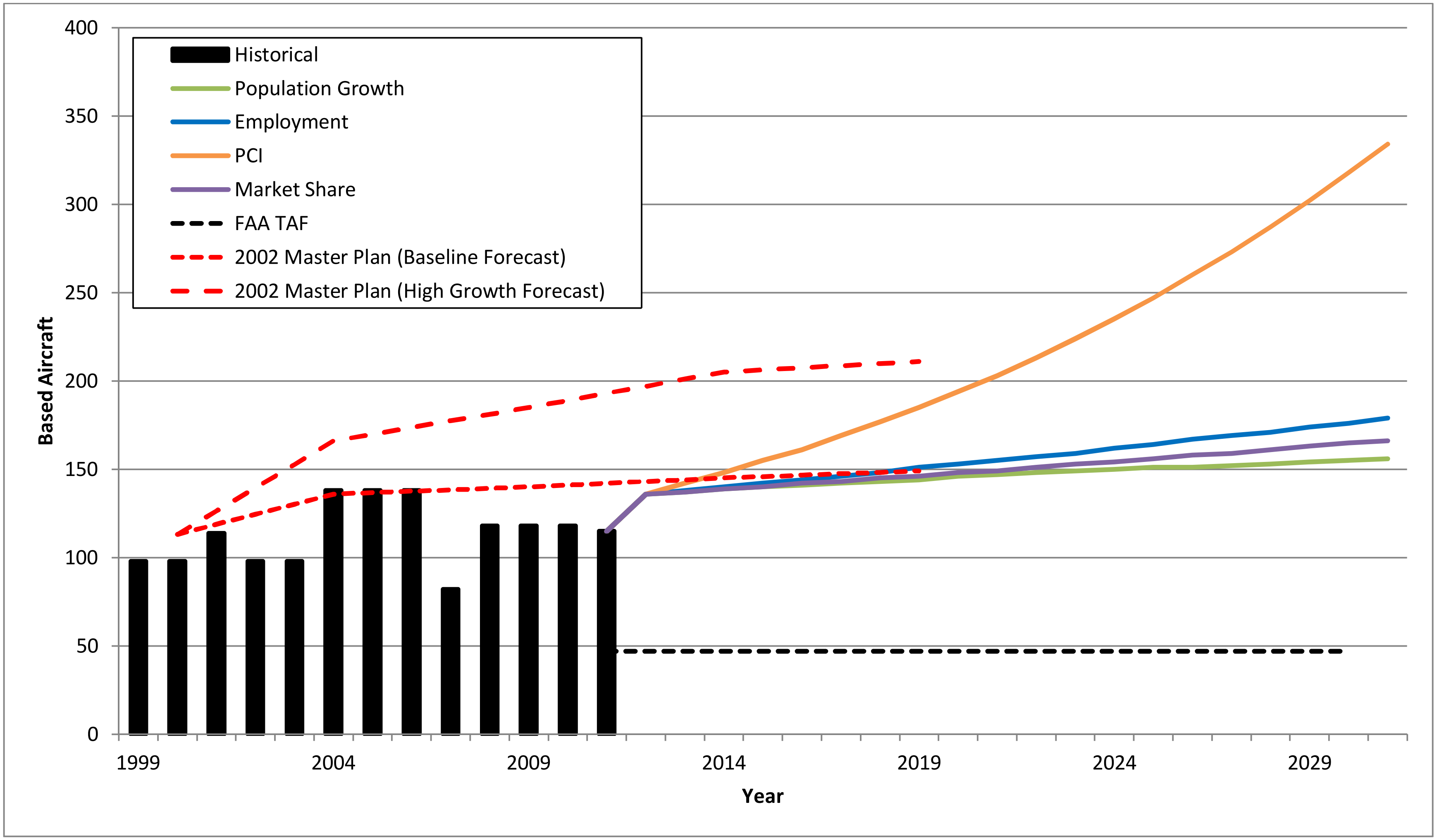
Table 3.7 - Comparison of Based Aircraft Projections

| Year | Population Growth | Employment | Personal Income | TX Market Share | FAA TAF |
|---|---|---|---|---|---|
| 2011 | 115 | 115 | 115 | 115 | 47 |
| 2012 | 136 | 136 | 136 | 136 | 47 |
| 2013 | 137 | 138 | 142 | 137 | 47 |
| 2014 | 139 | 140 | 148 | 139 | 47 |
| 2015 | 140 | 142 | 155 | 140 | 47 |
| 2016 | 141 | 144 | 161 | 142 | 47 |
| 2017 | 142 | 146 | 169 | 143 | 47 |
| 2018 | 143 | 148 | 177 | 145 | 47 |
| 2019 | 144 | 151 | 185 | 146 | 47 |
| 2020 | 146 | 153 | 194 | 148 | 47 |
| 2021 | 147 | 155 | 203 | 149 | 47 |
| 2022 | 148 | 157 | 213 | 151 | 47 |
| 2023 | 149 | 159 | 224 | 153 | 47 |
| 2024 | 150 | 162 | 235 | 154 | 47 |
| 2025 | 151 | 164 | 247 | 156 | 47 |
| 2026 | 151 | 167 | 260 | 158 | 47 |
| 2027 | 152 | 169 | 273 | 159 | 47 |
| 2028 | 153 | 171 | 287 | 161 | 47 |
| 2029 | 154 | 174 | 302 | 163 | 47 |
| 2030 | 155 | 176 | 318 | 165 | 47 |
| 2031 | 156 | 179 | 334 | 166 | 47 |
| *Compounded Annual Growth Rate* | | | | | |
| 2011 – 2031 | 1.5% | 2.2% | 5.5% | 1.9% | 0.0% |
| 2012 – 2031 | 0.7% | 1.5% | 4.8% | 1.1% | 0.0% |

*Source:* Kimley-Horn and Associates; FAA Terminal Area Forecast (SSF)

[26] Conversation with Stinson Airport Manager, 4/24/2012

**Exhibit 3.3 Based Aircraft Projection Comparison**



Based on the analysis, the preferred based aircraft forecast for Stinson Municipal Airport is the employment based projection. The employment based aircraft projection growth rate of 2.2 percent per year through the planning period includes the addition of 21 aircraft in 2012. The annual growth rate after 2012 is 1.5 percent, which is consistent with the actual growth rate experienced at the Airport over the most recent 20-year period (1.7 percent per year between 1991 and 2011). The total based aircraft projection was further allocated according to aircraft type. The fleet mix projections were developed based on the fleet mix percentages exhibited at the Airport in 2011 and consideration of the rates of growth by aircraft type in the FAA Aerospace Forecasts.

Based on projected U.S. general aviation trends found in the FAA Aerospace Forecast (FY 2011-2031), single and multi-engine piston aircraft are anticipated to lose their current market share of the active general aviation aircraft fleet in the country. Jet aircraft and helicopters are expected to continue to represent a growing percentage of the market share. The projected trends in the national general aviation fleet were used as a guide to develop fleet mix projections at Stinson Municipal Airport. The based aircraft fleet mix for the preferred based aircraft projection through the planning period is presented in **Table 3.8 -** .

Table 3.8 - Based Aircraft Fleet Mix Projection

| Year | Single-Engine | Multi-Engine | Turboprop & Jet | Helicopter | Total |
|---|---|---|---|---|---|
| 2011 | 97 | 5 | 0 | 13 | 115 |
| 2016 | 126 | 5 | 1 | 12 | 144 |
| 2021 | 133 | 6 | 2 | 14 | 155 |
| 2026 | 141 | 6 | 4 | 16 | 167 |
| 2031 | 149 | 6 | 5 | 19 | 179 |

*Source:* Kimley-Horn and Associates, Inc.

### 3.5 AIRCRAFT OPERATIONS FORECAST

Aircraft operations were projected using the following methodologies in order to select a preferred operations forecast for the Airport:

- Market Share – National – Compares historical number of operations at the Airport to the total general aviation operations in the United States. The resulting percentage (market share) is then applied to the FAA's forecast of operations. The forecast uses a constant market share of 0.45 percent, the ten-year average for the Airport.
- Market Share – SW Region – Compares historical number of operations at the Airport to the total general aviation operations in the FAA's Southwest Region. The resulting percentage is then applied to the FAA's forecast of operations for the Southwest Region. The forecast uses a constant market share of 0.97 percent, the ten-year average for the Airport.
- Preferred Based Aircraft Growth – Operations forecast to increase at a rate consistent with the selected preferred based aircraft forecast (1.5 percent per year).
- Historic Annual Operations Growth – Operations forecast to increase at a rate consistent with the historic operations growth rate at the Airport between 1990 and 2011 (3.3 percent per year).

The results of the four aircraft operations projection scenarios are summarized in **Table 3.9 -** and graphically in **Exhibit 3.4**. As shown, the different methodologies result in compounded annual growth rates over the planning period ranging from 0.7 percent to 3.3 percent, and annual aircraft operations in 2031 ranging from approximately 147,000 operations to 241,100 operations.

Table 3.9 - Comparison of Aircraft Operations Forecasts

| Year | Market Share National | Market Share FAA SW Region | Preferred Based Aircraft Growth | Historic Annual Operations Growth | FAA TAF |
|---|---|---|---|---|---|
| 2011 | 127,134 | 127,134 | 127,134 | 127,134 | 124,363 |
| 2012 | 116,491 | 131,548 | 129,041 | 131,268 | 126,495 |
| 2013 | 117,897 | 132,740 | 130,977 | 135,537 | 128,666 |
| 2014 | 119,324 | 134,030 | 132,941 | 139,945 | 130,876 |
| 2015 | 120,763 | 135,308 | 134,935 | 144,496 | 133,128 |
| 2016 | 122,225 | 136,593 | 136,959 | 149,195 | 135,421 |
| 2017 | 123,710 | 137,901 | 139,014 | 154,046 | 137,756 |
| 2018 | 125,215 | 139,231 | 141,099 | 159,056 | 140,133 |
| 2019 | 126,743 | 140,585 | 143,216 | 164,228 | 142,554 |
| 2020 | 128,293 | 141,960 | 145,364 | 169,569 | 145,019 |
| 2021 | 129,868 | 143,315 | 147,544 | 175,083 | 147,530 |
| 2022 | 131,468 | 144,695 | 149,757 | 180,777 | 150,087 |
| 2023 | 133,090 | 146,102 | 152,004 | 186,655 | 152,690 |
| 2024 | 134,738 | 147,537 | 154,284 | 192,725 | 155,340 |
| 2025 | 136,410 | 148,999 | 156,598 | 198,993 | 158,039 |
| 2026 | 138,108 | 150,489 | 158,947 | 205,464 | 160,787 |
| 2027 | 139,831 | 152,009 | 161,331 | 212,145 | 163,586 |
| 2028 | 141,584 | 153,558 | 163,751 | 219,044 | 166,436 |
| 2029 | 143,361 | 153,390 | 166,207 | 226,167 | 169,339 |
| 2030 | 145,162 | 156,749 | 168,701 | 233,522 | 172,294 |
| 2031 | 146,987 | 157,153 | 171,231 | 241,116 | 173,471 |
| Compounded Annual Growth Rate | | | | | |
| 2011-2031 | 0.7% | 1.1% | 1.5% | 3.3% | 1.7% |

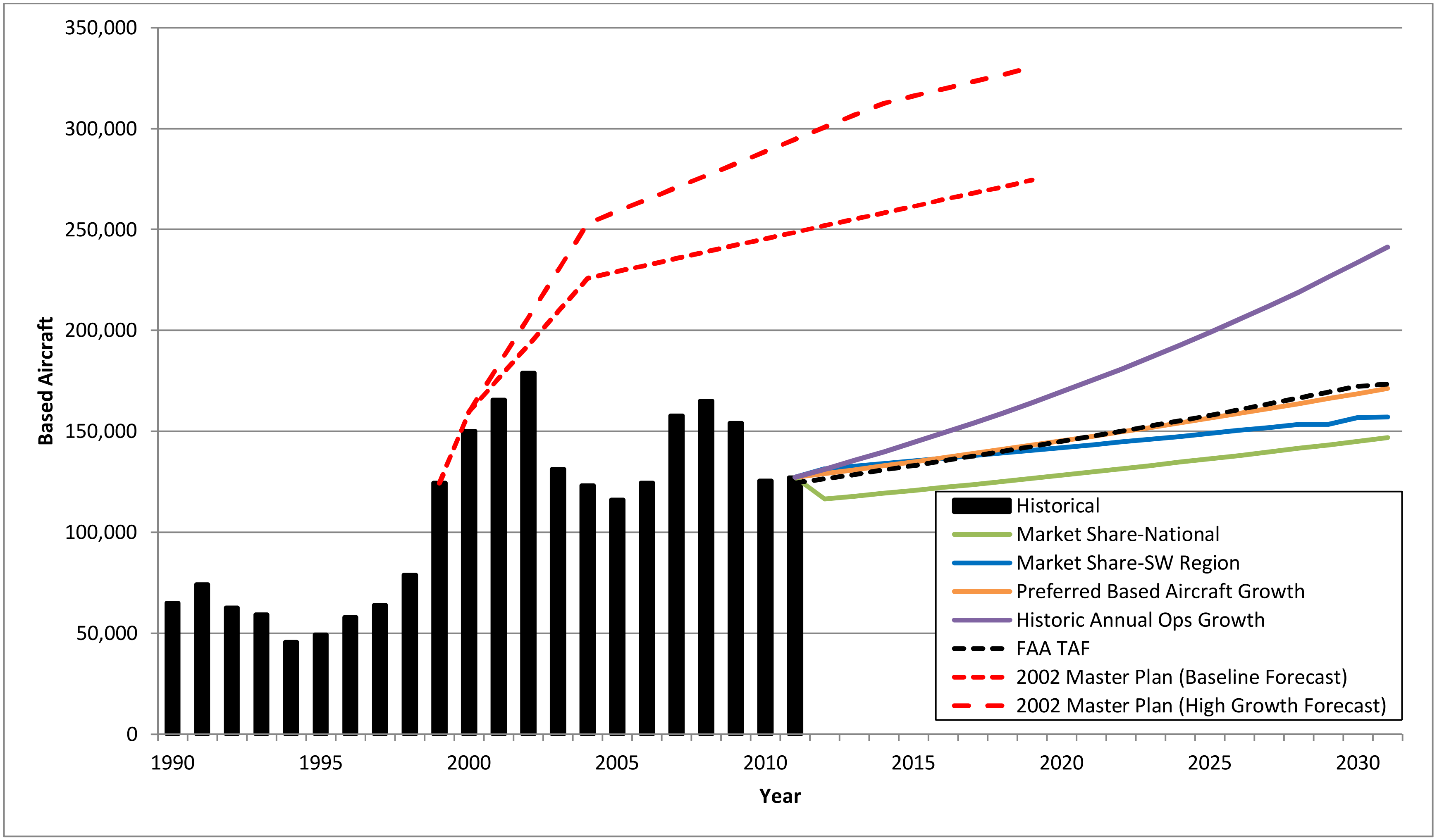
*Source:* Kimley-Horn and Associates, Inc.; FAA Terminal Area Forecast (SSF)

The Historic Annual Operations projection, which is consistent with the 20-year growth pattern experienced at the Airport, is selected as the preferred aircraft operations forecast for Stinson Municipal Airport.

In comparison with the general aviation activity forecast for SAT, the Airport is anticipated to experience significant growth in general aviation activity, while SAT is anticipated to experience an overall decline in general aviation activity. According to the general aviation operations baseline forecast scenario for SAT, annual general aviation operations are forecasted to decline from a 2008 baseline of approximately 84,000 operations to 76,000 in 2050, which is the extent of the SAT planning period. The SAT forecast anticipates general aviation activity will shift from SAT to the Airport throughout the remainder of the planning period.[27]

[27] San Antonio International Airport Master Plan, December 2010, prepared by AECOM

**Exhibit 3.4 Aircraft Operations Projection Comparison**



### 3.6 NIGHTTIME OPERATIONS ADJUSTMENT

The ATCT at Stinson Municipal Airport is operated between 7:00 a.m. and 10:00 p.m. As a result, when analyzing the airfield capacity, an adjustment for operations occurring when the ATCT is closed must be made. Based on reviews of previous studies, including the 2002 Master Plan and the EA for the Runway 9-27 Extension, SAT TRACON data, and discussions with Airport staff and Airport tenants, it is estimated an additional 11.5 percent of general aviation operations occurs while the tower is closed. No additional air taxi or military activity is assumed during the period the ATCT is closed.

### 3.7 MILITARY OPERATIONS

The San Antonio region is home to several military bases, many of which are aircraft bases for training purposes. Small aircraft from these bases utilize the Airport for training purposes, especially for T&G activity. During 2011, military activity accounted for 8,804 operations out of the total 127,134 operations for 2011, or approximately 7 percent[28]. These military operations solely consist of flight training activities.[29]

**Table 3.10 -** presents historical military operations at the Airport over the last ten years. Total military activity at the Airport has remained relatively stable between 2002 and 2011, averaging 7,420 operations per year during the period, although activity has shifted from an itinerant dominant operation to a local dominant operation.

Table 3.10 - Historic Annual Military Operations

| Year | Itinerant Military Operations | Local Military Operations | Total Military Operations | % Change |
|---|---|---|---|---|
| 2002 | 6,906 | 266 | 7,172 | -- |
| 2003 | 6,451 | 390 | 6,841 | -4.6% |
| 2004 | 6,618 | 332 | 6,950 | 1.6% |
| 2005 | 6,857 | 246 | 7,103 | 2.2% |
| 2006 | 6,269 | 488 | 6,757 | -4.9% |
| 2007 | 6,482 | 674 | 7,156 | 5.9% |
| 2008 | 4,472 | 2,522 | 6,994 | -2.3% |
| 2009 | 3,796 | 4,894 | 8,690 | 24.2% |
| 2010 | 3,060 | 4,668 | 7,728 | -11.1% |
| 2011 | 3,632 | 5,172 | 8,804 | 13.9% |

*Source:* FAA ATADS

Future military activity at Stinson will be determined by U.S. Department of Defense policy which dictates the level of military activity at an airport. For the purpose of this forecast, it is expected the military activity will remain constant at 7,500 operations each year throughout the planning period.

[28] Stinson ATCT Monthly Operations Counts
[29] Per conversation with Air Traffic Manager, 4/16/2012

### 3.8 ANNUAL OPERATIONS SUMMARY

The annual operations projection for Stinson Municipal Airport is shown in **Table 3.11.** Total operations at the Airport are expected to increase from 140,736 in 2011 to 268,840 in 2031, representing an annual compounded growth rate of 3.3 percent. Both the historical (2011) and projected (2012-2031) annual operations shown in Table 3.11 - include the nighttime operations adjustment factor, which has been applied to the general aviation operations category. Similar to military operations (discussed in Section 3.7), future air taxi operations are assumed to remain constant at 60 operations per year throughout the planning period, which is the average of air taxi activity experienced at the Airport over the previous ten years.

Table 3.11 - Annual Aircraft Operations Forecast Summary

| Year | Air Taxi | General Aviation(1) | Military | Total Operations |
|---|---|---|---|---|
| ***Historical*** | | | | |
| 2011 | 50 | 131,882 | 8,804 | 140,736 |
| ***Projected*** | | | | |
| 2012 | 60 | 138,800 | 7,500 | 146,360 |
| 2013 | 60 | 143,560 | 7,500 | 151,120 |
| 2014 | 60 | 148,480 | 7,500 | 156,040 |
| 2015 | 60 | 153,550 | 7,500 | 161,110 |
| 2016 | 60 | 158,790 | 7,500 | 166,350 |
| 2017 | 60 | 164,200 | 7,500 | 171,760 |
| 2018 | 60 | 169,790 | 7,500 | 177,350 |
| 2019 | 60 | 175,550 | 7,500 | 183,110 |
| 2020 | 60 | 181,510 | 7,500 | 189,070 |
| 2021 | 60 | 187,660 | 7,500 | 195,220 |
| 2022 | 60 | 194,010 | 7,500 | 201,570 |
| 2023 | 60 | 200,560 | 7,500 | 208,120 |
| 2024 | 60 | 207,330 | 7,500 | 214,890 |
| 2025 | 60 | 214,320 | 7,500 | 221,880 |
| 2026 | 60 | 221,530 | 7,500 | 229,090 |
| 2027 | 60 | 228,980 | 7,500 | 236,540 |
| 2028 | 60 | 236,670 | 7,500 | 244,230 |
| 2029 | 60 | 244,620 | 7,500 | 252,180 |
| 2030 | 60 | 252,820 | 7,500 | 260,380 |
| 2031 | 60 | 261,280 | 7,500 | 268,840 |
| Compounded Annual Growth Rate | | | | |
| 2011-2031 | 0.9% | 3.5% | -0.8% | 3.3% |

Notes:

(1) Historical and Projected General Aviation operations include an 11.5% nighttime operations adjustment factor. Projected GA operations rounded to nearest 10 operations.

*Source:* FAA ATADS (2011 operations during ATCT operational hours);
Kimley-Horn and Associates, Inc. (2011 operations after ATCT operational hours, projected 2012-2031 operations)

## 3.9 INSTRUMENT OPERATIONS

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

Historical annual IFR operations between 1990 and 2011 ranged from 5,445 in 1990 to 13,767 in 2003. The ratio of instrument operations to total operations also varied between a low of 5.4% in 2003 and 2004, and a maximum of 13.4 percent in 1994. The average annual growth rate of instrument operations over that same period for IFR operations was 1.8 percent per year, significantly lower than the total operations annual growth rate of 3.3 percent per year.

To project future instrument operations the historic annual instrument operations growth rate of 1.8 percent per year was applied over the 20-year planning period. **Table 3.12 -** presents the historical and projected annual instrument operations.

## 3.10 AIRCRAFT OPERATIONS PEAKING

A primary consideration for facility planning at airports is related to peak hour (or design level) activity. Aircraft aprons, terminal areas, and other facilities should be sized to accommodate peaks in activity. Standard practice utilizes the peak hour of the peak month of the average day (PMAD) for planning purposes.

For the purposes of this analysis, the peak month operations have been assumed to represent 10.6 percent of annual operations. This represents an average of the peak month activity as a share of annual operations based on tower records from 2002 to 2011. Average day conditions for the peak month are estimated by dividing the peak month operations by 31 (the average number of days in the peak months at the Airport between 2002 and 2010). Peak hour operations are estimated to consist of 12 percent of the daily operations.

## 3.11 LOCAL/ITINERANT DISTRIBUTION

Based on ATCT records for Stinson Municipal Airport, the percentage of itinerant flights at the Airport has averaged 39 percent since 1990. The 2010 and 2011 itinerant flight percentage has been 39.6 and 38.7 percent, respectively. The FAA Terminal Area Forecast projects an average itinerant flight percentage of 37.7 percent between 2012 and 2030.

For the projections of itinerant and local traffic, it was assumed the historical average of 39/61 would continue throughout the planning period.

## 3.12 TENANT AND USER SURVEYS

As part of the forecasting effort, airport tenant surveys and airport user surveys were conducted electronically via Survey Monkey®. These surveys were intended to capture trends and user needs that may affect the next phase of the planning process, which is the determination of airport facility requirements. The surveys and results are contained in **Appendix B.**

Table 3.12 - Historic and Projected Annual Instrument Operations

| Year | Instrument Operations(1) | Total Operations(2),(3) | Instrument Ops Percentage |
|---|---|---|---|
| ***Historical*** | | | |
| 1990 | 5,445 | 64,923 | 8.4% |
| 1991 | 5,803 | 74,108 | 7.8% |
| 1992 | 6,356 | 62,717 | 10.1% |
| 1993 | 5,960 | 59,288 | 10.1% |
| 1994 | 6,119 | 45,694 | 13.4% |
| 1995 | 6,462 | 49,248 | 13.1% |
| 1996 | 6,946 | 57,999 | 12.0% |
| 1997 | 7,537 | 64,919 | 11.6% |
| 1998 | 9,410 | 78,929 | 11.9% |
| 1999 | 10,275 | 124,457 | 8.3% |
| 2000 | 8,999 | 150,282 | 6.0% |
| 2001 | 11,753 | 165,543 | 7.1% |
| 2002 | 13,767 | 179,027 | 7.7% |
| 2003 | 12,797 | 131,248 | 9.8% |
| 2004 | 11,208 | 123,303 | 9.1% |
| 2005 | 10,913 | 116,221 | 9.4% |
| 2006 | 10,051 | 124,395 | 8.1% |
| 2007 | 11,509 | 157,838 | 7.3% |
| 2008 | 8,873 | 165,149 | 5.4% |
| 2009 | 8,290 | 154,017 | 5.4% |
| 2010 | 8,112 | 125,654 | 6.5% |
| 2011 | 7,843 | 127,134 | 6.2% |
| ***Projected*** | | | |
| 2016 | 8,550 | 166,350 | 5.1% |
| 2021 | 9,330 | 195,220 | 4.8% |
| 2026 | 10,180 | 229,090 | 4.4% |
| 2031 | 11,100 | 268,840 | 4.1% |
| | | | |
| Compounded Annual Growth Rate | | | |
| 1990-2011 | 1.8% | 3.3% | |
| 2011-2031 | 1.8% | 3.8% | |

Notes:
(1) Projected instrument operations rounded to nearest 10 operations.
(2) Historical operations from Table 3.6.
(3) Projected operations from Table 3.11 and include nighttime adjustment factor.

*Source:* SSF Tower Records (2008-2010), FAA ATADS (1990-2007, 2011), Kimley-Horn and Associates, Inc. (projected 2012-2031 operations)

## 3.13 SUMMARY

It is anticipated Stinson Municipal Airport will see a sustained amount of growth during the 20-year planning period. Based aircraft are expected to increase from 115 in 2011 to 179 in 2031. The Airport's operations are projected to increase from 140,700 in 2011 to 268,840 in 2031. **Table 3.13 -** summarizes the preferred aviation forecasts for Stinson Municipal Airport.

Table 3.13 - Aviation Activity Forecast Summary

| Year | Based Aircraft(1) | Total Annual Operations(2) | Peak Month Operations(3) | PMAD Operations(4) | Peak Hour Operations (PMAD)(5) |
|---|---|---|---|---|---|
| 2011 | 115 | 140,700 | 14,900 | 481 | 58 |
| 2016 | 144 | 166,400 | 17,600 | 568 | 68 |
| 2021 | 155 | 195,200 | 20,700 | 668 | 80 |
| 2026 | 167 | 229,100 | 24,300 | 784 | 94 |
| 2031 | 179 | 268,800 | 28,500 | 919 | 110 |

Notes:

(6) Data from Table 3.8.
(7) Data from Table 3.11. Numbers rounded to nearest 100.
(8) Peak month operations equals 10.6 percent of total annual operations. Numbers rounded to nearest 100.
(9) Peak month average day operations equals peak month operations divided by 31. Numbers rounded to nearest integer.
(10) Equals 12 percent of PMAD operations. Numbers rounded to nearest integer.

*Source:* Kimley-Horn and Associates, Inc.

# SECTION 4 - DEMAND/CAPACITY ANALYSIS AND FACILITY REQUIREMENTS

## 4.1 INTRODUCTION

This section provides a technical presentation of demand/capacity and facility requirements for Stinson Municipal Airport. The primary purpose of this analysis is to compare existing capacities of the Airport's facilities to the projected aviation-related demand in order to determine the timeframe in which capacity constraints could occur. The facility requirements for each horizon year (2016, 2021, 2026, and 2031) are based on forecast levels of aviation activity for those years. It should be noted the timing of the development of any new facilities should depend on the rate of growth that actually occurs at the Airport.

This section addresses functional areas of the Airport separately. The following topics are discussed in the remainder of this section:

- Airfield Facility Requirements
- General Aviation Facility Requirements
- Support Facility Requirements

The assessment of these functional areas was translated into facility requirements at demand levels throughout the planning period. Facility requirements were generated with a combination of qualitative and quantitative methodologies. The quantitative approach utilized existing airport data and forecast information from Section 3 and applied various numerical methods to determine future facility requirements. The qualitative approach utilized tenant and user surveys, which were completed by airport tenants and airport users. The qualitative approach supplemented the numerical data approach in an effort to understand potential future requirements that may not be captured by forecast-driven analysis.

For the purpose of the analysis in the remainder of this report, references to specific years will be minimized in this and subsequent sections, and instead Planning Activity Levels (PALs) will be emphasized. The purpose of the PALs is to guide Airport staff and officials, in determining when airport facilities need expansion or upgrades according to activity levels instead of calendar years. By referencing decisions to activity levels and not specific dates, airport operators can be flexible and responsible with regard to development needs.

PAL 1 (estimated to occur in 2016) is associated with the short-term planning horizon, PAL 2 (estimated to occur in 2021) is associated with the mid-term planning horizon, and PAL 3 (estimated to occur in 2026) and PAL 4 (estimated to occur in 2031) represent the long-term planning horizon. For the purpose of determining timing of Airport improvements in this and subsequent sections, PALs are not correlated to a specific calendar year.

## 4.2 AIRFIELD FACILITY REQUIREMENTS

Evaluation of an airport's runways and taxiways with respect to various factors such as capacity, geometry, and strength, plays a key role in the function of an airport within the regional and national system of airports. Thus, operational enhancements and airfield requirements for the Airport were identified through a review of the existing airspace environment, a determination of existing and future airfield capacity, as well as future runway and taxiway requirements.

### 4.2.1 Airspace Capacity

As presented in Section 2, Airspace, the airspace surrounding the Airport is classified as Class D. Class D airspace generally describes the airspace surrounding airports with an operational control tower, but with limited or no commercial air carrier activity. Aircraft operators wishing to enter the Stinson Class D airspace must establish two-way radio contact with the ATCT prior to entering during hours of ATCT operation. The Stinson Class D airspace extends from the airport surface upwards to 3,100 feet Mean Sea Level (MSL), and penetrates the outer ring of the SAT Class C airspace, the floor of which is at 2,000 feet MSL. SAT is located approximately 15 miles north of the Airport.

The Stinson ATCT has an official agreement in effect with the SAT TRACON such that control of the area of Class D airspace above 1,900 feet MSL is delegated to SAT. In the event the Stinson ATCT has an operational need for the Class D airspace above 1,900 feet MSL, inter-facility coordination between the Stinson ATCT and the SAT TRACON is necessary.

The Airport is also located in close proximity to Lackland Air Force Base and Randolph Air Force Base, which are located approximately 6 miles northwest and 15 miles northeast of Stinson, respectively. The Class D airspace of the Lackland Air Force Base adjoins the Stinson Class D airspace, and both share portions of the same boundary. Randolph Air Force Base airspace is also classified Class D, and is surrounded by an Alert area, designated A-635. Alert Areas contain unusually high volumes of pilot training or an unusual type of aerial activity. This area contains concentrated student jet training, and is operational from sunrise to 3 hours after sunset Monday through Friday. Because of its close proximity, operations from Lackland Air Force Base may impact the Stinson Class D airspace, especially arrivals on Runway 09 from the west.

There are several Military Operations Areas (MOAs) located in the vicinity of the Airport. MOAs are areas of airspace designated to separate or segregate certain non-hazardous military activities from IFR traffic and to identify VFR traffic where these activities are conducted. The Randolph 2B and Randolph 2A MOAs are located approximately 15 miles west of the Airport, and the Randolph 1A and Randolph 1B MOAs are located approximately 20 miles southeast of the Airport. Operations within these areas are not anticipated to affect capacity at the Airport.

Physical constraints on capacity include tall structures located in the vicinity of airports that have the potential to impact arrival and departure procedures by limiting arrival routes and requiring higher traffic pattern altitudes. There are no tall structures located within 5 miles of the Airport, but there is one tall structure located approximately 6 miles from the approach end of Runway 27, as shown on Exhibit 2.5, and is near the extended centerline of Runway 27. As there are no published instrument approaches to this runway, this structure should not negatively affect capacity.

Based on the above airspace capacity factors, there should be minimal negative impacts to the capacity of the airspace surrounding the Airport throughout the planning period. While minimal, most impacts occur as a result of the Stinson Class D airspace being located relatively close to the SAT Class C airspace, and because of the proximity of the Lackland Air Force Base Class D airspace adjoining the Stinson Class D airspace.

### 4.2.2 Airfield Capacity

The calculations of airfield capacity and delay are the basis for evaluating the adequacy of the runway and taxiway system to meet existing and future airport activity levels. The following analysis was conducted using the FAA's Airport Capacity and Delay Manual (AC 150/5060-5).

The capacity of the runway system is presented in terms of both hourly capacity and Annual Service Volume (ASV). As defined by AC 150/5060-5, ASV is a reasonable estimate of an airport's annual capacity, accounting for differences in runway use, aircraft mix, weather conditions, and other factors that would be encountered over a year's time. Hourly capacity is the number of aircraft operations (departures and arrivals) that can be accommodated in a one-hour time period, given a specific runway use strategy.

#### 4.2.2.1 Capacity Factors

The following factors are taken into account when evaluating airfield capacity using the previously described methodology. They are presented with a description of the criterion, and followed by a description of how it applies to the Airport specifically, if necessary.

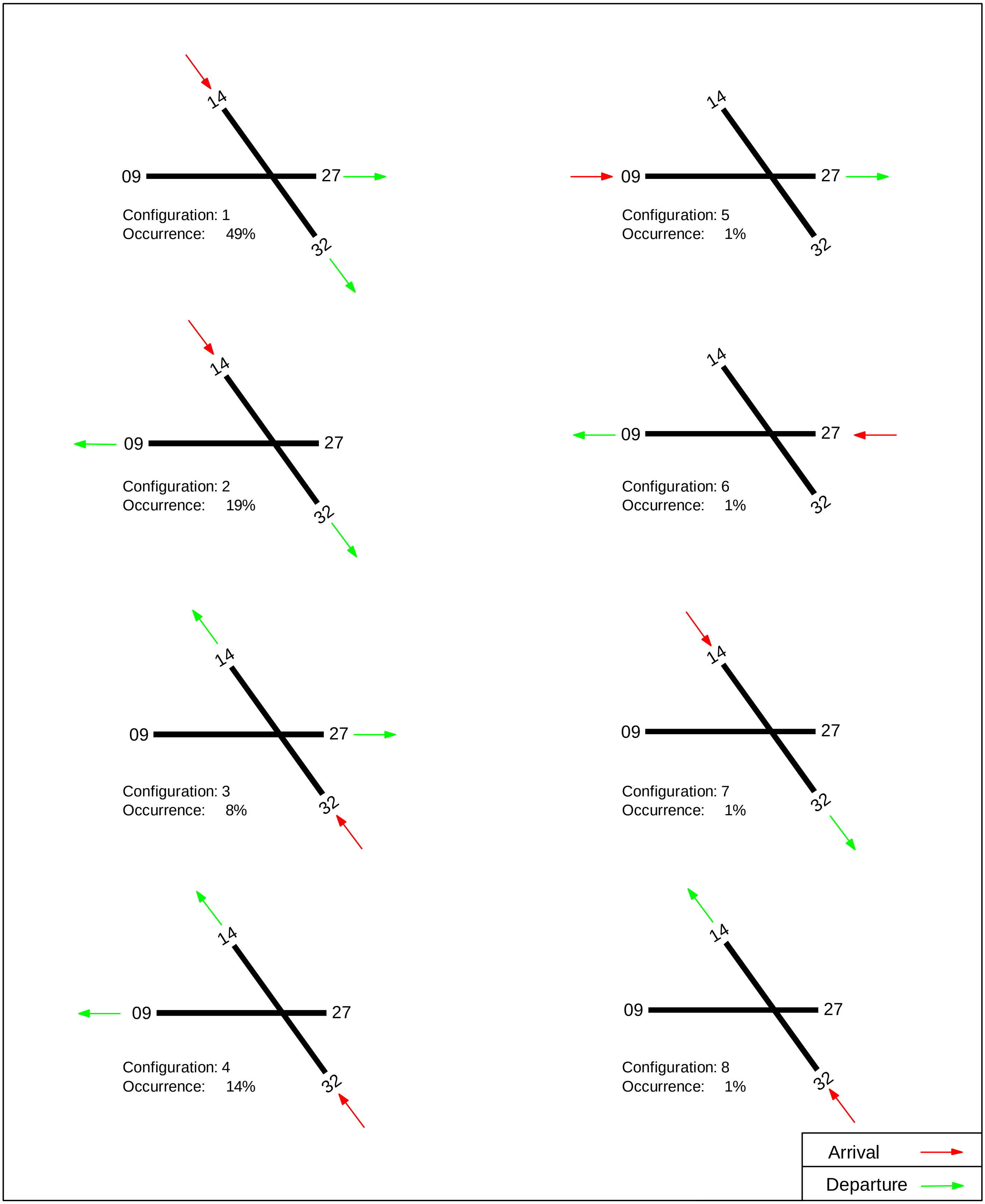
- **Airfield Characteristics**
  The spatial configuration and number of runways, parallel taxiways, and exit taxiways have a direct influence on an airfield's ability to accommodate various types of aircraft in a given time frame. The types of navigational aids, airfield lighting, surveillance radar, and other airfield instrumentation highly affect runway capacity.

- **Runway Use Configurations**
  At airports equipped with two or more runways, it is not uncommon for more than one configuration to be used under normal operating conditions. Poor weather conditions, wind conditions, and a lack of runway instrumentation may necessitate a change in preferential runway use. Ultimately, the airfield should operate under a configuration that affords the airport the highest hourly capacity; however, due to varying weather conditions, this particular configuration may not be used 100 percent of the time. The Airport's estimated ASV becomes a function of the time period each configuration is used on an average annual basis.

  The existing airfield operating configurations are discussed in Section 2, Airfield Operating Configurations. **Exhibit 4.1** illustrates the eight runway use configurations used at Stinson during VFR conditions and the occurrence rate of each configuration. **Exhibit 4.2** shows the same information for the two runway use configurations used during IFR conditions.

- **Meteorological Conditions**
  Runway capacity is highest during good weather conditions when visibility is at its best and visual flight rules are in effect. When visibility and cloud ceilings drop below certain levels (typically 3 statute miles visibility and 1,000 foot ceiling), instrument flight rules become effective, resulting in greater separations between airborne aircraft and longer runway occupancy times. Meteorological factors such as fog, strong crosswinds, or excessive water on the runways have a major impact on runway capacity and may even cause runway closure at times.

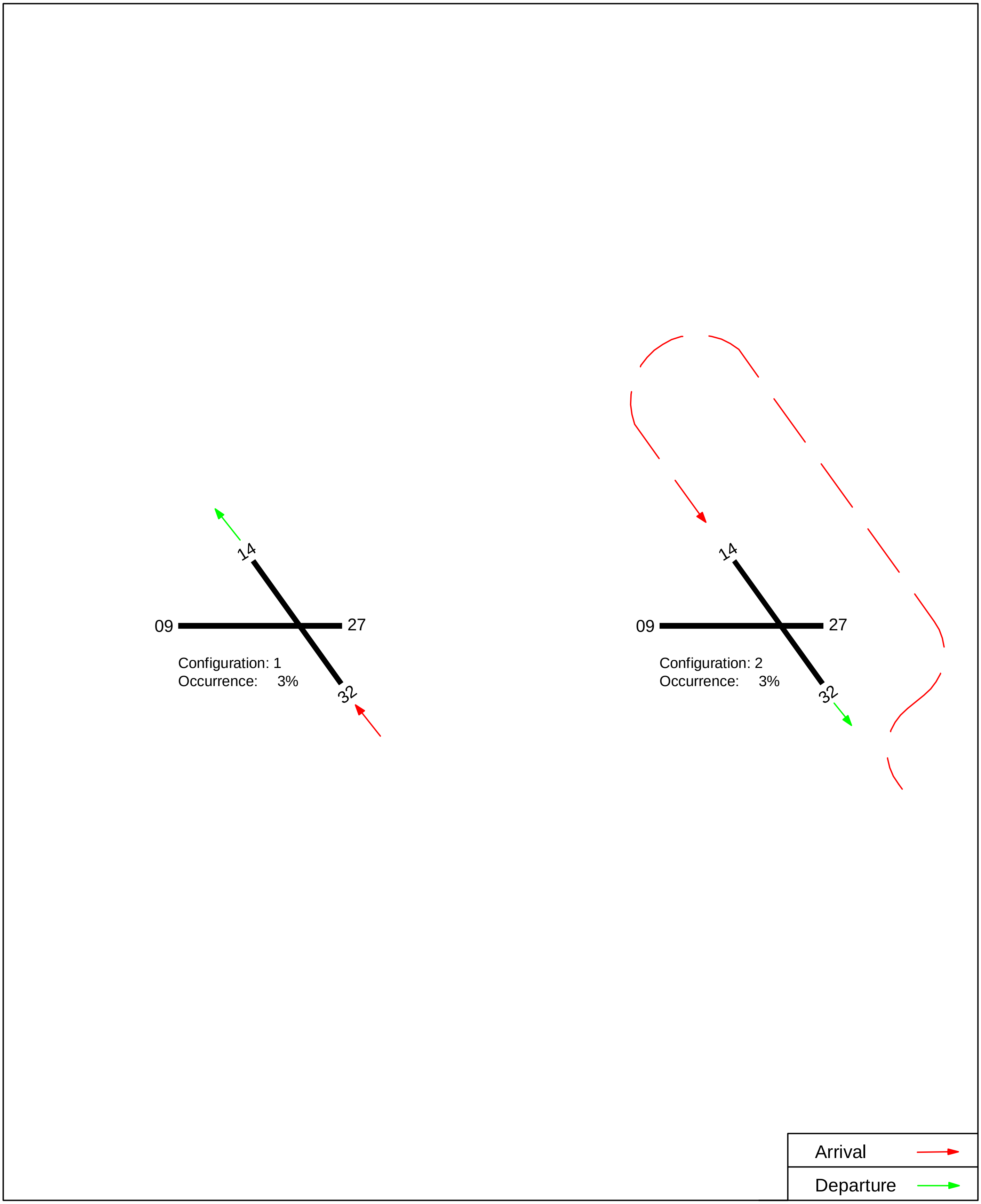
  Based on the wind data obtained from the National Climatic Data Center for Stinson, VFR weather conditions prevail approximately 92 percent of the time, while IFR conditions occur approximately 7 percent of the time.




Source: Stinson ATCT Personnel, February 2012

Exhibit 4.1

# Runway Use Strategies - VFR Conditions




Source: Stinson ATCT Personnel, February 2012

Exhibit 4.2

# Runway Use Strategies - IFR Conditions

Stinson Municipal Airport
Master Plan Update

- **Aircraft Fleet Mix**
  The fleet mix is the composition of aircraft types based on their size and approach speeds. This metric affects airfield capacity because the size, weight, approach speed, and braking ability of the aircraft affect the length of time the aircraft occupies the runway and the manner in which ATC directs activity. Larger aircraft generally have higher approach speeds, and require more airspace, thus decreasing capacity to some degree. Variations in approach speeds and landing distance performance can affect how long an aircraft is on the runway, known as the runway occupancy time, which in turn affects runway capacity. The aircraft fleet mix is divided into four classes when estimating capacity. These classes are identified by the letters A though D and represent the group of aircraft by general type and weight.

**Table 4.1** summarizes representative aircraft types found in each aircraft class and the estimated percentage of operations each class operates at Stinson Municipal Airport. Class A aircraft make up the bulk of the operational aircraft fleet mix currently at Stinson, a trend anticipated to continue throughout the planning period. The mix index calculation is based on the aforementioned classes of aircraft expected to operate at the Airport. The formula for calculating the mix index is C+3D, with C representing the percentage of aircraft greater than 12,500 pounds but less than 300,000 pounds, and D representing the percentage of aircraft greater than 300,000 pounds.

Table 4.1 - Aircraft Fleet Mix

| Class | Fleet Mix % | | Aircraft Type | |
|---|---|---|---|---|
| | Existing (2011) | Future (PAL 4) | | |
| **Class A** | 96% | 94% | **SMALL SINGLE-ENGINE (GROSS WEIGHT: 12,500 POUNDS OR LESS)** | |
| Examples |  | | Cessna 172/182<br>Beech, Bonanza | Mooney 201<br>Piper Cherokee/Warrior |
| **Class B** | 4% | 3% | **SMALL TWIN-ENGINE (GROSS WEIGHT: 12,500 POUNDS OR LESS)** | |
| Examples |  | | Beech Baron<br>Cessna 402<br>Lear 25 | Mitsubishi MU-2<br>Piper Navajo<br>Cessna Citation I |
| **Class C** | 0% | 3% | **LARGE AIRCRAFT (GROSS WEIGHT: 12,500 TO 300,000 POUNDS)** | |
| Examples |  | | Lear 35/55<br>Canadair RJ50<br>Embraer Brasilia<br>Embraer 135/145 | Gulfstream (I thru V)<br>Saab 340<br>Aerospatiale ATR 42/72<br>BBJ |
| **Class D** | 0% | 0% | **LARGE AIRCRAFT (GROSS WEIGHT: MORE THAN 300,000 POUNDS)** | |
| Examples |  | | Lockheed L-1011<br>Boeing B707<br>Boeing B747 | Airbus A-300/A-310<br>Douglas DC-8-60/70<br>McDonald Douglas MD-11 |

*Source*: Existing – SSF Tenant Surveys, 2012

Future – Kimley-Horn and Associates, 2012

Based on the anticipated mix of aircraft expected to utilize the Airport throughout the planning period, the mix index calculation is C+3D = 3, where C equals 3 percent and D equals 0 percent.

- **Touch and Go Operations**
  These operations are primarily for practicing and flight training, and have the ability to significantly affect runway capacity. A runway will typically be able to accommodate more of these operations in a given time period than full-stop landing operations, since touch-and-go operations result in lower runway occupancy times. As discussed in Section 3, Touch and Go Activity, touch-and-go activity at Stinson currently accounts for approximately 60 percent of total operations at the Airport. For the purposes of the capacity analysis this level of activity is assumed to continue throughout the planning period.

- **Taxiway System**
  Similar to runways, the presence of well-placed taxiways can significantly affect the level of air traffic an airfield may ultimately accommodate. Well-placed exit taxiways can help reduce runway occupancy times and preserve optimum levels of capacity. Utilizing the methodology contained in AC 150/5060-5, an exit factor is determined based on the quantity and placement of exit taxiways and the anticipated mix index.

  Based on the Airport's anticipated mix index and the prescribed exit location range from the threshold (2,000 to 4,000 feet), runway ends 14 and 27 have one exit taxiway useable for determining the exit factor in hourly capacity calculations. Runway ends 9 and 32 have two exit taxiways useable for the calculations.

- **Arrivals/Departures**
  The percentage of aircraft arrivals and the sequencing of aircraft departures are two other operational characteristics that affect overall airfield capacity. The percentage of aircraft arrivals is the ratio of landing operations to total airport operations during a given time frame. This percentage is important because arriving aircraft require higher runway occupancy time than departing aircraft. The FAA methodology provides for the use of 40, 50, or 60 percent of aircraft arrivals in the computation of airfield capacity. For general planning purposes, a 50 percent aircraft arrivals figure will be applied in the calculation of airfield capacity.

#### 4.2.2.2 Hourly Capacity

Hourly capacity is a measure of the maximum number of aircraft operations that can be accommodated at the airport in an hour. Hourly capacity determines if an airport can accommodate the projected peak hour operations.

The hourly capacity for each runway use strategy during VFR and IFR conditions was determined using the methodologies contained in Chapter 3 of AC 150/5060-5. The theoretical hourly capacity of the Airport is anticipated to vary between 123 and 137 hourly VFR operations and 60 to 62 hourly IFR operations, depending upon the airfield operating configuration being used.

As shown in Table 3.13, peak hour demand is projected to be 110 operations per hour at the end of the planning period. As discussed in Section 3, Instrument Operations, and shown in Table 3.12, instrument operations are projected to account for approximately 4 percent of total operations by the end of the planning period. For the purposes of evaluating hourly IFR capacity, peak hour demand in IFR conditions is assumed to be 10 percent of the overall peak hour demand in each planning level yielding an IFR peak hour demand of 11 operations in PAL 4.

As shown in **Exhibits 4.3 and 4.4**, hourly airfield capacity is expected to be adequate to accommodate projected demand under both VFR and IFR conditions.

4.2.2.3 Annual Service Volume

Annual Service Volume represents an approximation of the Airport's annual capacity, taking into consideration weighted hourly capacities and the hourly, daily, and monthly operational patterns at the Airport.

The weighted peak hour capacity ($C_w$) was developed based on the data covered above and the methodology in Chapter 3 of AC 150/5060-5. The $C_w$ is multiplied by two operational ratios to obtain the airport's estimated ASV:D (the ratio of annual demand to average daily demand in the peak month), and H (the ratio of average daily demand to average peak hour demand during the peak month). At the Airport, the daily and hourly ratios are 292 and 8 respectively. ASV is obtained through the following formula:

$$ASV = C_w \times D \times H$$

The resulting ASV projections for the planning period are summarized below in **Table 4.2.**

Table 4.2 - Airfield Demand/Capacity Summary

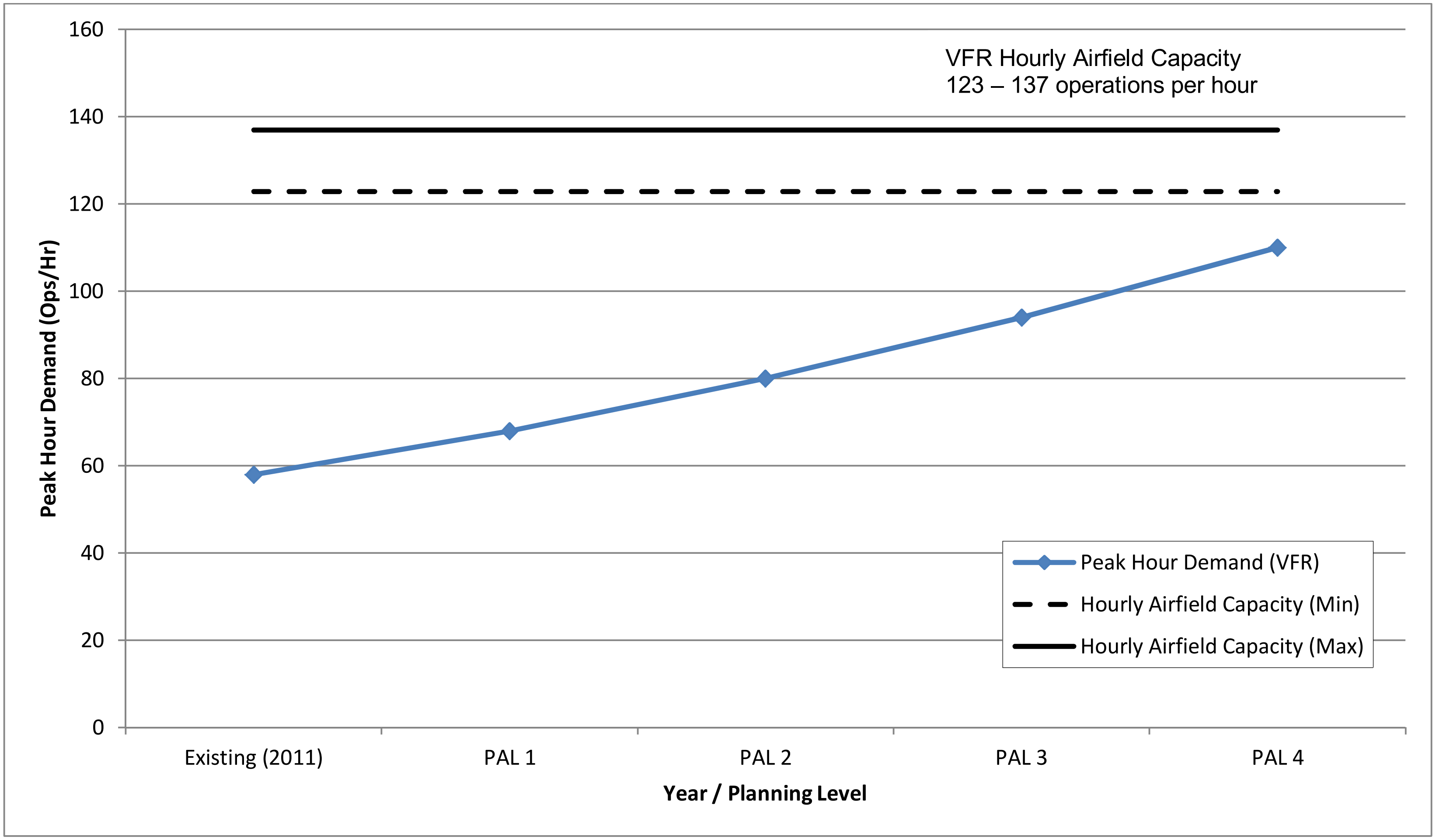
| Year/Planning Level | Projected Annual Operations(1) | Annual Service Volume(2) | Ratio of Annual Operations to ASV(3) |
|---|---|---|---|
| 2011 (Actual) | 140,700 | 309,600 | 0.45 |
| PAL 1 | 166,400 | 309,600 | 0.54 |
| PAL 2 | 195,200 | 309,600 | 0.63 |
| PAL 3 | 229,100 | 309,600 | 0.74 |
| PAL 4 | 268,800 | 309,600 | 0.87 |

Notes:
(1) From Section 3, Summary
(2) Calculated by multiplying weighted peak hour capacity ($C_W$) times the daily ratio (D) times the hourly ratio (H)
(3) Ratio is calculated by dividing Projected Annual Operations by Annual Service Volume

*Source:* Kimley-Horn and Associates, Inc. 2012

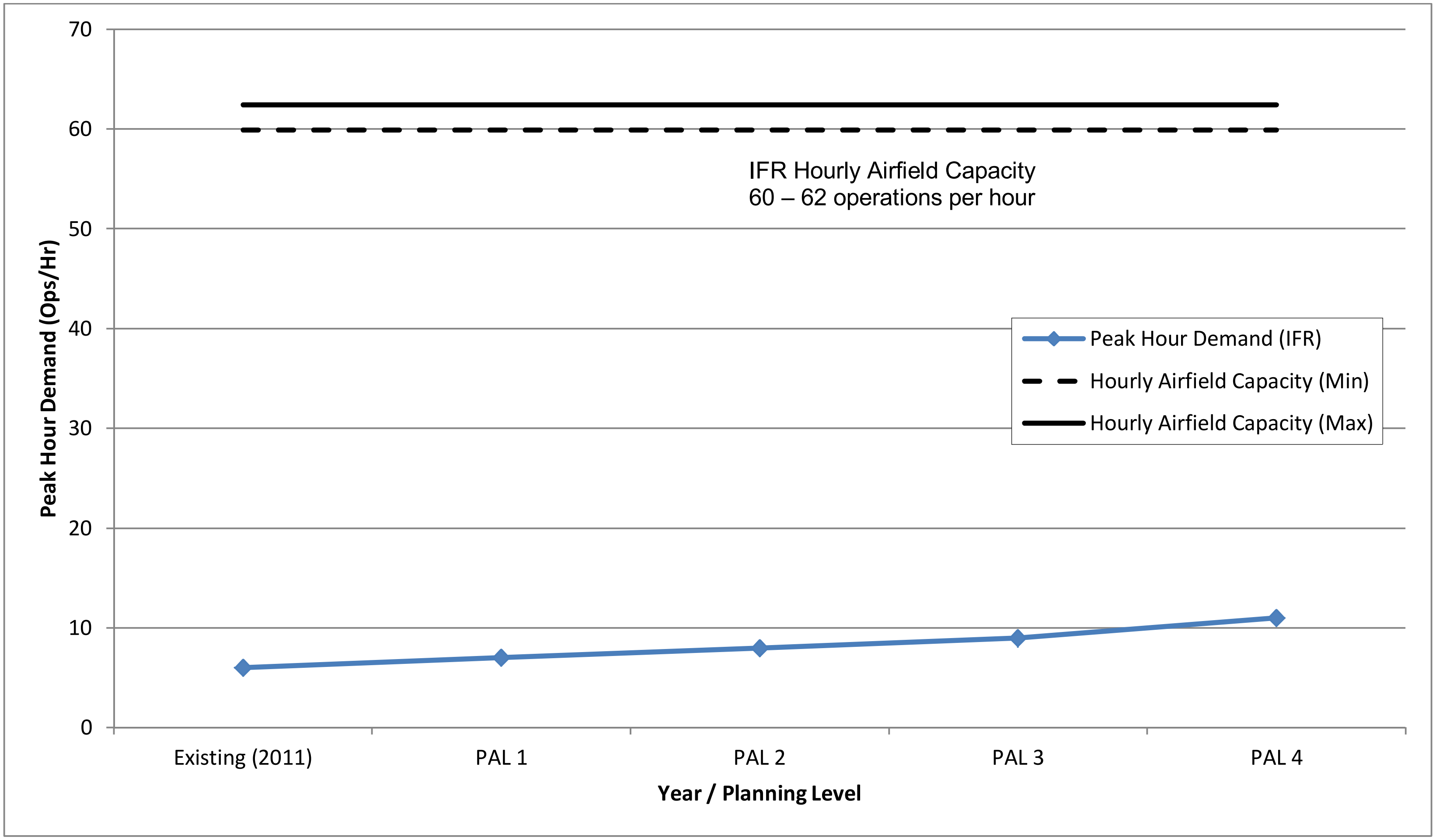
Based on the projections, the Airport's ratio of annual operations to ASV is expected to approach 87 percent by the end of PAL 4. FAA airport planning guidelines recommend planning for airfield capacity improvements when projected demand reaches 60 percent of capacity. While the demand/capacity ratio reaches the window recommended for additional runway planning, it is does not do so until the later portions of the planning period. It is anticipated the airfield should be able to meet capacity needs through the entire planning period. Should the high levels of touch-and-go traffic sustain at current levels throughout the planning horizon, the Airport is anticipated to have adequate time in the future for planning and construction of additional airfield capacity if needed.

**Exhibit 4.3 VFR Hourly Airfield Capacity**




*Source:* FAA AC 150/5060-5; Kimley-Horn and Associates, Inc.

**Exhibit 4.4 IFR Hourly Airfield Capacity**




*Source:* FAA AC 150/5060-5; Kimley-Horn and Associates, Inc.

### 4.2.3 RUNWAY REQUIREMENTS

Future runway requirements at the Airport were addressed for the runway orientation, critical aircraft, overall runway length, dimensional standards and pavement strength. Runway requirements are planned in accordance with design criteria presented in FAA AC 150/5300-13, Airport Design.

#### 4.2.3.1 Runway Orientation

The orientation of runways at an airport is primarily a function of wind direction and velocity. FAA guidance recommends an airport's runway configuration provide runway availability of at least 95 percent on the basis of the crosswind component not exceeding 10.5 knots for Airport Reference Codes A-I and B-I, and 13.0 knots for A-II and B-II. The Stinson wind rose, depicting the wind orientation and velocity, is shown in Section 2, Exhibit 2.4.

Runway 9-27 provides 93.9 percent coverage for the 10.5 knot crosswind component, and 96.9 percent coverage for 13 knots. By itself, Runway 9-27 cannot provide 95 percent coverage for A-I and B-I aircraft. Runway 14-32 provides 96.6 percent coverage for 10.5 knots, and 98.5 percent coverage for 13 knots. By itself, Runway 14-32 can provide 95 percent coverage for A-I through B-II type aircraft.

Both runways combined provide 97.6 percent and 99.2 percent coverage for 10.5 knot and 13 knot crosswind components, respectively. The existing runway configuration at the Airport is sufficient to meet wind coverage requirements.

#### 4.2.3.2 Critical Aircraft

The critical design aircraft is used to determine the appropriate spatial requirements and operational capabilities for the Airport during the planning period. The critical aircraft is the aircraft that is the most demanding aircraft from an airport design criteria perspective that will regularly use the Airport during the planning period.

According to the FAA, use of an airport on a regular basis is considered to be 500 or more annual operations (equivalent to 250 takeoffs and landings per year) conducted by a particular aircraft or aircraft group. A review of aircraft forecasted to use the Airport reveals that aircraft in approach category B will be the most demanding aircraft to regularly use the airport. The largest aircraft from the standpoint of wingspan to regularly use the Airport currently, and in the future, fall within Airplane Design Group (ADG) II. Based on FAA planning guidelines, the Airport should be designed to accommodate the spatial and geometric requirements of ADG II aircraft and have the operational capabilities to accommodate aircraft in approach category B. In combination, this results in an ARC of B-II. Thus, the airport design parameters associated with an ARC of B-II will be used for planning airfield facilities at the Airport.

Based on information obtained from the Airport, tenants, and user surveys, for the purpose of this requirements analysis, the critical aircraft is the Cessna Citation 550 series. Larger corporate aircraft such as the Gulfstream G550 currently utilize facilities at Stinson, and are anticipated to continue using the Airport in the future. However, given the current and anticipated level of activity of these larger aircraft, it is not necessary to develop the entire airport to higher ARC standards, but to give special consideration to certain portions of the airfield and its geometry. It is important to note this does not prevent larger aircraft from using Stinson Municipal Airport.

4.2.3.3 Runway Length Requirements

FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, provides guidance for determining runway length. According to this document, the following criteria are identified:

> *"The recommended length for the primary runway is determined by considering either the family of airplanes having similar performance characteristics or a specific airplane needing the longest runway. In either case, the choice should be based on airplanes that are forecast to use the runway on a regular basis. A regular basis is considered to be at least 250 takeoffs a year."*

The FAA's computer program, Airport Design 4.2D, calculates runway length requirements based on families of airplanes having similar performance characteristics. The program's results are categorized for small aircraft less than 12,500 pounds, large aircraft up to 60,000 pounds, and large aircraft more than 60,000 pounds. The large aircraft category of 60,000 pounds or less is further subdivided into groups of aircraft at payload capacities of 60 and 90 percent useful load.

**Table 4.3** presents the runway length requirements determined using the FAA program. As the table indicates, a runway length of approximately 4,450 feet is required to satisfy the requirements for all small aircraft. The current primary runway length of 5,000 feet exceeds this criterion. Large aircraft with maximum takeoff weights of 60,000 pounds or less would require a runway length between 5,500 and 9,300 feet, depending on payload and fuel loads.

Table 4.3 - Runway Length Analysis

| Category | Recommended Minimum Runway Length |
|---|---|
| Small Aircraft (less than 12,500 pounds) | |
| Less than 10 passenger seats | |
| 75% of these small airplanes | 2,750' |
| 95% of these small airplanes | 3,290' |
| 100% of these small airplanes | 3,930' |
| More than 10 passenger seats | 4,450' |
| Large Aircraft (60,000 pounds or less) | |
| 75% of these aircraft at: | |
| 60% useful load | 5,500' |
| 90% useful load | 7,310' |
| 100% of these aircraft at: | |
| 60% useful load | 6,020' |
| 90% useful load | 9,340' |

Notes:

Parameters used in calculations:

- Airport Elevation = 577'
- Mean daily maximum temperature of the hottest month = 95 degrees Fahrenheit
- Maximum difference in runway centerline elevation - 20'
- Assumes wet runway conditions for planning purposes.

*Source:* FAA Advisory Circular 150/5325-4B, Airport Design Program 4.2D.
Kimley-Horn and Associates, Inc., 2012

The existing lengths of the runway system (in combination) at the Airport are adequate to meet the needs of all smaller aircraft and a large percentage of the business jet fleet. Larger corporate jet aircraft, while still capable of operating out of Stinson Municipal Airport, would depart the Airport at less than their maximum take-off weight, thereby reducing the stage length of these aircraft from Stinson.

Additional runway length would be required to accommodate the largest corporate aircraft types to their maximum take-off weight and full range, such as the Gulfstream G550 and the Bombardier CL-600; however, these aircraft can still operate from Stinson with shorter stage lengths. To accommodate larger corporate jet aircraft to their maximum take-off weight and range, an extension of one of the two runways is explored in the Alternatives Analysis section of this report.

#### 4.2.3.4 Runway Dimensional Standards

Runway dimensional standards are determined by the ARC of the runway, in particular the ADG standards. Dimensional standards pertaining to runways and runway-related separations are essential to provide clearances from potential hazards affecting routine aircraft movements on the runways. These standards relate to separations for parallel runways, hold lines, parallel taxiways, aircraft parking, obstacle free areas, and safety areas.

The most recent approved Airport Layout Plan identifies an ARC of B-I (small aircraft) for the Airport. **Table 4.4** presents the existing runway-related dimensional standards for Runways 9-27 and 14-32 and compares them to the current dimensional standards (B-I small aircraft exclusively), and those recommended in the future (B-I and B-II).

The threshold displacements on runway ends 9, 14, and 32 alleviate the current Runway Safety Area (RSA) and Runway Object Free Area (ROFA) deficiencies. Should either runway be upgraded to B-I or B-II design standards, the following items would need to be addressed:

- **Runway 9-27 – Upgrade to B-I Standards**
  - Declared Distances updated to account for increased ROFA area requirements (Accelerate-Stop Distance Available (ASDA), Landing Distance Available (LDA)).

- **Runway 9-27 – Upgrade to B-II standards**
  - Declared Distances updated to account for increased ROFA requirements (ASDA, LDA).
  - Potential need to displace Runway 27 end by 38 feet or relocate a portion of the fenceline along Mission Road to accommodate ROFA.
  - Increase runway-to-taxiway separation to Taxiway D by an additional 30 feet (240 feet total) between Runway 9 end and Taxiway A.

- **Runway 14-32 – Upgrade to B-I Standards**
  - Declared Distances updated to account for increased ROFA area requirements (ASDA, LDA).

- **Runway 1-32 – Upgrade to B-II standards**
  - Declared Distances updated to account for increased ROFA requirements (ASDA, LDA).
  - Potential need to displace Runway 32 end by an additional 22 feet to accommodate ROFA.
  - Increase runway-to-taxiway separation to Taxiway A by an additional 55 feet (240 feet total) between Runway 14 end and Taxiway B.

Table 4.4 - Runway Dimensional Standards

| Design Criteria | B-I (Small) Design Standard[1, 2] | Existing Runway Dimensions | | | | B-I Design Standard[1] | B-II Design Standard[1] |
|---|---|---|---|---|---|---|---|
| | | 14 | 32 | 9 | 27 | | |
| Runway: | | | | | | | |
| Width | 60 | 100 | | 100 | | 60 | 75 |
| Shoulder Width | 10 | 20 | | None | | 10 | 10 |
| Safety Area Width | 120 | 120 | | 120 | | 120 | 150 |
| Safety Area Prior to Landing Threshold | 240 | 240 | 240 | 240 | 240 | 240 | 300 |
| Safety Area Length Beyond R/W End | 240 | 19 | 36 | 20 | 240 | 240 | 300 |
| OFA Width | 250 | 250 | | 250 | | 400 | 500 |
| OFA Length Beyond R/W End | 240 | 14 | 0 | 5 | 240 | 240 | 300 |
| OFZ Width | 250 | 250 | | 250 | | 400 | 400 |
| OFZ Length Beyond R/W End | 200 | 14 | 0 | 5 | 200 | 200 | 200 |
| Runway Centerline to: | | | | | | | |
| Parallel Runway Centerline | 700 | N/A | | N/A | | 700 | 700 |
| Taxiway/Taxilane Centerline | 150 | 240/185[(3)] | | 240/210[(4)] | | 225 | 240 |
| Aircraft Parking Area | 125 | 252 | | 303 | | 200 | 250 |

Notes:

(1) Runway design standards for runways with not lower than ¾-statute mile visibility minimums.
(2) Runway design standards for small airplanes exclusively.
(3) Taxiway Alpha has a centerline-to-centerline separation to Runway 14-32 of 185 feet between the Runway 14 end and Taxiway Bravo, and 240 feet between Taxiway Bravo and the Runway 32 end.
(4) Taxiway Delta has a centerline-to-centerline separation to Runway 9-27 of 210 feet between the Runway 9 end and Taxiway Alpha, and 240 feet between Taxiway Alpha and the Runway 27 end.

- Shaded cells indicate deficiency to FAA standards for ARC B-I (Small Aircraft).
- All distances in feet.

*Source:* FAA Advisory Circular 150/5300-13
Kimley-Horn and Associates, Inc., 2012

These design standard requirements will be further addressed as needed in Section 5 during the alternatives development.

### 4.2.4 Taxiway Requirements

Taxiway requirements are addressed to maintain and/or improve existing and future airfield capacity levels previously identified, and to provide more efficient and safe ground traffic movements. Taxiways, which provide vital links between independent airport elements, should optimize airport utility by providing free movement to and from the runway, general aviation terminal areas, and aircraft parking areas. The desirability of maintaining a uniform flow, with a minimum number of points necessitating a change in aircraft taxiing speed, is of paramount concern.

Dimensional standards pertaining to taxiways/taxilanes and taxiway/taxilane-related separations are necessary to ensure FAA recommended clearances between taxiing aircraft and fixed or movable objects during routine operations. These standards relate to separations for parallel taxiways/taxilanes, aircraft parking, service roads, object free areas, wingtip clearances, safety areas, and shoulders. Also addressed are recommended taxiway widths.

All dimensional standards are determined based on the ARC established for the Airport. **Table 4.5** presents all taxiway dimensional standards to be applied at the Airport, relative to the separations currently in existence. All taxiways at the Airport currently meet and/or exceed ADG I design standards. Currently, Taxiways B, C, and D also meet most ADG II design standards. As discussed above, runway-to-taxiway separation between Runway 9-27 and Taxiway D would need to be increased by 30 feet between the Runway 9 end and the intersection of Taxiway A and D to meet ADG II standards. However, should that realignment be pursued and designed to standard, no existing structures would need to be relocated to accommodate ADG II standards. Should Runway 14-32 be upgraded to ADG II standards, in addition to the runway-to-taxiway separation item for Taxiway A, numerous aircraft tie-down locations east of Taxiway A and north of Taxiway B would require removal to meet ADG II Taxiway OFA standards. These design standard requirements will be further addressed as needed in Section 5 during the alternatives development.

Table 4.5 - Taxiway Dimensional Standards

| Item | Existing Dimensions | ADG I Design Standard | ADG II Design Standard |
|---|---|---|---|
| Width | ≥35[1] | 35 | 35 |
| Safety Area Width | 49 | 49 | 79 |
| Taxiway OFA Width | 89 | 89 | 131 |
| Taxilane OFA Width | 79 | 79 | 115 |
| Taxiway Centerline to: | | | |
| Parallel Taxiway/Taxilane Centerline | N/A | 69 | 105 |
| Fixed or Moveable Object | 44.5 | 44.5 | 65.5 |
| Taxilane Centerline to: | | | |
| Parallel Taxiway/Taxilane Centerline | N/A | 64 | 97 |
| Fixed or Moveable Object | 39.5 | 39.5 | 57.5 |

Notes:
(1) Widths vary between 40’ and 50’. See Table 2.3
- All distances in feet.

*Source:* FAA Advisory Circular 150/5300-13
Kimley-Horn and Associates, Inc., 2012

### 4.2.5 Runway Pavement Strength Requirements

Pavement capacity requirements are related to three primary factors:

- The operating weight of aircraft anticipated to use the Airport;
- The landing gear type and geometry; and
- The volume of annual aircraft operations, by type.

Runway 14-32 has a current pavement strength of 12,000 lb. single-wheel and 20,000 lb. dual-wheel. Runway 9-27 has a current pavement strength of 30,000 lb. single-wheel and 75,000 lb. dual-wheel.[30] The maximum take-off weight of the Airport's future critical aircraft, the Citation 550, is 14,800 lbs. single-wheel.

Pavement strength rating is not the same as maximum weight limit. Aircraft weighing more than the certified strength can operate on the runways on an infrequent basis. The existing pavement strength of Runway 9-27 is sufficient to meet ARC B-II standards. If Runway 14-32 is identified for upgrade to B-II standards, the pavement strength should be upgraded to 30,000 lb. single-wheel.

## 4.3 GENERAL AVIATION FACILITY REQUIREMENTS

The purpose of this evaluation is to determine the aggregate capacity of the existing general aviation facilities and their ability to meet forecast levels of demand during the planning period. The term "General Aviation Facility" refers to a facility that provides aviation services to airport users and aircraft operators, such as hangar space, terminal space, fuel sales, and aircraft apron space. In this analysis, the following facilities were evaluated:

- General Aviation Administrative/Terminal Facilities
- Aircraft Storage Hangars
- Based & Transient Apron Areas
- Vehicular Parking Facilities

### 4.3.1 General Aviation Administrative/Terminal Facilities

General aviation administrative/terminal facilities are required to meet the needs of pilots, passengers and visitors using the airport. However, no official FAA guidance exists on recommended or required sizes of general aviation terminal buildings. In many cases at general aviation airports, the traditional aviation services provided by a general airport terminal are instead provided by private FBOs, located separately from the terminal. This can be the case when the airport sponsor does not directly operate the FBO. Examples of traditional general aviation terminal services include passenger waiting areas, aircraft ground services, catering, pilot supplies sales, pilot lounges, flight planning rooms, and refreshments.

[30] Airport Master Record Form 5010, Effective March 2011.

The Stinson terminal offers a flight planning room, vending machines, and waiting areas/lobby space. However, sales of aircraft line services are not provided within the terminal itself. FBOs such as San Antonio Aviation and Stinson Jet Center provide aircraft line services in separate buildings and ramp areas.

Currently, the terminal houses airport administrative offices, lobby space, tenant office space, a conference facility, and restaurant space. Tenants of the terminal include Palo Alto College, which utilizes classroom space, i3 Stinson Flight Training Center, Alamo Helicopter Tours, and airport administration offices. At the time of this report's publication, the Airport is currently seeking a new tenant for the terminal restaurant space, as well as a rental car concessionaire.

Official guidelines and recommendations on GA terminal space are limited and fairly outdated, but they do serve as a starting point. The space requirements are broken down into categories of uses, such as pilot lounge space, waiting areas, dining, circulation, maintenance, and administrative. **Table 4.6** below shows the baseline requirements according to the FAA, and recommended space requirements based on more contemporary needs of GA terminals.

Table 4.6 - Generic General Aviation Terminal Building Space Requirements

| Operational Use | Minimum Required (SF/passenger) | Recommended (SF/passenger) |
|---|---|---|
| Pilot Lounge | 15 | 20 |
| Public Space | 0 | 20 |
| Administration | 3 | 15 |
| Public Conveniences | 1.5 | 10 |
| Concessions | 5 | 10 |
| FBO Services | 0 | 10 |
| Tenant Space | 0 | 45 |
| Circulation, Mechanical, Maintenance | 24.5 | 45 |
| **Total** | **49** | **175** |

*Source:* "Aviation Demand and Airport Facility Requirement Forecast for Medium Air Transportation Hubs, through 1980", Federal Aviation Administration, January 1969
Kimley-Horn and Associates, Inc., 2012

The preceding space requirements per passenger were applied to a design hour amount of passengers in order to gain an understanding of terminal space requirements for future activity levels. **Table 4.7** below displays the results of applying the amount of recommended space per passenger to a design hour level of passengers in future years.

Based on the above methodology, the existing terminal space should be adequate throughout the majority of the planning period, with a modest need for additional space arising as PAL 4 approaches. This need could be made up through the expansion of existing facilities or construction of new facilities at the Airport.

An identified need for the Airport as a result of PAC input has been the presence of a U.S. Customs and Border Protection facility. This need is explored in further detail in the Support Facilities portion of this section.

Table 4.7 - General Aviation Terminal Facilities Recommended Space Requirements

| Description | PAL 1 | PAL 2 | PAL 3 | PAL 4 |
|---|---|---|---|---|
| Design Hour Itinerant Operations[(1)] | 27 | 31 | 37 | 43 |
| Design Hour Itinerant Passengers[(2)] | 108 | 124 | 148 | 172 |
| Pilot Lounge (SF) | 2,160 | 2,480 | 2,960 | 3,440 |
| Public Space (SF) | 2,160 | 2,480 | 2,960 | 3,440 |
| Administration (SF) | 1,620 | 1,860 | 2,220 | 2,580 |
| Public Conveniences (SF) | 1,080 | 1,240 | 1,480 | 1,720 |
| Concessions (SF) | 1,080 | 1,240 | 1,480 | 1,720 |
| FBO Services (SF) | 1,080 | 1,240 | 1,480 | 1,720 |
| Tenant Space (SF) | 4,860 | 5,580 | 6,660 | 7,740 |
| Circulation, Mechanical, Maintenance (SF) | 4,860 | 5,580 | 6,660 | 7,740 |
| **Total Area Required (SF)** | **18,900** | **21,700** | **25,900** | **30,100** |
| Existing Capacity (SF) | 30,000 | 30,000 | 30,000 | 30,000 |
| **Net Surplus / Deficiency (SF)** | **11,100** | **8,300** | **4,100** | **(100)** |

Notes:
(1) Calculated by multiplying itinerant PMAD operations by 12%, and multiplying that result by the itinerant operations split of 39%. Numbers rounded to nearest operation.
(2) Calculated by multiplying design hour operations by 4 occupants per operation (2 crew, 2 passengers).

*Source:* Kimley-Horn and Associates, Inc. 2012

### 4.3.2 AIRCRAFT STORAGE HANGARS

The demand for storage hangars is dependent upon the number and type of aircraft based at the Airport, as well as local climate conditions, airport security, availability, rates and charges, and owner preferences. The percentage of based aircraft stored in hangars varies from state to state, but is usually greatest in regions subject to extreme weather conditions.

For the purpose of calculating aircraft storage hangar demand, the storage locations were classified as either hangar or apron (tie-down). The hangar storage type was further divided into three types: T-Hangar, Conventional FBO Hangar, or Conventional Non-FBO Hangar. For the purposes of this study, the following assumptions for aircraft storage area were used:

- **Storage Location:**
  - Based Aircraft – 85% stored in hangars, 15% stored on the apron (tie-downs).
  - Itinerant Aircraft – 25% stored in hangars, 75% stored on the apron.
- **Hangar Storage Type:**
  - Based Aircraft – 60% in T-Hangars, 20% in Conventional FBO Hangars, 20% in Non-FBO Hangars
  - Itinerant Aircraft – 100% in Conventional FBO Hangars.

4.3.2.1 Hangar Type Definitions

- **Conventional FBO Hangar**

This type of hangar is a large building which can house multiple aircraft in protective storage, and usually contains a large door through which aircraft can pass. The "FBO" designation of this type of hangar indicates it is operated by a provider of public aviation services, and can store multiple itinerant and based aircraft.

- **Conventional Non-FBO Hangar**

This type of hangar is structurally similar to a Conventional FBO Hangar, but only houses aircraft operated by or in conjunction with the owner/operator of the hangar. Examples of operators of this type of hangar space include governmental aviation divisions, private aviation companies, or corporate aviation departments. These operators would only house their own aircraft in these hangars, not itinerant aircraft.

- **T-Hangar**

This type of hangar is an individual storage unit for a small aircraft, usually a single-engine or light twin aircraft classified under ADG I. The "T" designation corresponds to the overall shape of the unit, which is similar to a T. These individual hangars are generally grouped into linear buildings containing multiple units in a row.

Storage hangar requirements for each type will be developed in the following sub-sections. Conventional hangar requirements will be developed based on a conservative approach utilizing a weighted average area per aircraft. T-hangars will be developed based on number of units demand combined with an average area per unit assumption.

4.3.2.2 Conventional Hangar Area Required

To develop the required conventional hangar area per aircraft, a safety clearance is added to the aircraft wingspan and length to calculate an average hangar area required. A weighted average is then calculated based on the average fleet mix assumed for PAL 4 in Section 3: 83% single-engine aircraft (ADG I), 3.5% multi-engine aircraft and small turboprops (ADG II), 3% larger turboprops and jet aircraft (ADG III), and 10.5% helicopters. A weighted average of 2,200 square feet per aircraft was calculated for conventional hangar storage and is summarized in **Table 4.8**.

Table 4.8 - Conventional Storage Hangar Area Required per Aircraft

| ADG | Average Aircraft Length (ft) | Average Wingspan (ft) | Additional Clearance around Aircraft (ft) (1) | Average Hangar Area Required (SF) (2) | Fleet Mix | Weighted Average Area by ADG (SF) (3) |
|---|---|---|---|---|---|---|
| I | 26 | 35 | 5 | 1,620 | 83% | 1,300 |
| II | 55 | 60 | 10 | 6,000 | 3.5% | 200 |
| III | 100 | 100 | 10 | 14,400 | 3% | 400 |
| Helicopter | 35 | 30 | 10 | 2,750 | 10.5% | 300 |
| | | | | **Weighted Average** | | **2,200** |

Notes:
(1) Operational safety area around aircraft.
(2) Aircraft area plus additional clearances on all four sides of the aircraft (5 ft for ADG I, 10 ft for ADG II, III, and helicopters).
(3) Calculated by multiplying fleet mix percentages and associated area requirement by ADG type, then summing the four ADG requirements. All numbers rounded to nearest 100 SF.

*Source:* FAA Advisory Circular 150/5300-13
Table 3.8 of this document (2031 Fleet Mix)
Kimley-Horn and Associates, Inc., 2012

### 4.3.2.3 Aircraft Storage Hangar Demand

Future demand for aircraft storage hangars by number of aircraft, based on the assumptions listed previously is presented in **Table 4.9**. Each hangar type is evaluated separately given the different space requirements. The results of the demand analysis by hangar type are presented in **Table 4.10**.

Table 4.9 - Aircraft Storage Hangar Demand

| Planning Level | Based Aircraft (1) | Based Aircraft in Storage Hangars (2) | Itinerant Aircraft (3) | Itinerant Aircraft in Storage Hangars (4) | Total Aircraft in Storage Hangars (5) |
|---|---|---|---|---|---|
| PAL 1 | 144 | 123 | 111 | 28 | 151 |
| PAL 2 | 155 | 132 | 130 | 33 | 165 |
| PAL 3 | 167 | 142 | 153 | 39 | 181 |
| PAL 4 | 179 | 153 | 179 | 45 | 198 |

Notes:
(1) Data from Table 3.13 – Aviation Activity Forecast Summary.
(2) Assumed 85% of based aircraft stored in hangars (See Section 4.3.2). Numbers rounded up to nearest integer.
(3) Itinerant Aircraft calculated as 39 percent (See Section 3.11) of annual operations (See Table 3.13). Then multiplied by 10.6% to determine peak month itinerant operations. Then divided by 31 to determine peak month average day itinerant operations, and then divided by 2 (assume one take-off and one landing – two operations per aircraft). Peak month and average month peak day factors are discussed in Section 3.10. Numbers rounded to nearest integer.
(4) Assumed 25% of itinerant aircraft stored in hangars (See Section 4.3.2). Numbers rounded up to nearest integer.
(5) Summation of based aircraft in storage hangars and itinerant aircraft in storage hangars.

*Source:* Kimley-Horn and Associates, Inc., 2012

Table 4.10 - Aircraft Storage Hangar Demand by Hangar Type

| Planning Level | Aircraft Stored in Hangars [(1)] | | | Demand by Hangar Type | | | |
|---|---|---|---|---|---|---|---|
| | Based | Itinerant | Total | T-Hangars [(2)] | Conventional FBO [(3)] | Conventional Non-FBO [(4)] | Total |
| PAL 1 | 123 | 28 | 151 | 74 | 53 | 24 | 151 |
| PAL 2 | 132 | 33 | 165 | 79 | 59 | 27 | 165 |
| PAL 3 | 142 | 39 | 181 | 85 | 67 | 29 | 181 |
| PAL 4 | 153 | 45 | 198 | 92 | 76 | 30 | 198 |

Notes:
(1) Data from Table 4.9.
(2) Assumed 60% of based aircraft and 0% of itinerant aircraft stored in T-hangars (See Section 4.3.2). Numbers rounded to nearest integer.
(3) Assumed 20% of based aircraft and 100% of itinerant aircraft stored in Conventional FBO hangars (See Section 4.3.2). Numbers rounded to nearest integer.
(4) Assumed 20% of based aircraft and 0% of itinerant aircraft stored in Conventional Non-FBO hangars (See Section 4.3.2). Numbers rounded to nearest integer and adjusted to match total aircraft in storage hangars calculated in Table 4.9.

*Source:* Kimley-Horn and Associates, Inc., 2012

4.3.2.4 Hangar Requirements Summary

Aircraft storage hangar requirements were calculated based on the assumptions outlined in Section 4.3.2 and on the different types of hangars. Based on the analysis, the existing hangar capacity does not meet existing demand, with a deficiency increasing to approximately 73,000 square feet of T-Hangar space and 121,600 square feet of conventional hangar space by the end of PAL 4.

A summary of overall aircraft storage hangar requirements by hangar type is shown in **Table 4.11.**

Table 4.11 - Summary of Aircraft Hangar Requirements

| Planning Level | T- Hangars | | | |
|---|---|---|---|---|
| | Required (Units) (1) | Existing Units (2) | Net Surplus/(Deficiency) (3) Number | Area (SF) |
| PAL 1 | 74 | 31 | (43) | (51,600) |
| PAL 2 | 79 | 31 | (48) | (57,600) |
| PAL 3 | 85 | 31 | (54) | (64,800) |
| PAL 4 | 92 | 31 | (61) | (73,200) |

| Planning Level | Conventional FBO Hangars | | |
|---|---|---|---|
| | Required Area (SF) (4) | Existing Area (SF) (5) | Net Surplus / (Deficiency) Area (SF) (6) |
| PAL 1 | 116,600 | 70,078 | (46,522) |
| PAL 2 | 129,800 | 70,078 | (59,722) |
| PAL 3 | 147,400 | 70,078 | (77,322) |
| PAL 4 | 167,200 | 70,078 | (97,122) |

| Planning Level | Conventional Non-FBO Hangars | | |
|---|---|---|---|
| | Required Area (SF) (4) | Existing Area (SF) (7) | Net Surplus / (Deficiency) Area (SF) (6) |
| PAL 1 | 52,800 | 41,509 | (11,291) |
| PAL 2 | 59,400 | 41,509 | (17,891) |
| PAL 3 | 63,800 | 41,509 | (22,291) |
| PAL 4 | 66,000 | 41,509 | (24,491) |

| Planning Level | All Conventional Hangar Types | | |
|---|---|---|---|
| | Required Area (SF) | Existing Area (SF) | Net Surplus / (Deficiency) Area (SF) |
| PAL 1 | 169,400 | 111,587 | (57,813) |
| PAL 2 | 189,200 | 111,587 | (77,613) |
| PAL 3 | 211,200 | 111,587 | (99,613) |
| PAL 4 | 233,200 | 111,587 | (121,613) |

Notes:

(1) Data presented in Table 4.10.

(2) Includes T-hangars in the following locations as identified in Table 2.5: Ocotillo East Hangars (Buildings 618 and 620) and Ocotillo West Hangars (Building 673).

(3) Additional T-hangar number requirements calculated by subtracting required number of units from existing facilities. Additional T-hangar area requirements calculated by multiplying Net Surplus/(Deficiency) number requirements by 1,200 square feet.

(4) Required Conventional FBO and Non-FBO hangar area calculated by multiplying the respective hangar demand presented in Table 4.10 by 2,200 square feet (as presented in Table 4.8).

(5) Includes 90% of building area square footage in the following hangars: San Antonio Piper (Building 601), San Antonio Aviation (Buildings 602 & 604), Sky Safety (Buildings 614 & 616), and Stinson Aviation Corporation (Building 612).

(6) Additional hangar area requirement calculated by subtracting required hangar area from existing hangar area.

(7) Includes 90% of building area square footage in the following hangars: SAPD (Building 660B), US Helicopter (Buildings 660A), Texas DPS (Building 610), Air Methods (Building 605), and Red Wing Aerial (Buildings 608 & 609).

*Source* Kimley-Horn and Associates, Inc., 2012

### 4.3.3 Apron Requirements

The apron areas are intended to accommodate based and itinerant aircraft parking. Itinerant aircraft typically require a greater area for shorter amounts of time (usually less than 24 hours). Based aircraft require a smaller area for longer amounts of time. Since parking configurations and spatial requirements for itinerant and based aircraft can vary, they have been analyzed separately. The results of the analysis will be combined to develop an overall apron area requirement to compare with the existing 575,800 square feet of apron area currently available at the Airport.

#### 4.3.3.1 Itinerant Aircraft Apron Area Requirements

For itinerant aircraft, consideration must be made for the aircraft parking area, taxilanes leading into and out of the parking positions, and circulation areas. This analysis assumes itinerant parking will consist of single rows, wing-to-wing, pull-through and/or back-in parking, depending on the row location. In addition to the required parking area for the aircraft, taxilane, taxilane object free area, and aircraft clearances on all sides of the aircraft are included in the area requirements. ADG I aircraft are assumed to have a 5-foot clearance on all sides, ADG II & III aircraft are assumed to have a 10-foot clearance on all sides, and helicopters are assumed to have a 12-foot clearance.

**Table 4.12** summarizes the weighted average parking apron requirements per itinerant aircraft by type. The analysis results in a weighted average of 6,400 square feet per fixed wing itinerant aircraft.

Table 4.12 - Itinerant Aircraft Parking Apron Requirements per Aircraft

| Airplane Design Group | Average Length (ft) | Average Wingspan (ft) | Additional Clearances (ft)(1) | TOFA Clearance (ft) | Average Parking Area Required (SF)(2) | Fleet Mix | Weighted Average Parking Area (SF)(3) |
|---|---|---|---|---|---|---|---|
| I | 26 | 35 | 5 | 79 | 5,175 | 94% | 4,900 |
| II | 55 | 60 | 10 | 115 | 15,200 | 3% | 500 |
| III | 100 | 100 | 10 | 162 | 33,840 | 3% | 1,000 |
| Helicopter | 35 | 30 | 12 | 0 | 3,186 | 0% | 0 |
| | | | | | **Weighted Average** | | **6,400** |

Notes:
(1) Operational safety area around aircraft.
(2) Parking for fixed-wing aircraft assumes wing-to-wing parking, in single rows. Parking area includes full width of taxilane and object free area in front of aircraft parking to accommodate back-in parking (wingspan + additional clearance multiplied by TOFA clearance). Calculated by multiplying aircraft length plus two times additional clearances by wingspan plus two times additional clearances, and adding wingspan plus two times additional clearances times the TOFA clearance.
(3) Calculated by multiplying fleet mix percentages and associated area requirement by ADG type, then summing the two ADG requirements. All numbers rounded to nearest 100 SF.

*Source:* Kimley-Horn and Associates, Inc., 2012
FAA Advisory Circular 150/5300-13

4.3.3.2 Itinerant Aircraft Apron Area Demand

The annual itinerant operations ratio is forecasted to remain at the current ratio of 39% of total operations throughout the planning period. To calculate demand for itinerant fixed wing aircraft and helicopters, the following assumptions were applied to the annual operations forecast developed in Section 3:

- Itinerant Operations – 39% of total
- Peak Month Itinerant Operations – 10.6% of annual itinerant operations
- PMAD Itinerant Operations – peak month itinerant operations divided by 31
- PMAD Itinerant Aircraft – PMAD itinerant operations divided by 2 (1 aircraft performing one take-off and one landing)
- Itinerant Aircraft Parking Stalls – 50% of PMAD Itinerant Aircraft multiplied by assumed itinerant percentage for apron storage (identified in Section 4.3.2)

**Table 4.13** summarizes the itinerant aircraft parking demand based on the assumptions outlined above.

Table 4.13 - Itinerant Aircraft Parking Apron Demand

| Planning Level | Annual Operations (1) | Annual Itinerant Operations (2) | Peak Month Itinerant Operations (3) | PMAD Itinerant Operations (4) | Average Day Itinerant Aircraft (5) | Itinerant Aircraft Parking Stalls (6) |
|---|---|---|---|---|---|---|
| PAL 1 | 166,400 | 64,900 | 6,900 | 223 | 112 | 42 |
| PAL 2 | 195,200 | 76,100 | 8,100 | 261 | 131 | 49 |
| PAL 3 | 229,100 | 89,300 | 9,500 | 306 | 153 | 57 |
| PAL 4 | 268,800 | 104,800 | 11,100 | 358 | 179 | 67 |

Notes:

(1) Data presented in Table 3.13.
(2) Annual itinerant aircraft operations calculated by taking 39 percent of annual operations (See Sections 4.3.2 and 4.3.3.2). Numbers rounded to nearest 100.
(3) Peak month itinerant operations equals 10.6 percent of annual itinerant operations. Numbers rounded to nearest 100.
(4) Peak month average day itinerant operations equals peak month itinerant operations divided by 31. Numbers rounded to nearest integer.
(5) Equals PMAD operations divided by 2 (assumes one take-off and one landing per aircraft). Numbers rounded to nearest integer.
(6) Calculated by dividing average day itinerant aircraft by 2 (assumes 50% of aircraft on the ground at a given time) then multiplied by 75% (See Section 4.3.2). Numbers rounded to nearest integer.

*Source:* Kimley-Horn and Associates, Inc., 2012

4.3.3.3 Based Aircraft Apron Area Requirements

For based aircraft, consideration must be made for the aircraft parking area, taxilanes leading into and out of the parking positions, and circulation areas. This analysis assumes based aircraft parking will consist of double rows, wing-to-wing, back-in parking, where aircraft in the two rows face in opposite directions and are parked tail-to-tail. In addition to the required parking area for the aircraft, one-half the taxilane and taxilane object free area width, and aircraft clearances on all sides of the aircraft are included in the area requirements. ADG I aircraft are assumed to have a 5-foot clearance on all sides, ADG II & III aircraft are assumed to have a 10-foot clearance on all sides, and helicopters are assumed to have a 12-foot clearance.

**Table 4.14** summarizes the weighted average parking apron requirements per based aircraft by type. The analysis results in a weighted average of 4,200 square feet per based aircraft.

Table 4.14 - Based Aircraft Parking Apron Requirements per Aircraft

| Airplane Design Group | Average Length (ft) | Average Wingspan (ft) | Additional Clearances (ft) (1) | TOFA Clearance (ft) | Average Parking Area Required (SF) (2) | Fleet Mix | Weighted Average Parking Area (SF) (3) |
|---|---|---|---|---|---|---|---|
| I | 26 | 35 | 5 | 79 | 3,398 | 83% | 2,800 |
| II | 55 | 60 | 10 | 115 | 10,600 | 4% | 400 |
| III | 100 | 100 | 10 | 162 | 24,120 | 3% | 700 |
| Helicopter | 35 | 30 | 12 | 0 | 3,186 | 11% | 300 |
| | | | | | **Weighted Average** | | **4,200** |

Notes:
(1) Operational safety area around aircraft.
(2) Parking for aircraft assumes double rows of back-in parking. Parking area includes one-half the width of taxilane and object free area in front of aircraft parking to accommodate back-in parking (wingspan + additional clearance multiplied by TOFA Clearance). Calculated by multiplying aircraft length plus two times additional clearances by wingspan plus two times additional clearances, and adding wingspan plus two times additional clearances times the TOFA clearance.
(3) Calculated by multiplying fleet mix percentages and associated area requirement by ADG type, then summing the two ADG requirements. All numbers rounded to nearest 100 SF.

*Source:* Kimley-Horn and Associates, Inc., 2012
FAA Advisory Circular 150/5300-13

### 4.3.3.4 Based Aircraft Apron Area Demand

As stated previously, it was assumed 15 percent of based aircraft will be stored at tie-down positions on the apron, with the remaining aircraft in hangars. **Table 4.15** summarizes the based aircraft demands for the apron area.

Table 4.15 - Based Aircraft Parking Apron Demand

| Planning Level | Based Aircraft (1) | Aircraft Stored on Apron (2) |
|---|---|---|
| PAL 1 | 144 | 22 |
| PAL 2 | 155 | 23 |
| PAL 3 | 167 | 25 |
| PAL 4 | 179 | 27 |

Notes:
(1) Data presented in Table 3.13.
(2) Assumed 15% of based aircraft stored on apron (See Section 4.3.2). Numbers rounded to nearest integer.

*Source:* Kimley-Horn and Associates, Inc., 2012

4.3.3.5 Aircraft Apron Area Requirements

**Table 4.16** presents the summary of the aircraft apron area requirements. As shown, anticipated demand exceeds existing apron capacity starting in PAL 3 with a total need of approximately 102,000 square feet of additional apron area needed by the end of PAL 4.

Based on how the existing apron areas at Stinson are utilized today, approximately 50 percent of the apron area is utilized for FBO related space and activities, supporting both based and itinerant aircraft. This area represents the apron utilized by the FBO (San Antonio Aviation), Sky Safety, and the apron area in front of the terminal building. The remaining 50 percent are grouped into non-FBO related space, primarily assumed to support only based aircraft.

Using the same analysis methodology described above, an FBO apron area and non-FBO apron area requirement was developed and is presented in **Table 4.17**. The FBO apron area requirement assumes 50 percent of the based aircraft demand identified in Table 4.15 and 100 percent of itinerant aircraft demand identified in Table 4.13 represents the FBO apron demand. The non-FBO apron area analysis assumes 50 percent of the based aircraft demand identified in Table 4.15, represents the non-FBO apron demand. It was assumed no itinerant aircraft would be accommodated on non-FBO apron areas. As shown in the table, the existing and future need for additional apron space is largely associated with FBO apron space category, which includes itinerant aircraft and based aircraft utilizing space provided by public aviation service providers.

Table 4.16 - Summary of Aircraft Parking Apron Area Requirements

| Planning Level | Aircraft Storage Requirements | | Apron Area Required (SF) | | | Circulation Area Required[5] (SF) | Total Apron Required[6] (SF) | Existing Apron (SF) | Net Surplus/ (Deficiency) (SF) |
|---|---|---|---|---|---|---|---|---|---|
| | Based[1] | Itinerant[2] | Based[3] | Itinerant[4] | Total | | | | |
| PAL 1 | 22 | 42 | 92,400 | 268,800 | 361,200 | 90,300 | 451,500 | 575,800 | 124,300 |
| PAL 2 | 23 | 49 | 96,600 | 313,600 | 410,200 | 102,550 | 512,750 | 575,800 | 63,050 |
| PAL 3 | 25 | 57 | 105,000 | 364,800 | 469,800 | 117,450 | 587,250 | 575,800 | (11,450) |
| PAL 4 | 27 | 67 | 113,400 | 428,800 | 542,200 | 135,550 | 677,750 | 575,800 | (101,950) |

Notes:

(1) Data presented in Table 4.15.
(2) Data presented in Table 4.13.
(3) Equals number of based aircraft times 4,200 SF (apron requirement per based aircraft presented in Table 4.14). Numbers rounded to nearest 100.
(4) Equals number of itinerant aircraft times 6,400 SF (apron requirement per itinerant aircraft presented in Table 4.12). Numbers rounded to nearest 100.
(5) Circulation area equals 25 percent of required apron area based on general aviation aprons at similar airports. Numbers rounded to nearest integer.
(6) Total apron required equals sum of required based and itinerant aircraft apron areas and circulation areas.

*Source:* Kimley-Horn and Associates, Inc., 2012

Table 4.17 - FBO and non-FBO Apron Area Assessment

| Planning Level | FBO Apron Area | | | Non-FBO Apron Area | | |
|---|---|---|---|---|---|---|
| | Apron Area Required[1] (SF) | Existing Apron (SF) | Net Surplus/ (Deficiency) (SF) | Apron Area Required[3] (SF) | Existing Apron (SF) | Net Surplus/ (Deficiency) (SF) |
| PAL 1 | 393,750 | 287,900 | (105,850) | 57,750 | 287,900 | 230,150 |
| PAL 2 | 455,000 | 287,900 | (167,100) | 57,750 | 287,900 | 230,150 |
| PAL 3 | 524,250 | 287,900 | (236,350) | 63,000 | 287,900 | 224,900 |
| PAL 4 | 609,500 | 287,900 | (321,600) | 68,250 | 287,900 | 219,650 |

Notes:

(1) Assumes 50 percent of based aircraft and 100 percent of itinerant aircraft shown in Table 4.16 represents the FBO apron area demand. Required apron area calculated in same fashion as outlined in Table 4.16.
(2) Assumes 50 percent of based aircraft and zero percent of itinerant aircraft shown in Table 4.16 represents the non-FBO apron area demand. Required apron area calculated in same fashion as outlined in Table 4.16.

*Source:* Kimley-Horn and Associates, Inc., 2012

### 4.3.4 General Aviation Parking Facilities

There are currently 82 striped automobile parking spaces designated as general airport parking areas, and 135 striped spaces that are part of conventional hangar facilities. The 82 general airport parking spaces include a parking lot located on the east side of Mission Road, and spaces located at the terminal building. The remaining 135 spaces belong to various conventional hangar facilities. This number was used as the baseline for the calculation of required parking spaces below.

To determine future vehicle parking requirements, a planning metric of 1 space per 1,000 square feet of aircraft storage hangar space was applied. It was also assumed each vehicle parking space would be 20 feet deep by 9 feet wide, and include half of a 26 foot wide drive aisle for circulation. These assumptions result in an area planning metric of 300 square feet per parking space. **Table 4.18** summarizes the results of the vehicular parking analysis, which indicates existing parking facilities at the Airport are insufficient to meet anticipated demand. By the end of the planning period an additional 29,400 square feet of vehicular parking areas are necessary to accommodate anticipated demand, or 98 spaces.

Table 4.18 - Vehicular Parking Area Requirements

| Planning Level | Required Hangar Area (SF)(1) | Required Vehicle Parking Stalls(2) | Existing Vehicle Parking Stalls | Additional Vehicle Parking Stalls Required | Additional Vehicle Parking Area Required (SF)(3) |
|---|---|---|---|---|---|
| 2016 | 169,400 | 169 | 135 | 34 | 10,200 |
| 2021 | 189,200 | 189 | 135 | 54 | 16,200 |
| 2026 | 211,200 | 211 | 135 | 76 | 22,800 |
| 2031 | 233,200 | 233 | 135 | 98 | 29,400 |

Notes:
(1) Equals Required Area of Conventional Hangars presented in Table 4.11. Does not include T-Hangar area.
(2) Assumes planning metric of 1 space per 1,000 SF of hangar area. Numbers rounded to nearest integer.
(3) Calculated by multiplying required number of additional parking stalls by 300 SF per space. 300 SF per space assumes stall dimensions of 9 feet wide X 20 feet deep plus one half of a 26 feet wide drive aisle for vehicle circulation.

*Source:* Kimley-Horn and Associates, Inc., 2012

### 4.3.5 General Aviation Facility Requirements Summary

The following is a summary of additional general aviation facility requirements for the planning period:

- Hangar Facilities:
  - Develop additional T-hangars to accommodate a projected deficiency of 61 units throughout the planning period.
  - Develop additional conventional hangars to accommodate a projected deficiency of approximately 121,600 SF throughout the planning period.
- Apron Facilities:
  - Provide a minimum additional apron area of approximately 102,000 SF throughout the planning period.
  - Through either additional apron area or redistribution of existing areas, provide additional FBO or itinerant aircraft apron areas to address projected deficiencies in apron areas utilized by itinerant and based aircraft provided by public aviation service providers.
- Vehicular Parking Facilities:
  - Provide additional general aviation public vehicular parking of approximately 98 stalls or 29,400 SF.

**Table 4.19** presents the overall summary for general aviation facilities throughout the planning period.

Table 4.19 - Summary of General Aviation Facility Requirements

| Planning Level | Hangar Area Requirements[1] | | | | | Apron Area Requirements[2] | | | Vehicle Parking Requirements[3] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing T-Hangars | Additional Required T-Hangars | Existing Conventional Hangar Area | Required Conventional Hangar Area | Additional Required Conventional Hangar Area | Existing Apron Area | Required Apron Area | Additional Required Area | Existing Spaces | Required Spaces | Additional Spaces Required |
| PAL 1 | 31 | 43 | 111,600 | 169,400 | 57,800 | 575,800 | 451,500 | (124,300) | 135 | 169 | 34 |
| PAL 2 | 31 | 48 | 111,600 | 189,200 | 77,600 | 575,800 | 512,750 | (63,050) | 135 | 189 | 54 |
| PAL 3 | 31 | 54 | 111,600 | 211,200 | 99,600 | 575,800 | 587,250 | 11,450 | 135 | 211 | 76 |
| PAL 4 | 31 | 61 | 111,600 | 233,200 | 121,600 | 575,800 | 677,750 | 101,950 | 135 | 233 | 98 |

Notes:
(1) Data presented in Table 4.11.
(2) Data presented in Table 4.16.
(3) Data presented in Table 4.18.
- All areas in square feet.

*Source:* Kimley-Horn and Associates, Inc., 2012

## 4.4 SUPPORT FACILITY REQUIREMENTS

This section examines the facility requirements of airport support facilities essential to the daily operations at the Airport. These facilities include airport maintenance facilities, fuel storage facilities, instrument approach procedures, and U.S. Customs and Border Protection facilities (CBP).

### 4.4.1 AVIATION FUEL STORAGE FACILITIES

There is no general airport fuel farm at the Airport. Each service provider maintains their own separate inventory of aviation fuel. San Antonio Aviation has fuel trucks which are supplied by AvFuel, and Stinson Jet Center maintains an above ground self-service fuel farm which is supplied by EPIC (formerly AirBP). The combined capacity of the FBO fuel storage is 29,200 gallons. The capacities of the existing fuel storage are listed below in **Table 4.20.** It should be noted this fuel storage capacity is for FBOs only, and does not include individual fuel inventories maintained by non-FBO organizations, such as the SAPD.

Table 4.20 - Existing Fuel Storage Capacity

| Fuel Type | Storage Capacity (Tank) | Storage Capacity (Truck) |
|---|---|---|
| 100LL | 10,000 | 7,000 |
| JET A | 10,000 | 2,200 |

*Source:* San Antonio Aviation Personnel, April 2012

It is recommended that aviation fuel providers maintain a 30-day supply of fuel. Based on projected aircraft operations throughout the planning period, it is recommended that as jet-powered aircraft operations increase at the Airport, the FBOs replenish their supply more frequently or acquire additional storage capacity. In the event a new, additional FBO facility locates at the Airport, that facility should be planned with space for fuel storage capacity, including tank storage and truck storage.

The data in **Table 4.21** assumes a constant flow of 100 gallons per every turbine aircraft departure. This flow is used to account for aircraft that may not purchase fuel at all, and aircraft that may purchase more than 100 gallons.

Table 4.21 - Jet A Fuel Storage Requirements

| Planning Level | Daily Turbine Departures (1) | Average Flow per Departure | 30 Day Supply Requirement | Existing Capacity | Net Surplus/ (Deficiency) |
|---|---|---|---|---|---|
| PAL 1 | 2.3 | 100 | 6,838 | 12,200 | 5,362 |
| PAL 2 | 3.7 | 100 | 11,231 | 12,200 | 969 |
| PAL 3 | 6.9 | 100 | 20,713 | 12,200 | (8,513) |
| PAL 4 | 11.1 | 100 | 33,140 | 12,200 | (20,940) |

Notes:
(1) Calculated by dividing total annual operations for each PAL by 2 to obtain departures, then dividing by 365 to obtain daily departures, then multiplying by the turbine aircraft fleet mix in Section 3.4, Table 3.8.
- All fuel units shown in gallons.

*Source:* Kimley-Horn and Associates, Inc., May 2012

Table 4.22 - 100LL Fuel Storage Requirements

| Planning Level | Daily Piston Departures | Average Flow per Departure | 30 Day Supply Requirement | Existing Capacity | Net Surplus / (Deficiency) |
|---|---|---|---|---|---|
| PAL 1 | 200 | 6 | 35,990 | 17,000 | (18,990) |
| PAL 2 | 230 | 6 | 41,448 | 17,000 | (24,448) |
| PAL 3 | 265 | 6 | 47,628 | 17,000 | (30,628) |
| PAL 4 | 306 | 6 | 55,018 | 17,000 | (38,018) |

Notes:

(1) Calculated by dividing total annual operations for each PAL by 2 to obtain departures, then dividing by 365 to obtain daily departures, then multiplying by the single and multi-engine aircraft fleet mix in Section 3.4, Table 3.8.

- All fuel units are shown in gallons.

*Source:* Kimley-Horn and Associates, Inc., May 2012

**Table 4.22** above highlights the storage requirements for 100LL fuel, which is used for piston-driven aircraft. Using an assumed flow of 6 gallons per piston aircraft departure, it is estimated that additional 100LL fuel storage capacity will be needed during the planning horizon. This capacity can be achieved by increasing the frequency of fuel deliveries to the storage sites, or acquiring additional physical storage, such as tanks or trucks.

### 4.4.2 Roadway Capacity

Currently, there are two primary roads which provide access to the Airport. Roosevelt Avenue provides access to the western airport facilities, including the SAPD helicopter facility. Roosevelt Avenue also provides access to 96th Street, which in turn provides access to the eastern airport facilities along Mission Road. Mission Road provides the main access to the eastern airport facilities.

As shown in Table 2.6, the roadways providing access to the Airport currently have ample capacity. However, roadway connectivity is an issue that has been identified during stakeholder meetings and PAC meetings. Testimony from several PAC members and stakeholders has shown it is very difficult for one to navigate from the west side of the Airport to the east side. A person must travel via 96th Street, Echo Street, and 99th Street to access Mission Road and the eastern airport facilities from the west side of the Airport. There is also minimal signage and way finding.

Roadway connectivity between the eastern and western portions of the airport should be improved during the early part of the planning horizon. Improvements should include creating a continuous roadway connection between Roosevelt Avenue and Mission Road. In addition, way finding and signage improvements should be implemented to enhance the aesthetics of the Airport and to create a well-defined airport entrance.

### 4.4.3 Airport Maintenance

The Airport's maintenance facilities are currently housed in a 23,000 square foot building on the east side of Mission Road, opposite Hangar 1. This building houses machinery, tools, equipment, and offices for airport maintenance personnel.

According to maintenance staff and Airport management, the existing building provides adequate space for maintenance needs, but its current location does not allow convenient airfield access. As the building is currently located on the east side of Mission Road, maintenance staff must cross Mission Road and enter the airfield via access gates.

A new airport maintenance facility should be planned for during the planning period, which will provide adequate storage space for maintenance trucks, tool and machine equipment, and direct airfield access. The airport operations and maintenance staff should be consulted to conduct a full inventory of current and planned equipment, maintenance activities, and space requirements in order to determine an appropriate facility size.

### 4.4.4 INSTRUMENT APPROACH PROCEDURES

Instrument Approach Procedures (IAP) provide a means for aircraft to approach and land at an airport in instrument meteorological conditions (IMC). IMC generally refers to atmospheric conditions which include cloud ceilings lower than 1,000 feet above ground level (AGL) and visibility conditions less than 3 statute miles.

The Airport currently has two IAPs: The VOR Runway 32 approach, and the RNAV (GPS) Runway 32 approach. Both approaches are non-precision, and terminate at Runway 32 with a straight-in landing procedure or a circle-to-land procedure. As both approaches are non-precision, which only provide horizontal course guidance, the minimum altitudes are higher in comparison with the minimum altitudes of a precision instrument approach, which provides both horizontal and vertical guidance.

The lack of an instrument approach with precision-like minimum altitudes and/or vertical guidance restricts Airport activity during IMC. User and tenant input received from the survey process indicates an instrument approach with lower minimums than currently offered is highly desired. Many times, itinerant aircraft that originally intend to land at the Airport are required to divert to SAT during poor visibility conditions or low cloud ceilings because of the lack of an approach with lower visibility minimums. The high level of flight training at the Airport would also highly benefit from this type of approach, as more approach training could be conducted at the Airport versus needing to fly to other airports.

Examples of these types of IAPs include an Instrument Landing System (ILS) procedure or a Localizer Performance with Vertical Guidance (LPV) procedure. An ILS procedure requires the installation of ground facilities, such as a glideslope and localizer antenna, while the LPV procedure is GPS-based and does not require ground facilities.

As the goal of the Airport is to become the premier general aviation facility for the San Antonio region, the Airport staff and FAA should collaborate with discussions on the potential of implementing an IAP on either Runway 09 or Runway 27. This potential IAP should offer lower approach minimums than what is currently available on Runway 32. This requirement is not addressed further as a development alternative, but is instead recommended as a general airport enhancement.

**Table 4.23** indicates the requirements for various types of instrument approaches.

### 4.4.5 CUSTOMS AND BORDER PROTECTION

The Airport currently does not have an onsite CBP facility. A CBP facility has been identified as a need during the user survey process and based on input from members of the PAC, and from other business and stakeholder meetings. Consideration for this facility should be included by planning for the usage of terminal office space as a CBP facility.

Table 4.23 - Instrument Approach Requirements

| Instrument Approach Requirements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Approach Type | | | | | | | |
| **Criteria** | **ILS or LPV** | | **APV** | | | **Non-Precision** | | |
| Visibility Minimums | <3/4 Mile | >3/4 Mile | <3/4 Mile | < 1 Mile | 1 Mile | <3/4 Mile | < 1 Mile | 1 Mile |
| Height Above Threshold (HAT) | 200 feet | | 250 feet | 300 feet | 350 feet | 300 feet | 340 feet | 400 feet |
| TERPS Precision "W" Surfaces | Clear | Increase HAT as required | N/A | | | | | |
| TERPS Glidepath Qualification Surface (GQS) | Clear[1] | | Clear[2] | | | N/A | | |
| TERPS Obstacle Clearance Slope | 34:1 | 20:1 | 34:1 | 20:1 | 20:1 | 34:1 | 20:1 | 20:1 |
| Precision Obstacle Free Zone | Required | Not Required | Required | Required | Required | Not Required | Not Required | Not Required |
| Minimum Runway Length | 4,200 feet | | 4,200 feet | 3,200 feet | 3,200 feet | 4,200 feet | 3,200 feet | 3,200 feet |
| Approach Lights (MALSR) | Required | Recommended | Required | Recommended | Recommended | Required | Required[3] | Recommended |
| Runway Design Standards | <3/4 mile vis. minimums | >3/4 mile vis. minimums | <3/4 mile vis. minimums | >3/4 mile vis. minimums | >3/4 mile vis. minimums | < 3/4 mile vis. minimums | >3/4 mile vis. minimums | >3/4 mile vis. minimums |
| Survey Requirements | V. Guided Airport Airspace Analysis Survey AC 150/5300-18b | | | | Non V. Guided | V. Guided | Non V. Guided | |

Notes: 1) See AC 150/5300-13 for specific criteria
2) See AC 150/5300-13 for specific criteria
3) ODALS or MALS Acceptable

*Source:* FAA Advisory Circular 150/5300-13

## 4.5 SUMMARY

Based on the demand/capacity analysis and facility requirements identified in this section, the following is a summary of recommended improvements to the Airport's existing facilities throughout the planning period:

Airfield

- Explore/Investigate an extension of one of the two runways to at least 6,000 feet to accommodate larger corporate jet aircraft to their maximum take-off weight and range.
- Increase runway-to-taxiway separation for at least one runway from current B-I (small aircraft) standards to either B-I or B-II standards.
- If Runway 14-32 is identified for upgrade to B-II standards, pavement strength should be upgraded to 30,000 lb. single-wheel gear within the planning period.

General Aviation Facilities

- Plan for the location of a U.S. Customs and Border Protection facility inside the Terminal building or as a stand-alone facility.
- Develop additional T-hangars to accommodate a projected deficiency of 61 units throughout the planning period.
- Develop additional conventional hangars to accommodate a projected deficiency of approximately 121,600 SF throughout the planning period.
- Provide a minimum additional apron area of approximately 102,000 SF throughout the planning period.
- Through either additional apron area or redistribution of existing areas, provide additional FBO or itinerant aircraft apron areas to address projected deficiencies in apron areas utilized by itinerant and based aircraft provided by public aviation service providers.
- Provide additional general aviation public vehicular parking of approximately 98 stalls or 29,400 SF.

Support Facilities

- Expand the Airport's Jet A and 100LL fuel storage facilities through additional tanks, expanded fuel farm, or increasing frequency of fuel deliveries.
- Identify potential areas on airport property for a new airport maintenance facility to provide additional space and more direct airfield access.
- Investigate potential of adding an instrument approach with precision-like minimum altitudes and/or vertical guidance.
- Consideration of CBP space and/or operations potential at the Airport either through usage of office space in the terminal building or through appointments with CBP staff at San Antonio International Airport.
- Increase roadway connectivity between west and east sides of airport by creating a single, continuous roadway between Roosevelt Avenue and Mission Road, and improve signage and way finding.