FACILITY REQUIREMENTS

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3. DEMAND / CAPACITY ASSESSMENT AND FACILTIY REQUIREMENTS

3.1. Introduction

The previous chapter forecasted the levels of aviation demand that could reasonably be expected to occur at Avi Suquilla Airport through the planning period (2032). This chapter will assess whether or not existing facilities are adequate to meet that demand. This chapter will also identify what types and quantities of new facilities may be required as well as establish a time frame for when these facilities may be needed to accommodate the future demand. Further, an extensive analysis will be conducted to insure that all airside facilities meet current FAA design standards and, if necessary, a list of all deviations from the current standards will be provided.

The FAA outlines the essential facilities into the following categories:

- Runways
- Taxiways
- Navigational Aids
- Aprons
- Terminal Building and Associated Facilities
- Airport Access and Automobile Parking
- Airport Support Facilities

This chapter will provide a complete assessment of these facilities at the Avi Suquilla Airport.

3.2 Demand / Capacity Analysis

Based on the forecasts from Chapter 2, it is expected that within 20 years, the airport is likely to provide service for over 20,000 operations per year. Future development at the airport within this time frame may be necessary to accommodate this future demand. The next step in the Demand / Capacity Analysis is to determine the current capacity of the airfield.

The principal guidance for the analysis of airfield capacity is FAA Advisory Circular 150/5060-5, Airport Capacity and Delay. There are two key measurements of airfield capacity that assist planners in evaluating the adequacy of airfield facilities. Hourly capacity considers the throughput during a typical busy hour. Factors such as percentage of arrivals, runway crossings, and taxiway exit locations are considered to arrive at an hourly number of aircraft that can use the airfield without undue delays.

The other measure is Annual Service Volume (ASV), an estimate of the number of aircraft operations that can be accommodated in one year. This measure is used to program additional runways, and/or modified taxiway exits. Airfield capacity improvements are typically programmed when actual annual operations reach 60 percent of ASV and constructed when operations reach 80 percent of ASV.

Hourly Capacity

This approach utilizes the projections of annual operations by the specified fleet mix as projected in the Aviation Activity Forecasts. It considers a variety of factors including airfield layout, meteorological conditions, runway conditions, runway use, aircraft mix, percent arrivals, percent touch-and-go's, and exit taxiway locations.

Airfield characteristics, particularly the layout of the runways and taxiways, directly affect the capacity of the airfield. The location and orientation of the runways, the percent of time that a particular runway or combination of runways is in use and the length, width, weight bearing capacity, and instrument approach capability of each runway at the airport all factor in to hourly capacity analysis. The location and orientation of exit taxiways also have a direct bearing on hourly capacity in that properly placed exit taxiways will allow an aircraft to clear the runway environment in the least amount of time and allow for the following arrival or departure procedure.

Weather also plays a key role in determining hourly capacity. When weather conditions are such that there are low clouds and/or reduced visibility, arriving and departing aircraft operate under different flight rules. The conditions for each set of rules are listed below:

Visual Flight Rules (VFR)

Conditions necessary to operate under VFR are a cloud ceiling that is equal to or greater than 1,000 feet above the ground level (AGL) and the visibility is equal to or greater than 3 statute miles. This does not cover every situation, but these are the most common criteria used at most commercial service airports with instrument approaches.

Instrument Flight Rules (IFR)

Conditions requiring operation under IFR are complicated, but in general are conditions that do not qualify as VFR. Weather that is worse than the minimum requirements for instrument approach procedures at an airport will preclude any operation at the airport and can cause cancellations or diversions to other airports. These conditions vary by operation type, type of aircraft, and aircraft equipment.

When operating in VFR conditions, pilots are responsible for the separation of their aircraft from other aircraft and obstacles. However, when IFR operations are required, Air Traffic Control is responsible for the separation of aircraft and obstacle clearance. This is done through the use of RADAR, where available, and through the use of Standard Instrument Procedures. Large margins are built into the system, which is what limits the capacity in the airspace surrounding the airport, as well as the hourly capacity of the airfield.

The demand characteristics that are relevant to calculating airfield capacity are the mix of aircraft types that utilize the airport in the busy hour along with the percentage of arrivals and the percentage of touch-and-go operations. Aircraft types are classified according to size as shown below.

Class A: Small single engine aircraft weighing less than 12,500 pounds

Class B: Small twin engine aircraft weighing less than 12,500 pounds.

Class C: Aircraft weighing between 12,500 pounds and 300,000 pounds

Class D: Aircraft weighing more than 300,000 pounds

Avi Suquilla Airport has a single runway with two parallel taxiways, has instrument approach procedures and no aircraft in Class D. According to FAA Advisory Circular 150/5060-5, Airport Capacity and Delay, this airfield configuration should yield an hourly capacity of approximately 98 aircraft per hour in VFR conditions and 59 aircraft per hour in IFR conditions.

The approximate annual capacity of this airfield configuration is estimated at 230,000 operations. The Annual Service Volume, the VFR hourly capacity and the IFR capacity all far exceed the demand projections for the 20 year period.

3.3 Airfield Requirements

Airfield requirements relate to those facilities needed for the arrival, departure, and ground movement of aircraft. Key airfield facilities include the following:

- Runways
- Taxiways
- Navigational and Approach Aids

The Federal Aviation Administration (FAA) has recently introduced the new Airport Design Advisory Circular 150/5300-13A which includes clarifications, revisions and the introduction of new terms. As always, the planning and design of airfield facilities is based primarily on the types of aircraft using the airport. The FAA has established the Airport Reference Code (ARC) for planning and design purposes that signifies the airport's highest Runway Design Code (RDC). The RDC is a code based on planned development and signifies the design standards to which the runway is to be built. The Runway Design Code has three components. The first component, depicted by a letter, is the Aircraft Approach Category (AAC) and relates to **aircraft approach speed**. The second component, depicted by a Roman numeral, is the Airplane Design Group (ADG). ADG is a function of the design aircraft's **wingspan**. The third component of the RDG is the Visibility Minimums and is used to establish runway to taxiway separation distances. The FAA has also introduced the Runway Reference Code (RRC) which is comprised of the same three components as the RDC, however, describes the current operation capabilities of a runway where no special operating procedures are necessary. For layout of airport facilities, the design aircraft is the most demanding aircraft or group of aircraft having, or forecast to have, more than 500 annual operations at the airport.

Aircraft Approach Category is a grouping of aircraft based on 1.3 times their stall speed in their landing configuration at their maximum certificated landing weight. FAA design standards recognize the following Aircraft Approach Categories:

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

Airplane Design Group is a grouping of aircraft based on wingspan. FAA design standards recognize the following Airplane Design Groups.

- Group I: Up to but not including 49 feet, tail height less than 20 feet.
- Group II: 49 feet up to but not including 79 feet, tail height 20 feet to less than 30 feet.
- Group III: 79 feet up to but not including 118 feet, tail height 30 feet to less than 45 feet.
- Group IV: 118 feet up to but not including 171 feet, tail height 45 feet to less than 60 feet.
- Group V: 171 feet up to but not including 214 feet, tail height 60 feet to less than 66 feet.
- Group VI: 214 feet up to but not including 262 feet, tail height 66 feet to less than 80 feet.

Visibility Minimums are expressed as Runway Visual Range (RVR) values in feet corresponding to the following Flight Visibility categories.

- 4000 ft: Lower than 1 mile but not lower than ¾ mile
- 2400 ft: Lower than ¾ mile but not lower than ½ mile
- 1600 ft: Lower than ½ mile but not lower than ¼ mile
- 1200 ft: Lower than ¼ mile

Therefore, for example, RDG B-I/2400 is an aircraft meeting the requirements for Aircraft Approach Category B (91 knots or more but less than 121 knots) and Airplane Design Group I (wingspan up to but not including 49 feet, tail height less than 20 feet) with visibilities lower ¾ mile. Typically, increasing the Aircraft Approach Category or Airplane Design Group, and providing for lower approach visibility minimums will increase required airport geometric design standards.

Additional design criteria are determined based on aircraft weight and type of approach. A small aircraft is defined in Advisory Circular 150/5300-13A, Airport Design, as "an airplane of 12,500 pounds or less maximum certificated takeoff weight". An aircraft weighing more than 12,500 pounds is considered a large aircraft. Aircraft weight affects the required Part 77 surfaces and pavement design strength.

It is important to note that it is not necessary to design all of the airfield system to the standards of the most demanding aircraft using the airfield. For airports with two or more runways it is generally most practical to design some airfield components for a less demanding RDG. **Figure 3-1** on the follow page provides a visual representation of various aircraft and their associated RDG's

Figure 3-1 Runway Design Group

Currently, the most demanding aircraft using the airport are any number of the large B-II and C-II class corporate aircraft. Corporate aircraft, used on a regular basis at the Avi Suquilla Airport, include the following:

Owner	Aircraft Type	Runway Reference Code
Sun Care	(Medi-Vac) Piper Navajo	B-I
Native American Air	(Medi-Vac) Citation II, Pilatus, Helicopter	B-II, A-II
Guardian Air	(Medi-Vac) King Air 90	B-II
Manchester Feed, Inc.	Cessna 441	B-II
Air Rutter International	Citation III, Hawker HS 700, Gulfstream IV and V	C-II, C-II, C-III
Delta Media Corp.	Citation X	C-II
Bank One	Cessna 402	B-I
Basha's Grocery	King Air 350	B-II
Terrible Herbst	Citation III, Learjet	C-II, C-I
Safeway Grocery	King Air 350	B-II
Indian Health Service	King Air 350, Hawker HS 700	B-II, C-II

Based and transient GA aircraft include small single- and multi-engines (RDG A-I and B-I) and corporate turboprops (RDG B-II).

Avi Suquilla has developed an Airport Layout Plan (ALP) which provides a graphic representation of current and future airport facilities. It acts as a guide for long-term development at the airport. The airport's existing and ultimate design aircraft, shown on the ALP is the Gulfstream III (Runway Design Group C-II).

The critical aircraft, also called the design aircraft, may be a single aircraft or a composite of the most demanding characteristics of several aircraft. Considering the existing and future fleet mix, including B-II and C-II corporate jets and occasional usage by C-III aircraft, it is recommended that airfield areas continue to maintain RRC C-II design standards

Under former guidance, taxiway design was based on Airplane Design Groups (ADG). In the updated Advisory Circular AC 150/5300-13A, taxiway design is based on newly established Taxiway Design Groups (TDG), which are based on the overall Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance. With respect to the former design standards, all taxiway lateral clearances, with the exception of Taxiway C2 are currently planned for ultimate Group III lateral clearances on the Airport Layout Plan. (Taxiway C-2 is an apron access taxiway which would be used primarily by smaller aircraft.) Group III standards are comparable to current standards for TDG 3. Use of TDG 3 provides clearances for aircraft such as the Gulfstream IV and V, which do occasionally use the airport. This represents a conservative approach for facility design.

In summary, the Runway Reference Code and Taxiway Design Groups of the associated airside facilities are shown below in **Table 3-1.**

Table 3-1 Facility Classifications

	Existing Classification	Ultimate Classification
Runway 1-19	RRC C-II	RRC C-II
Taxiway A	TDG 5	TDG 5
Taxiway B	3	3
Taxiway C	NA	3
Taxiway D	NA	3
Taxiway A1, A2, A3	2, 3	3
Taxiway C1	3	3
Taxiway C2	2	2

*Taxiways A1, A2, and A3 currently meet TDG 3 design standards between Taxiway A and B, and between future taxiway C and Runway 1-19. The remaining sections meet or will meet TDG 2 design standards.

3.4 Runway Requirements

In consideration of the forecast of future aviation activity, the existing runway was analyzed from several perspectives. These include airfield capacity, runway orientation, runway length, pavement strength, and compliance with applicable FAA design standards. The analysis for these various aspects of the runway system design is the basis for recommendations pertaining to airside improvements.

3.4.1 Runway Length

The critical aircraft selection is the primary consideration for the length requirements for Runway 1-19 The FAA Airport Design software program was used for evaluating the runway. Variables required by the program include the airport elevation, mean maximum temperature of the hottest month, the difference in feet between the high and low points of the runway, stage length for aircraft weighing more than 60,000 pounds, and the condition of the runway in terms of either dry or wet and slippery. Input variables for the Avi Suquilla Airport are:

Airport Elevation:	458.4 Feet
Effective Runway Gradient:	0.05 %
Mean Maximum Temperature:	109.0 Degrees F
Stage Length for Aircraft Greater than 60,000 Pounds:	1200 Miles

The results from the program can be found in **Table 3-2.** The software's output provides information for different classifications and percentages of aircraft that the runway will be designed to accommodate. The first distinction is between small and large aircraft. Small aircraft are defined as those weighing less than 12,500 pounds. Aircraft in the small category are almost exclusively piston driven propeller aircraft, although there are some small turboprop aircraft in this category as well. Large aircraft are those weighing in excess of 12,500 pounds and encompass the remainder of the fleet. The critical aircraft for the Avi Suquilla Airport, the Gulfstream III, is within the large aircraft classification. Additionally, the aircraft weighs in excess of 60,000 pounds, which FAA guidance indicates the appropriate runway length would be (at least) 6,510 feet.

According to the table a runway length of 4,670 feet will accommodate 100 percent of small airplanes. This runway length is adequate to accommodate all small aircraft up to ARC B-II.

The present runway length of 6,250 is adequate to accommodate 75 percent of the business jet fleet at a useful load of 60 percent. Thus the current runway length is adequate for some use by a number of business jet aircraft. To accommodate a full range of business jet activity at 60 percent useful load, however, a runway length of 6,980 feet will be needed.

The 1997 Master Plan Update reviewed a summary of flight manual runway length requirements for aircraft most likely to operate at Avi Suquilla. The adjusted runway lengths for Avi Suquilla (450 AMSL, 100% gross take-off weight) gave runway lengths varying from 4,100 feet (turbo-prop) to 8,500 feet. The average runway length for aircraft weighing less than 30,000 lbs. was 6,650 feet with about 75% of the fleet requiring 7,500 feet of runway.

To accommodate longer range flights, such as nonstop flights to the east coast, the useful load would need to be increased to 90 percent for 75 percent of the business jets. As indicated on the table, this would require a runway length of 8470 feet. It is not anticipated that 100 percent of the fleet at 90 percent useful load would need to be accommodated, because this length typically represents long range international trips. While extension to this length is not anticipated to be justified during the planning period, the ability to ultimately extend the runway to as near to 8470 feet as possible should be preserved through land ownership control and protection of the airspace.

Table 3-2 FAA Runway Lengths, FAA Design Software

AIRPORT AND RUNWAY DATA
Airport elevation . . . . 458.4 feet Mean daily maximum temperature of the hottest month . . . . 109.0 F. Maximum difference in runway centerline elevation . . . . .3.2 feet Length of haul for airplanes of more than 60,000 pounds . . . . 1200 miles Dry runways
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN
Small airplanes with approach speeds of less than 30 knots . . . . .310 feet Small airplanes with approach speeds of less than 50 knots . . . . 840 feet Small airplanes with less than 10 passenger seats 75 percent of these small airplanes . . . . .2860 feet 95 percent of these small airplanes . . . . .3420 feet 100 percent of these small airplanes . . . . 4090 feet Small airplanes with 10 or more passenger seats .4670 feet
Large airplanes of 60,000 pounds or less 75 percent of these large airplanes at 60 percent useful load . . . . .5120 feet 75 percent of these large airplanes at 90 percent useful load . . . . .8470 feet 100 percent of these large airplanes at 60 percent useful load . . . . .6980 feet 100 percent of these large airplanes at 90 percent useful load . . . . .11030 feet
Airplanes of more than 60,000 pounds . . . . .Approximately 6510 feet
REFERENCE: Chapter 2 of AC 150/5325-4B, Runway Length Requirements for Airport Design, no Changes included.

3.4.2 Runway Orientation, Additional Runways

FAA design standards recommend additional runway orientations when the primary runway orientation provides less than 95 percent wind coverage. The Avi Suquilla runway orientation was analyzed according to various crosswind components and calculated for all-weather conditions.

Crosswind limitations are a function of an aircraft's stall speed, pilot proficiency and other factors. For general planning purposes, the FAA has established crosswind limits of 10.5 knots for general aviation A-I and B-I aircraft, 13 knots for A-II and B-II general aviation aircraft and 16 knots for transport aircraft A-III, B-III and C-I through D-III. Aircraft in approach category IV (A-IV through D-VI) have a crosswind limit of 20 knots.

The wind roses at the Avi Suquilla Airport were analyzed using 10.5 knot 13 knot and 16 knot crosswind components. **Table 3-3** summarizes wind coverage data for the airport. For the 10.5 knot crosswind limit, Runway 1-19 is available 96.66% of the time. For the 13 knot crosswind limit the runway is available 98.22% of the time and Runway 1-19 is available 99.51 of the time for the 16.0 knot crosswind component.

Table 3-3 Wind Coverage Summary Avi Suquilla Airport

	10.5 Knots Crosswind	13 Knots Crosswind	16 Knots Crosswind
Runway 1-19	96.66%	98.22%	99.51%

Because the Runways 1-19 achieves greater than 95% coverage at 10.5 knot, 13 knot and 16 knot crosswinds, additional or adjusted runway orientations are not necessary at the Avi Suquilla Airport.

3.4.3 Runway Width

The width of the existing runway was also examined to determine if it meets the needs for aircraft the currently and are forecasted to use the airfield. Currently, Runway 1-19 is 100 feet wide. This width will accommodate the requirements for Airplane Design Groups (ADG) II and III through the planning period.

3.4.4 Runway Pavement Strength

According to airport records, Runway 1-19 is rated as having an existing runway pavement strength of 30,000 pounds for single wheel aircraft, 50,000 pounds for dual wheel aircraft. The heaviest critical aircraft that will be used to determine load bearing capacity is the Gulfstream III, which has a maximum takeoff weight of 68,700 pounds on dual wheel gear. A pavement strength of 60,000 pounds for dual wheel aircraft would provide suitable strength for this aircraft at a 90 percent useful load, which is reasonable given likely haul lengths. In addition, taxiways and designated apron areas must be strengthened sufficiently to support taxiing and parking of these aircraft.

A regular series of pavement maintenance is recommended for all airfield pavements. Based on the current condition of existing pavements, a general schedule for major and preventative maintenance items is presented in **Table 3-4**. Actual project timing will depend on the availability of funding and actual wear on pavement. The primary elements are listed, followed by their typical useful life.

Table 3-4 Airfield Pavement Maintenance

Recommended Maintenance Program		Approximate Life Expectancy		
Pavement Overlays		15 to 20 years		
Sealcoat		6 to 8 years		
Cracksealing		3 years		
Pavement	**Last Construction**	**Overlay**	**Sealcoat**	**Cracksealing**
Runway 1-19	2008	2018	2013	3 year cycle
Parallel Taxiway A	2010	2020	2013	3 year cycle
Parallel Taxiway B	2010/2011	2020	2013	3 year cycle
Other Taxiways	*	*	*	3 year cycle
Transient Apron	2008	2018	2012	3 year cycle
Based Aircraft Apron	1993	2012	2017	3 year cycle

*Maintenance on exit and connecting taxiways should be done as part of related runway, parallel taxiway, or apron projects.

3.5 Taxiway Requirements

Taxiways are constructed primarily to facilitate aircraft movement to and from the runway system. Some taxiways are necessary simply to provide access between aprons and runways, while other taxiways become necessary as activity increases and safer and more efficient use of the airfield is needed. Runway 1-19 is served by two parallel taxiways located west of the runway. Taxiway A is located 1,050 feet from the runway centerline and Taxiway B is located 1,300 feet from the runway centerline. Taxiway A is the former runway alignment and is 75 feet wide. Taxiway B is 50 feet wide. Connecting Taxiways A1, A2 and A3 link parallel Taxiways A and B to Runway 1-19. Connecting Taxiways A1, A2 and A3 are 50 feet wide between the parallel runways and 35 feet wide between Taxiway A and Runway 1-19.

The existing 50 and 75 foot taxiway widths are adequate for TDG 2 and 3 aircraft; the Taxiway Design Group 2 and 3 standards are 35 feet and 50 feet respectively. The configuration of taxiways necessitates several 90 degree turns as aircraft taxi from the ends of Runway 1-19 to the terminal area. Airport users with larger aircraft have indicated difficulty in maneuvering the 35 feet wide sections of taxiway. Consideration should be given in the future for widening the 35 foot sections of taxiway on the airfield and/or modifying taxiway geometry to eliminate 90 degree turns.

3.6 FAA Design Standards

One of the key considerations of any airport planning effort is to evaluate the dimensional standards for the airfield layout, established by the FAA. **Table 3-5** presents a summary of significant FAA design standards that need to be compared with existing conditions to evaluate whether the Avi Suquilla airport meets criteria for the aircraft currently being served. The application of these design standards establishes airport geometry. As previously mentioned, the airport is currently classified as a C-II facility.

Table 3-5 FAA Design Standards

	Existing RW 1-19	FAA Standards for C-II	FAA Standards for C-III*
Runway Object Free Area			
Width	800’	800’	800’
Length Beyond Runway End	1,000’	1,000’	1,000’
Runway Safety Area			
Width	500’	500’	500’
Length Beyond Runway End	1,000	1,000	1,000
Runway Obstacle Free Zone			
Width	400’	400’	400’
Length Beyond Runway End	200’	200’	200’
Taxiway Object Free Area			
Width	131’	131’	186’
Taxiway Safety Area			
Width	79’	79’	118’
Design Criteria			
Runway Width	100’	100’	100
Taxiway Width	40’-75’	35’ (TDG 2)	50’ (TDG 3)
Runway Centerline to Parallel T/W Centerline	400’	300’	400’
Runway Centerline to Holdline	250’	250’	250’
Runway Centerline to Edge of Aircraft Parking	>500’	400’	500’
Taxiway Centerline to Fixed or Movable Object	>93’	65.5’	93’

*Note that most of the existing Avi Suquilla airfield facilities also meet the FAA Standards for RDG C-III.

Runway Object Free Area (OFA): The Runway Object Free Area is a two dimensional ground area surrounding the runway. The runway OFA clearing standard precludes parked airplanes and objects except those whose location is fixed by function such as a navigational aid. In order to meet the standard for RRC C-II, the OFA for Runway 1-19 must be 800 feet wide and extend 1,000 feet beyond each runway end. The existing OFA for Runway 1-19 does meet the FAA design standards for RRC C-II.

Runway Safety Area (RSA): The Runway Safety Area is a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. The RSA should be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations. The RSA dimensions associated with C-II standards are a width of 500 feet and an extension of 1,000 feet beyond the runway end. The existing RSA for Runway 1-19 meets the FAA design standards for RRC C-II.

Runway Obstacle Free Zone (OFZ): The runway OFZ is a defined volume of airspace centered above the runway centerline. It is the airspace above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. The standard OFZ for RRC C-II aircraft is 400 feet wide and 200 feet beyond the runway end. The OFZ for Runway 1-19 meets the FAA design standards for RRC C-II, measuring 400 feet wide and extending 200 feet beyond the runway end.

Taxiway Object Free Area (TOFA): The TOFA is a two dimensional ground area adjacent to taxiways. The taxiway OFA clearing standard precludes vehicle service roads, parked airplanes, and objects except those whose location is fixed by function such as a navigational aid. The FAA standard TOFA for Group II aircraft is 131' wide centered on the taxiway centerline. This indicates that parked aircraft need to be at least 65.5 feet from the centerline of the nearest taxiway. The provided TOFA is 131 feet wide and meets required FAA design standards for Group II aircraft.

Taxiway Safety Area (TSA): The TSA is a defined surface alongside the taxiway prepared or suitable for reducing risk of damage to an airplane unintentionally departing the taxiway. The minimum standard TSA width for Group II aircraft is 79 feet. The existing taxiways currently have a TSA of 79' wide which meets the FAA design standard for Group II aircraft.

3.7 Design Criteria

Runway Width: The design standards for runway width take into account not only aircraft approach category, but also consider operations conducted during reduced visibility. The FAA runway width design standard for RRC C-II aircraft is 100 feet for aircraft weighing less than 150,000 pounds. Runway 1-19 is 100 feet wide and meets FAA RRC C-II standards.

Line of Sight: FAA line of sight standards require that two points five feet above the centerline of a runway, without a parallel taxiway, be mutually visible for the entire runway. For runways with a full parallel taxiway, the standard requires that two points, five feet above the centerline, be mutually visible for one half of the runway length. Further, there is a requirement that for intersecting runways, points five feet above the centerline must be mutually visible within the Runway Visibility Zone (RVZ).

Line of sight requirements are currently met at Avi Suquilla Airport; however, care must be taken not to create a problem should the runway be lengthened in the course of development.

Taxiway Width: Taxiway width is correlated to the physical characteristics of the aircraft design group without respect to the operational characteristics of the airport approach category. The Taxiway Design Group 2 width standard is 35 feet, the Taxiway Design Group 3 width standard is 50 feet and the TDG 5 standard is 75 feet.

Taxiway A is 75 feet wide and Taxiway B is 50 feet wide. Connecting Taxiways A1, A2 and A3 are 50 feet wide between the parallel taxiways and 35 feet wide between Taxiway A and Runway 1-19. Taxiway C1 is 50 feet wide and taxiway C2 is 40 feet wide.

The existing configuration of taxiways necessitates several 90 degree turns as aircraft taxi from the ends of Runway 1-19 to the terminal area. Airport users with larger aircraft have indicated difficulty in maneuvering the 35 feet wide sections of taxiway.

Runway Centerline to Parallel Taxiway Centerline: This design criterion establishes the minimum separation between the centerline of the runway and the centerline of the parallel taxiway. This separation is determined based upon the RRC. The separation standard for Runways and Parallel Taxiways with a RRC of C-II is 300 feet and C-III is 400 feet.

The distance between the centerline of Runway 1-19 and the parallel portions of Taxiway A-1 and A-3 is 400 feet. The distance between the centerlines for Runway 1-19 and Taxiway A is 1,050 feet. The distance between the centerlines for Runway 1-19 and Taxiway B is 1,300 feet.

Runway Centerline to Holdline: This standard provides for marking on pavement and placing signs at locations on taxiways where aircraft hold prior to receiving clearance to enter the runway. These locations are chosen to ensure that aircraft are clear of the RSA and OFZ during operations by other aircraft on the runway. The standard holding positions for RRC C-II and C-III aircraft are located 250 feet from the runway centerline.

A holdline position of 250 feet of separation is provided for Runway 1-19. This meets the standard for RRC C-II and C-III.

Runway Centerline to Edge of Parking Area: This standard is designed to allow additional clearance between aircraft parking areas and aircraft operations on the runway, while protecting space between these areas for a parallel taxiway. The FAA standard for RRC C-II is 400 feet and C-III is 500 feet.

The airport's aircraft parking separation currently exceeds the required distance. No construction of aircraft parking aprons will be permitted within the designated area.

3.8 Airfield Marking, Lighting and Signage

Pavement markings, lighting and signage facilitate the safe movement of aircraft about the airfield by directing pilots to their destinations. Runway markings are designed according to the type of instrument approach available on the runway. FAA Advisory Circular (AC) 150/5340-1G, Marking of Paved Areas on Airports, provides the guidance necessary to design an airport's markings.

Runway 1-19 has the necessary markings for the non-precision instrument approach that serves the runway. Besides routine maintenance of the runway markings, these markings will suffice through the planning period.

Taxiway and apron areas also require marking. Yellow centerline stripes are currently painted on all taxiway surfaces at the airport to provide guidance to pilots. The terminal apron surface has centerline markings to indicate the alignment of taxilanes within these areas, however the general aviation apron does not. Taxilane markings should be added to the general aviation apron areas during routine maintenance of the pavement surface.

Airport lighting systems provide critical guidance to pilots during nighttime and low visibility operations. Runway 1-19 is equipped with medium intensity runway edge lighting (MIRL).Effective ground movement at night is enhanced by the availability of taxiway lighting. Medium intensity taxiway lighting (MITL) is in place on all taxiways and exits. The existing airfield lighting systems, while adequate in intensity, will need routine maintenance and upgrades during the planning period.

Airfield signage provides another means of notifying pilots as to their location on the airport. A system of signs placed at several airfield intersections on the airport is the best method available to provide this guidance. Signs located at intersections of runways and taxiways provide crucial information to avoid conflicts between moving aircraft. Directional signage instructs pilots as to the location of taxiways and terminal aprons.

Signage for the Avi Suquilla Airport was surveyed and updated in 2008 in conjunction with the relocation of Runway 1-19. Airfield signage at the airport includes hold position signs, distance remaining signs and directional signs. Airfield signs are incandescent internally lighted and reflect current FAA standards.

3.9 Navigational and Approach Aids

Electronic and visual approach aids provide guidance to arriving aircraft and enhance the safety and capacity of the airfield. Such facilities are vital to the success of the airport and provide additional safety to passengers using the air transportation system. While instrument approach aids are especially helpful during poor weather, they are often used by commercial pilots when visibility is good.

Instrument approaches are categorized as either precision or non-precision. Precision instrument approach aids provide an exact alignment and decent path for an aircraft on final approach to a runway while non-precision instrument approach aids provide only runway alignment information. Most existing instrument approaches in the United States are instrument landing systems (ILS).

With the advent of Global Positioning System (GPS), stand-alone instrument assisted approaches will eventually be established that provide vertical guidance down to visibility minimums currently associated with precision runways. As a result, airport design standards that formerly were associated with a type of instrument procedure (precision/non-precision) are now revised to relate instead to the designated or planned approach visibility minimums. It is expected that future instrument approaches to the airport will involve the use of GPS to provide vertical guidance and runway alignment information with visibilities of 3/4 mile or less.

3.10 Existing Instrument Approaches

The current instrument approach procedures at Avi Suquilla are “circling to land” using a VOR/DME or GPS-A approach. The existing minimums are:

Category A: 1,450 ft. ceiling, 1 ¼ mile visibility
Category B: 1,450 ft. ceiling, 1 ½ mile visibility
Category C: 1,450 ft. ceiling, 3 mile visibility

Future refinements of GPS along with the installation of a GPS ground station will permit lower minimums in the future. For planning purposes, establishment of a non-precision approach with visibility minimums as low as ¾ mile should be assumed to establish future FAR part 77 lateral clearances.

3.11 Approach Lighting

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway electronic visual approach aids are commonly provided at airports. The existing visual approach aids consist of four light precision approach path indicators (PAPI-4) on both ends of Runway 1-19.

Runway end identifier lights (REILs) provide rapid and positive identification of the approach end of the runway. Runway ends at Avi Suquilla are not currently equipped with REILs. REILs should be considered for runway ends not planned for a more sophisticated approach lighting system. Addition of a medium intensity approach lighting system with runway alignment indicator lights (MALSR) would ultimately enable the airport to meet Category I minimums of one half mile visibility.

RUNWAYS AND TAXIWAYS		
EXISTING	**SHORT TERM (2017)**	**LONG TERM (2032)**
Runway 1-19 6250' X 100' 30,000 lbs SWL, 50,000lbs DWL, Full length parallel TW A Full length parallel TW B	**Runway 1-19** Same	**Runway 1-19** 8,500' X 100' 60,000 lbs DWL
NAVIGATIONAL AIDS		
EXISTING	**SHORT TERM (2015)**	**LONG TERM (2032)**
Runway 1-19 VORTAC DME GPS PAPI-4	**Runway 1-19** Same	**Runway 1-19** Stand Alone GPS (WAAS)
LIGHTING AND MARKING		
EXISTING	**SHORT TERM (2015)**	**LONG TERM (2032)**
Runway 1-19 Non-Precision Instrument Markings MIRL, MITL	**Runway 9-27** Non-Precision Instrument Markings MIRL, MITL REIL	**Runway 9-27** Non-Precision Instrument Markings MIRL, MITL REIL MALSR

Figure 3-2 Airfield Facility Requirements

3.12 Landside Facility Requirements

Landside facilities are those that support the airside facilities, but are not actually a part of the aircraft operating areas. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs during the planning period for the following types of facilities:

- General Aviation Terminal Services
- Hangars
- Aircraft Parking Apron
- Access and Vehicle Parking
- Fuel Storage

3.12.1 Terminal Area

Terminal Building

A general aviation terminal can serve several functions including providing space for passenger waiting, pilot's lounge, flight planning, concessions, line service, airport management offices, and various other needs. At most general aviation airports, these functions may not necessarily be limited to a single, separate terminal building, but can also be included in the space offered by fixed base operators (FBO) for these functions and services. For the purposes of this analysis, and since CRIT serves as the airport's FBO, the space requirements will reflect that of a single, functional, terminal building.

The existing building serving the functions of airport administration office, pilots lounge, and FBO office is located adjacent to the itinerant ramp and is approximately 1,500 square feet. The methodology used in estimating general aviation terminal facility needs is based on the number of airport users expected to utilize general aviation facilities during the design hour. General aviation space requirements were then based upon providing 120 square feet per design hour itinerant passenger. The number of design hour itinerant passengers is determined by multiplying design hour itinerant operations by the number of passengers on the aircraft (multiplier). An increasing passenger count (from 1.9 to 2.2) is used to account for the likely increase in larger, more sophisticated aircraft using the airport. **Table 3-6** outlines the general space requirements for a public general aviation terminal at Avi Suquilla. This analysis indicates that while the existing terminal building may be appropriately sized in the short term, it will be undersized in the intermediate and long term.

Table 3-6 General Aviation Terminal Area Facilities

	Available	2017	2022	2027	2032
Design Hour Itinerant Operations	5	6	6	7	8
Multiplier	1.8	1.9	2	2.1	2.2
Total Design Hour Passengers	10	11	13	15	17
General Aviation Building Space (s.f.)	1,500	1,320	1,560	1,800	2,040

Apart from sizing, it should be noted that the building is approaching 50 years old and is in need of extensive renovations or replacement. The building has no insulation except in the ceiling and its windows are all single pane. With summer temperatures frequently in excess of 110 degrees Fahrenheit, it is often impossible to cool the inside of the building below 90 degrees.

Fire Protection

Currently, there are not any water mains or fire hydrants protecting the aircraft parking area, terminal or hangars at the airport. The closest fire hydrant is at a shopping center at the intersection of Airport Road and Highway 95, which is about 1,400 feet away from the closest aircraft parked on the GA Apron. A fire protection water line to serve the general aviation parking apron, terminal and hangar areas is urgently needed to increase fire safety on the airfield.

Drainage Issues

At the present time, rainfall runoff from a portion of the aircraft apron and public parking lot floods the Terminal and main hangar buildings. Although average annual rainfall at the airport is in the two to four inch range, it is not uncommon for intense localized summer monsoon thunder storms to drop up to an inch of rainfall in less than an hour. An August, 2012 storm (3/4" in about 25 minutes) completely overwhelmed the capacity of the parking lot to the drain the surface runoff, resulting in flooding of the hangar and terminal buildings. The existing conditions are due to a number of factors, most of which can be traced to decisions for siting the terminal and hangar when they were constructed in the 1960's and subsequently the lack of funds to reconstruct airside at more desirable locations. This drainage situation needs to be corrected by re-grading the parking lot and installing an underground storm drainage system. Because facilities are currently damaged and continue to degrade with each flooding event, the construction of the storm drain system should be viewed as a high priority project.

Parking lot flooding 8/1/2012

Utilities

The existing terminal is served by a 40+ year old septic tank and leach field, which does not meet current standards. There are no as-built plans available, and the leach field is covered by asphalt, which is not permitted under current regulations. The airport is in need of a sanitary sewer line that extends to the Parker/CRIT sanitary sewer system for treatment. The administration building is currently served with above ground electrical power and telephone service which should be placed underground. In addition, the building relies on dial-up internet access, which does not provide the speed required for Pilots Flight Planning or AWOS weather data download. An upgrade in Internet communications access is recommended.

3.12.2 Hangars

The demand for hangar facilities typically depends on the number and type of aircraft expected to be based at the airport. For planning purposes, it is necessary to estimate hangar and apron facilities based on peak design periods. However, hangar and apron development should be based on actual demand trends and financial investment conditions.

Typical utilization of hangar space varies across the country as a function of local climate conditions, airport security and owner preferences. Although most of the based aircraft at the Avi Suquilla Airport are stored in hangars, weather is not the only factor that influences the demand for hangar storage. Nationwide trends for general aviation aircraft, whether single or multi-engine, are toward larger, more sophisticated and expensive aircraft. Owners of these types of aircraft normally desire hangar space to protect their investment.

The future allocation of based aircraft storage is presented in **Table 3-7**. Single-engine aircraft use was split evenly between conventional hangars and T-hangars / condos, with a small percentage being stored using tie-downs. Conventional hangar use was assumed for 80 percent of the multi-engine and helicopter fleet and 100 percent of the business jets.

Table 3-7: Based Aircraft Storage Distribution

	Current Need	2017	2022	2027	2032
Tie Down					
Single Engine	40%	30%	20%	15%	10%
Multi Engine	0%	0%	0%	0%	0%
Jet	0%	0%	0%	0%	0%
Rotorcraft	0%	0%	0%	0%	0%
T-Hangar					
Single Engine	57%	60%	70%	75%	80%
Multi Engine	50%	45%	40%	35%	30%
Jet	100%	50%	50%	50%	30%
Rotorcraft	50%	0%	0%	0%	0%
Conventional Hangar					
Single Engine	3%	10%	10%	10%	10%
Multi Engine	50%	55%	60%	65%	70%
Jet	0%	50%	50%	50%	70%
Rotorcraft	50%	100%	100%	100%	100%

Determining hangar requirements involves estimating the area necessary to accommodate the required hangar space. A planning standard of 1,250 square feet per based aircraft stored in T-hangars was used. For conventional hangars, a planning standard of 1,500 square feet for single-engines and 2,500 square feet for twin-engine, jet and helicopters was used. Current hangars provide an average of 1950 square feet for each aircraft based on the airfield. Since portions of conventional hangars are also used for aircraft maintenance and servicing, requirements for service hangar area were estimated using a planning standard of approximately 15 percent of the total hangar space needs.

Table 3-8 compares existing hangar availability to the future hangar requirements for the planning period. From the analysis, additional hangar area is justified in the near term.

Table 3-8: Hangar Requirements

	Currently Available	Current Need	2017	2022	2027	2032
Based Aircraft*						
Single Engine		27	29	32	35	37
Multi Engine		5	7	8	11	14
Jet		1	2	2	2	3
Rotorcraft		2	2	2	2	2
Total Based Aircraft*		35	40	44	50	56
Aircraft to be Hangared						
T-Hangar /Condo Positions	20	20	22	27	31	35
Conventional Hangar **	4	4	10	11	14	18
Total Aircraft ***	24	24	31	38	45	52
Hangar Area (s.f.)						
T-Hangar/Condo Area	25,000	24,863	26,938	33,250	38,875	43,375
Conventional Hangar Area	10,000	9,965	21,475	24,300	30,625	40,300
Maintenance Area ****		5,224	7,262	8,633	10,425	12,551
Total Hangar Area (s.f.)	35,000	40,052	55,674	66,183	79,925	96,226

* Not including military aircraft
** An average of 5 positions per large hangar, 2 positions per standard hangar assumed for current conditions
*** May not total due to rounding
**** Existing maintenance areas included within conventional hangar area.

3.13 Aircraft Parking Apron

A parking apron should be provided to accommodate the number of locally-based aircraft that are not stored in hangars as well as transient aircraft. As noted in **Table 3-9**, it is anticipated that some based single engine aircraft owners will still prefer ramp storage over the long range. Therefore, the parking apron should be sized to accommodate this demand through the planning period. FAA planning criterion of 300 square yards per tie down was used to estimate the ramp area that would be needed for based aircraft. The number of local tie downs and ramp space for the planning period is presented in **Table 3-9**.

FAA Advisory Circular 150/5300-13A suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At Avi Suquilla Airport, the number of transient spaces required was estimated to be approximately 25 percent of busy day itinerant operations. Planning criterion of 500 square yards per aircraft was applied to the number of transient apron requirements. The transient apron space ratio is higher than that of the based aircraft apron because it serves a larger variety of aircraft and is typically designed for taxi-through parking spaces. The results of this analysis are presented in **Table 3-9**. There is approximately 43,000 square yards of parking apron in the general aviation area. While the results shown in the table indicate that the existing general aviation apron area should be adequate for the planning period, consideration must be given to the regular special events that occur at the airport. The apron regularly exceeds full capacity during special events when the ramp can fill with in excess of 100 aircraft. Another consideration will be the location of the apron in relation to other facilities. Currently helicopter operations are integrated into fixed wing activity on the ramp. Separating helicopter operations from fixed wing aircraft would reduce the risk of damage to aircraft due to wind turbulence and flying debris.

Table 3-9: Aircraft Parking Apron Requirements

	Currently Available	Current Need	2017	2022	2027	2032
Based Aircraft						
Non-Hangared Aircraft		11	9	6	5	4
Tie-down Area (s.y.)		3,240	2,610	1,920	1,575	1,110
Transient Aircraft						
Busy Day Itinerant Operations		44	48	52	57	63
Transient Parking Positions		11	12	13	14	16
Transient Apron Area		5,444	5,959	6,528	7,155	7,846
Total Parking Apron						
Positions	77	22	21	19	20	19
GA Apron Area (s.y.)	43,150	8,684	8,569	8,448	8,730	8,956

3.14 Fuel Storage

The fuel farm consists of two above ground tanks, one 12,000 gallon jet fuel tank and one 12,000 gallon avgas tank. Fuel storage requirements are typically based upon maintaining a one month supply of fuel during an average month, however more frequent deliveries can reduce the fuel storage capacity requirement. Over the past four years, avgas fuel sales at Avi Suquilla Airport have averaged 2.36 gallons per operation while Jet A fuel sales have averaged 3.15 gallons per operation. This ratio was used to project future fuel sales. **Table 3-10** presents future fuel storage requirements for the airport.

Table 3-10: Fuel Storage Requirements

	Currently Available	Current Need	2017	2022	2027	2032
Annual Operations		11,250	14,002	15,791	17,709	20,085
AvGas						
Annual Demand (gal.)		26,550	33,045	37,267	41,793	47,400
Existing Capacity (gal.)		12,000	12,000	12,000	12,000	12,000
Number of Days Supply (gal.)		165	133	118	105	92
Jet A						
Annual Demand (gal.)		35,438	44,106	49,741	55,783	63,268
Existing Capacity (gal.)		12,000	12,000	12,000	12,000	12,000
Number of Days Supply (gal.)		124	99	88	79	69
*Note recommended minimum tank size – 12,000 gallons						

It is anticipated that avgas and Jet fuel storage capacities will be adequate for the planning period. However, as noted in Chapter 1, the tank system was constructed to auto fueling standards with minimal engineering and is poorly designed for aviation use. The fuel storage tanks themselves appear adequate, however, the fuel dispensing systems require significant upgrade in order to meet aviation fueling standards. To better serve after-hours operations and in consideration of limited staffing, it is recommended that a fueling system with self-serve capability be considered in the short term. In addition, it is recommended that a spill containment facility be constructed at the fuel truck parking location.

It is recommended that the following items be included in the specifications for a fuel dispensing system upgrade:

Jet A Tank System

- **Automated Self-Serve Fuel Management System** capable of unattended operation for 7 days a week, 24 hours a day.
- **Filtration:** Milli-pore test ports installed on the inlet and outlet lines of the Jet-A filter vessel. For self service delivery directly into an aircraft from storage, a filter/monitor should be used. Filter vessels should be equipped with a means of convenient sump draining, and a DP (Delta Pressure or differential pressure gauge), a pressure relief valve, and an air eliminator with any discharges captured to a container.
- **Drain / Sump:** Filter vessels should be equipped with a sump drain positioned at the low point of the vessel for removal of accumulated water and free water (i.e., a ball valve piped to an accessible location, all stainless steel).
- **Overwing Nozzles:** OPW 1 ½” inlet x 1 ½” outlet anti mis-fueling overwing nozzle. Nozzle should be equipped with swivel, dust cap, and static ground/wire clamp. Nozzle should be interchangeable and completely functional between both hoses.
- **Single Point Nozzle:** A single point fuelling nozzle with hose end pressure control valve. Nozzle should be equipped with 100-mesh strainer, swivel and dust cap. Nozzle should be interchangeable and completely functional between both hoses.

- **Deadman Control Unit:** The single point nozzle shall have an independent deadman control handle.

Avgas 100LL Tank System

- **Automated Self-Serve Fuel Management System** capable of unattended operation for 7 days a week, 24 hours a day.
- **Filtration:** Avgas 100LL, a one (1) micron filter monitor should be used on the outlet line of the system. Filter vessels must be equipped with a means of convenient sump draining and a DP (Delta Pressure or differential pressure gauge). Pressure relief valve and air elimination are not required or advised for this low flow system.
- **Drain / Sump:** Filter vessels should be equipped with a sump drain positioned at the low point of the vessel for removal of accumulated water and free water (i.e., a ball valve piped to an accessible location, all stainless steel).
- **Overwing Nozzles:** OPW 1" inlet x 1" outlet anti miss-fueling over wing nozzle. Nozzle shall be equipped with swivel, dust cap, and static ground/wire clamp.

3.15 Security

Avi Suquilla Airport is currently surrounded by six foot security fencing; however, the perimeter road used to inspect the fence is on unstable sand. A perimeter road with an all-weather surface is recommended.

As noted in Chapter 1, Apron lighting consists of automobile street lights mounted on weathered wooden poles. The lights are served by overhead power lines which run parallel with the edge of the apron. It is recommended that apron lighting be upgraded to standard specifications and converted to underground power.

3.16 Summary

The facility requirements evaluation has identified several facility improvements for the airfield, in the terminal area and in general aviation segments. Key recommendations in each of these areas are summarized below.

Airfield

- Plan for lengthening of Runway 1-19 to 7,000 feet within the planning period
- Plan for ultimate length of up to 8,500 feet on Runway 1-19
- Consider widening 35 foot wide sections of taxiways to 50 feet
- Consider modification of taxiway geometry to eliminate 90 degree turns
- Protect lateral ground clearance for possibility of future GPS
- Protect lateral ground clearance for MALSR approach lighting system
- Add REILS to Runway 1-19
- Designate helicopter landing area(s)

Terminal Area / Access

- GA terminal expansion / replacement
- Access / signage from Riverside Drive
- Fire Protection Water Line
- Drainage improvements to terminal parking area

- Utility installation / relocation – electric, telephone, internet, sewer

General Aviation

- Apron expansion to accommodate regular special events
- Additional storage hangars
- Segregated area for helicopter operators
- Fueling system upgrades including self-service and spill containment
- Upgrade apron lighting
- All-weather perimeter road

Each of these functional areas will be given consideration in the following evaluation of airport development alternatives. The next chapter will provide analysis and recommend the best alternative for the future development of the airport, taking into consideration other factors such as access and highest and best use of airport property.