AIRPORT MASTER PLAN

Working Paper No. 2

BISBEE DOUGLAS INTERNATIONAL AIRPORT

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ARMSTRONG

Chapter Three
Facility Requirements

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3.1 INTRODUCTION

This chapter identifies the requirements for airfield and landside facilities to accommodate the forecast demand level at Bisbee Douglas International Airport. In order to meet the demand levels, an assessment of the ability of existing airport facilities to meet current and future demand is needed. The facility requirements will be based on information derived from capacity and demand calculations, information from FAA advisory circulars and design standards, the sponsor's vision of the future of the airport, the condition and functionality of existing facilities, and other pertinent information.

Facility requirements have been developed for the various airport functional areas listed below:

- General aviation requirements
- Support facilities
- Ground access, circulation, and parking requirements
- Infrastructure and utilities
- Land use compatibility and control

The time frame for addressing development needs usually involves short-term (up to five years), medium-term (six to ten years), and long-term (eleven to twenty years) planning periods. Long-term planning primarily focuses on the ultimate role of the airport and is related to development. Medium-term planning focuses on a more detailed assessment of needs, while the short-term analysis focuses on immediate action items. Most important to consider is that a good plan is one that is based on actual demand at an airport rather than time-based predictions. Actual activity at the airport will vary over time and may be higher or lower than what the demand forecast predicts. Using the three planning milestones (short-term, medium-term, and long-term) the airport sponsor can make an informed decision regarding the timing of development based on the actual demand. This approach will result in a financially responsible and demand-based development of the Bisbee Douglas International Airport.

3.2 DESIGN STANDARDS

Airport design standards provide basic guidelines for a safe, efficient, and economic airport system. The standards cover the wide range of size and performance characteristics of aircraft that are anticipated to use an airport. Various elements of airport infrastructure and their functions are also covered by these standards. Choosing the correct aircraft characteristics for which the airport will be designed needs to be done carefully so that future requirements for larger and more demanding aircraft are taken into consideration, while at the same time remaining mindful that designing for large aircraft that may never serve the airport is not economical.

As discussed previously in Chapter 1, Section 1.13, the Runway Design Code (RDC) is one component of the FAA's design standards. The RDC can be used to determine the necessary facility requirements. Examples of various aircraft meeting the design standards for a RDC of A-I and B-I are illustrated on **Table 3-1**, and examples of aircraft with a RDC of A-II and B-II are depicted in **Table 3-2.** Lastly, examples of aircraft with a RDC of C-I and C-II are shown in **Table 3-3**. For the purpose of this Chapter, examples of the remaining Airplane Design Group (ADG) categories of C, D, and E aircraft and their corresponding approach categories (I, II, III, etc.) are not depicted due to their infrequent use of the Airport; the sample aircraft provided below are those that are likely to use the Airport on a regular basis.

TABLE 3-1 RDC OF A-I OR B-I (SAMPLE AIRCRAFT)

Aircraft	Approach Speed (kts)	Wingspan (ft)	Tail Height (ft)	Max Take Off Weight (lbs)
Beech Baron 58P	101	37.8	9.1	6,200
Beech Bonanza V35B	70	33.5	6.6	3,400
Beech King Air B100	111	45.9	15.3	11,799
Cessna 150	55	33.3	8.0	1,670
Cessna 172	60	36.0	9.8	2,200
Cessna 177	64	35.5	8.5	2,500
Cessna 182	64	36.0	9.2	2,950
Cessna 340	92	38.1	12.2	5,990
Cessna 414	94	44.1	11.5	6,750
Cessna Citation I	108	47.1	14.3	11,850
Gates Learjet 28/29	120	42.2	12.3	15,000
Mitsubishi MU-2	119	39.1	13.8	10,800
Piper Archer II	86	35.0	7.4	2,500
Piper Cheyenne	110	47.6	17.0	12,050
Rockwell Sabre 40	120	44.4	16.0	18,650
Swearingen Merlin	105	46.3	16.7	12,500
Raytheon Beechjet	105	43.5	13.9	16,100
Eclipse 500 Jet	90	37.9	13.5	5,920

Source: FAA AC 150/5300-13A, *Airport Design*

TABLE 3-2 RDC OF A-II OR B-II (SAMPLE AIRCRAFT)

Aircraft	Approach Speed (kts)	Wingspan (ft)	Tail Height (ft)	Max Take Off Weight (lbs)
Air Tractor 802F	105	58.0	11.2	16,000
Beech King Air C90-1	100	50.3	14.2	9,650
Beech Super King Air B200	103	54.5	14.1	12,500
Cessna 441	100	49.3	13.1	9,925
Cessna Citation II	108	51.6	15.0	13,300
Cessna Citation III	114	50.6	16.8	17,000
Dassault Falcon 50	113	61.9	22.9	37,480
Dassault Falcon 200	114	53.5	17.4	30,650
Dassault Falcon 900	100	63.4	24.8	45,500
DHC-6 Twin Otter	75	65.0	19.5	12,500
Grumman Gulfstream I	113	78.5	23.0	35,100
Pilatus PC-12	85	52.3	14.0	9,920

Source: FAA AC 150/5300-13A, *Airport Design*

TABLE 3-3 RDC OF C-I OR C-II (SAMPLE AIRCRAFT)

Aircraft	Approach Speed (kts)	Wingspan (ft)	Tail Height (ft)	Max Take Off Weight (lbs)
Learjet 24	128	35.1	12.3	13,001
Canadair CL-600	125	61.8	20.7	41,250
Gulfstream-III	136	77.8	24.4	68,700
1329 JetStar	132	54.5	20.4	43,750
Sabre 80	128	50.4	17.3	24,500
Gulfstream-II	141	68.8	24.5	65,300
Rockwell 980	121	52.1	14.9	10,325
Cessna Citation 650	126	53.6	16.8	23,000
Cessna Citation 750 X	131	63.6	18.9	36,100
Astra 1125	126	52.5	18.1	23,500
Hawker 125-1000	130	61.9	17.1	36,000
Falcon 900 EX	126	63.5	24.2	48,300

Source: FAA AC 150/5300-13A, *Airport Design*

As discussed in Chapter 1, the approved 1997 Master Plan for the Airport indicated that the existing RDC for Runway 17-35 is C-I, and the existing RDC for Runway 8-26 is B-I. Furthermore, the existing design aircraft for Runway 17-35 is a small corporate jet, and the existing design aircraft Runway 8-26 is a light, twin-engine propeller aircraft. An example of a light, twin-engine propeller aircraft is the Piper Navajo. Likewise, an example of a small corporate jet is the Lear 25. Without adequate operations data for each runway, specific design aircraft cannot be established. Therefore, based on existing and forecasted demand levels, these aircraft represent the most likely types of aircraft to use the facility in the planning period. Based on a review of the published RDCs for both runways, it is reasonable to maintain the published RDCs for this Master Plan. Therefore, RDC design standards for both B-I and C-I will be applied to the existing and ultimate development plans for the Bisbee Douglas International Airport.

3.3 AIRFIELD CAPACITY

The airfield capacity analysis is determined by using an airport's annual service volume (ASV). An airport's ASV has been defined by the FAA as "a reasonable estimate of an airport's annual capacity. It accounts for differences in runway use, aircraft mix, weather conditions, etc., that would be encountered over a year's time." Therefore, ASV is a function of the hourly capacity of the airfield and the annual, daily, and hourly demands placed upon it. According to FAA AC 150/5060-5, *Airport Capacity and Delay*, the ASV for a single runway configuration is approximately 230,000 operations, and approximately 260,000 operations for an airfield configuration similar to Bisbee Douglas International.

At Bisbee Douglas International Airport the ASV is estimated to be 1,920 aircraft operations (landings and takeoffs) for present conditions. Compared to the projected 3,228 operations by the year 2033, it is evident that airfield capacity will not be a constraining factor to growth of the airport. Therefore, no additional runways are needed (from a capacity perspective) to accommodate the existing or forecasted activity. **Table 3-4** summarizes the ASV relationship developed in this section.

TABLE 3-4 ANNUAL SERVICE VOLUME SUMMARY

Year	Annual Operations	Annual Service Volume[1]	Annual Capacity Ratio
2013	1,920	260,000	>1%
2023	3,228	260,000	1.2%
2033	3,228	260,000	1.2%

[1]FAA AC 150/5060-5, *Airport Capacity and Delay*

3.4 AIRSIDE FACILITY REQUIREMENTS

All airports are comprised of both airside and landside facilities as presented in Chapter 1. Airside facilities consist of those facilities that are related to aircraft arrival, departure, and ground movement, along with all associated navigational aids, airfield lighting, pavement markings, and signage.

3.4.1 RUNWAY LENGTH

There are many factors that may determine the runway length for an airport. FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length requirements. The information required to determine the recommended runway length(s) includes airfield elevation, mean maximum temperature of the hottest month, and the effective gradient for the runway. Also, the performance characteristics and operating weight of an aircraft impacts the amount of runway length needed. The following information for the Bisbee Douglas International Airport was used for the analysis:

- Field elevation: 4,150 mean sea level (MSL)
- Mean maximum temperature of hottest month (June): 95^{o} F
- Effective Runway 17-35 gradient: 35 feet
- Effective Runway 8-26 gradient: 34 feet
- Performance characteristics and operating weight of aircraft

The process to determine recommended runway lengths for a selected list of critical design aircraft begins with determining the weights of the critical aircraft that are expected to use the airport on a regular basis. For aircraft weighing 60,000 pounds or less, the runway length is determined by family groupings of aircraft having similar performance characteristics. The first family grouping is identified as small aircraft, which is defined by the FAA as airplanes weighing 12,500 pounds or less at Maximum Takeoff Weight (MTOW). The second family grouping is identified as large aircraft, which is defined by the FAA as aircraft exceeding 12,500 pounds but weigh less than 60,000 pounds. For aircraft weighing more than 60,000 pounds, the required runway length is determined by aircraft-specific length requirements. **Table 3-5** depicts the aircraft weight categorization as recommended by the FAA.

TABLE 3-5 AIRPLANE WEIGHT CATEGORIZATION FOR RUNWAY LENGTH REQUIREMENTS

<table>
<tr><th colspan="3">Airplane Weight Category Maximum MTOW</th><th>Design Approach</th></tr>
<tr><td rowspan="4">≤ 12,500 Pounds</td><td colspan="2">Approach Speed < 30 knots</td><td>Family groupings of small airplanes</td></tr>
<tr><td colspan="2">Approach Speed ≥ 30 knots, but < 50 knots</td><td>Family groupings of small airplanes</td></tr>
<tr><td rowspan="2">Approach Speed ≥ 50 knots</td><td>With < 10 Passengers</td><td>Family groupings of small airplanes</td></tr>
<tr><td>With ≥ 10 Passengers</td><td>Family grouping of small airplanes</td></tr>
<tr><td colspan="3">Over 12,500 pounds, but < 60,000 pounds</td><td>Family groupings of large airplanes</td></tr>
<tr><td colspan="3">≥ 60,000 pounds or more, or Regional Jets[1]</td><td>Individual large airplane</td></tr>
<tr><td colspan="4">Note[1]: All regional jets, regardless of their MTOW, are assigned to the 60,000 pounds or more weight category.</td></tr>
</table>

Source: FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*

Recommended runway lengths are determined using charts in FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, based on the seating capacity and the mean daily maximum temperature of the hottest month of the year at the airport. The small airplanes with the approach speed of greater than or equal to 50 knots with less than 10 passengers seats and a Maximum Takeoff Weight (MTOW) less than 12,500 pounds recommends a runway length of 5,450 feet in order to accommodate 95 percent of the fleet; the 95 percent of fleet category applies to airports that are primarily intended to serve medium size population communities with a diversity of usage and greater potential for increased aviation activities. Also included in this category are those airports that are primarily intended to serve low-activity locations, small population communities and remote recreational areas. The approach speed of greater than or equal to 50 knots with less than 10 passenger seats and a MTOW less than 12,500 pounds recommends a runway length of 5,760 feet in order to accommodate 100 percent of the aircraft fleet. The 100 percent of fleet category is a type of airport that is primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area. With an existing runway length of 6,430 feet, Runway 17-35 can accommodate 100 percent of the small airplanes.

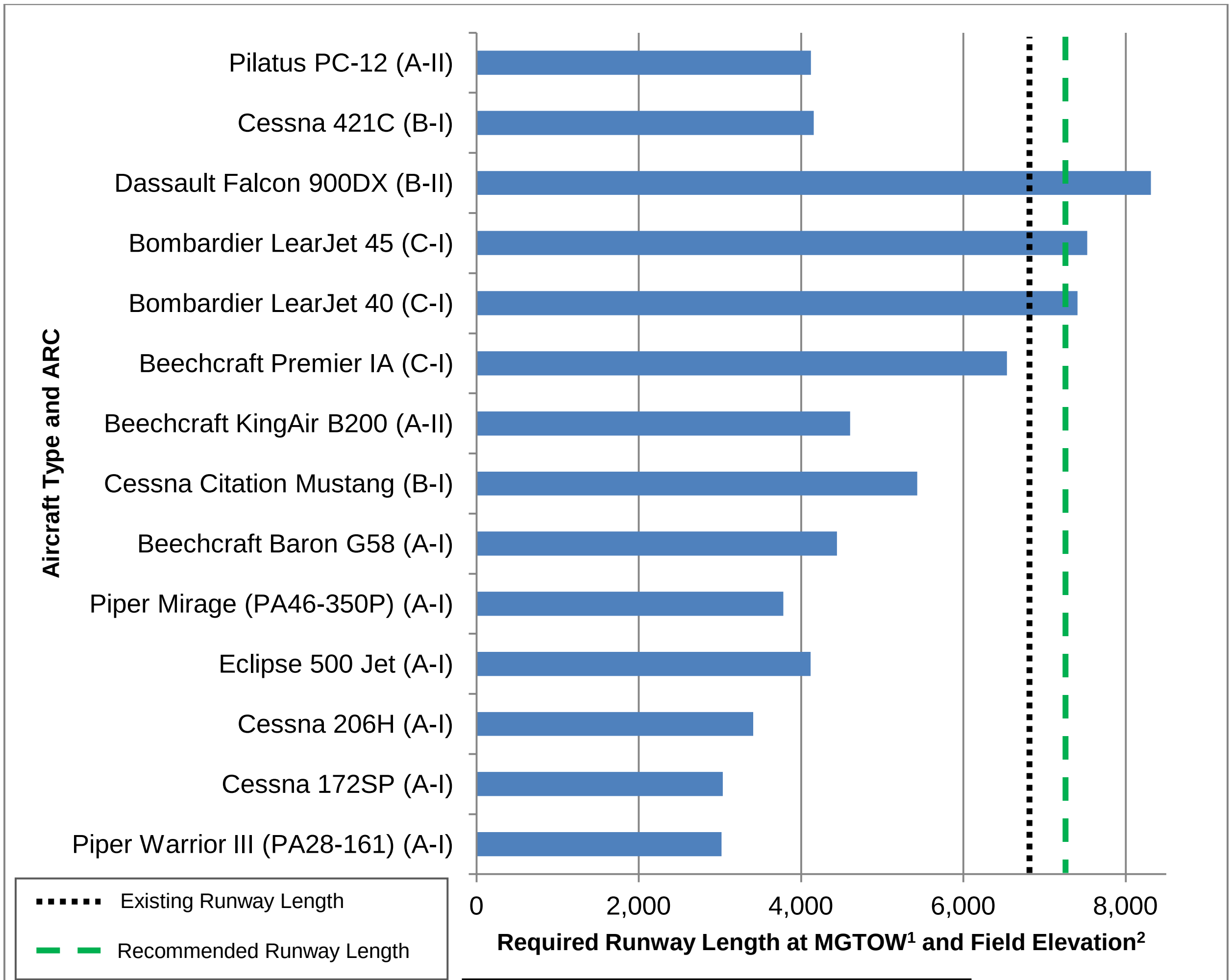
Recommended runway lengths to serve large aircraft weighing over 12,500 pounds, but less than 60,000 pounds, are determined using a certain percentage of the useful load. The term useful load, as defined by the FAA, is the difference between the maximum allowable structural gross weight and the operating empty weight. A typical operating empty weight includes the airplane's empty weight, crew, baggage, other crew supplies, removable passenger service equipment, removable emergency equipment, engine oil and unusable fuel. According to the above referenced Advisory Circular, 75 percent of fleet at 60 and 90 percent useful load require runway lengths of 6,810 and 9,000 feet respectively. The Advisory Circular indicates that 100 percent of fleet at 60 and 90 percent useful load require runway lengths of 9,670 and 11,090 feet respectively. To accommodate 75 percent of aircraft at 60 percent useful load weighing 60,000 pounds or less, a runway length of 6,810 feet is recommended. Based on the analysis, the potential need to extend the runway in the planning period exists. However, if the types and frequencies of operations change significantly at the airport, the need to revisit the runway length analysis may be warranted. **Table 3-6** provides the recommended runway length information.

TABLE 3-6 RECOMMENDED RUNWAY 17-35 LENGTH

Description	Runway Length (ft)
Existing Runway 17-35 Length	6,430
Recommended to accommodate:	
Small Aircraft (<12,500 lbs.,< 10 passenger)	
75 percent of these small airplanes	4,150
95 percent of these small airplanes	5,450
100 percent of these small airplanes	5,760
Large Aircraft (<60,000 lbs.)	
75 percent of these planes at 60 percent useful load	**6,810 (recommended)**
75 percent of these planes at 90 percent useful load	9,000
100 percent of these planes at 60 percent useful load	9,670
100 percent of these planes at 90 percent useful load	11,090
Aircraft more than 60,000 lbs.	6,470 (approx.)

Source: FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*

Takeoff Distance Requirements: When determining runway length requirements for an airport, it is necessary to consider the types of aircraft (aircraft design group and critical aircraft) that will be using the airport and their respective takeoff distance requirements. Examples of takeoff distance requirements for several aircraft likely to use the primary runway at Bisbee Douglas International Airport are illustrated in **Figure 3-1**. Examples of takeoff distance requirements for the crosswind runway are not provided as Runway 17-35 (the primary runway) is viewed as the most important runway to drive growth at the airport.



[1]Maximum Gross Takeoff Weight
[2] 4,150 feet MSL
Source: ACI

FIGURE 3-1 RUNWAY LENGTH REQUIREMENTS

The Alternatives chapter will present various concepts for achieving the recommended runway length taking into consideration any site constraints and potential environmental impacts.

3.4.2 RUNWAY ORIENTATION

The FAA recommends that a runway's orientation provide at least 95 percent crosswind coverage. Based on the wind data presented in **Table 1-13** in Chapter 1, Runway 17-35 only provides 87.6 percent wind coverage for A-I and B-I aircraft (10.5 knots) and 92.8 percent wind coverage for B-II aircraft (13 knots).

With the addition of the existing Runway 8-26, the combined wind coverage is 99.0 percent and 99.8 percent respectfully. The existing airfield configuration exceeds the FAA's recommended crosswind coverage of 95 percent. Therefore, additional runways are not needed during the planning period.

The FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, recommends the same guidelines be followed to determine the recommended runway length for crosswind runways. Small aircraft weighing less than 12,500 pounds primarily have less crosswind performance capabilities. As such, it is usually recommended that a crosswind runway accommodate 100 percent of small aircraft. The current runway length of 4,966 feet can accommodate approximately 86 percent of small aircraft weighing less than 12,500 pounds. According to AC 150/5325-4B, to accommodate 100 percent of small aircraft weighing less than 12,500 pounds, Runway 8-26 would need to be a lengthened to 5,760 feet. At this time, it is not recommended to lengthen Runway 8-26 based upon existing and forecasted aircraft operations. The existing length is considered adequate for the planning period. However, if the types and frequencies of operations change significantly for Runway 8-26, the need to revisit the runway length may be warranted. **Table 3-7** provides the Runway 8-26 length analysis.

TABLE 3-7 RUNWAY 8-26 (CROSSWIND) ANALYSIS

Description	Runway Length (ft)
Existing Runway 8-26 Length	4,966
Recommended to accommodate:	
Small Aircraft (<12,500 lbs.,< 10 passenger)	
75 percent of these small airplanes	4,150
95 percent of these small airplanes	5,450
100 percent of these small airplanes	5,760
Large Aircraft (<60,000 lbs.)	
75 percent of these planes at 60 percent useful load	6,750
75 percent of these planes at 90 percent useful load	8,940
100 percent of these planes at 60 percent useful load	9,610
100 percent of these planes at 90 percent useful load	11,030
Aircraft more than 60,000 lbs.	6,470 (approx.)

Source: FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*

The Alternatives chapter will present various concepts for achieving the recommended crosswind runway length taking into consideration any site constraints and potential environmental impacts.

3.4.3 RUNWAY WIDTH

The required runway width is a function of airplane approach category, airplane design group, and the approach minimums for the design aircraft expected to use the runway on a regular basis.

The existing runway pavement widths meet the existing and future FAA design standards and should be maintained for the planning period:

- Runway 17-35 is 100 feet wide

- Runway 8-26 is 60 feet wide

3.4.4 Runway Pavement Strength

According to FAA guidance on pavement strength, the aircraft types and the critical aircraft expected to use the airport during the planning period are used to determine the required pavement strength, or weight bearing capacity, of airfield surfaces. The required pavement design strength is an estimate based on average levels of activity and is expressed in terms of aircraft landing gear type and configurations. Pavement design strength is not the maximum allowable weight; limited operations by heavier aircraft other than the critical aircraft may be permissible. It is important to note that frequent operations by heavier aircraft will shorten the lifespan of the pavement.

The existing runway pavement strengths are reported to be:

- Runway 17-35 is 30,000 pounds gross weight single-wheel landing gear and 160,000 pounds gross weight dual-wheel landing gear.
- Runway 8-26 is 12,500 pounds gross weight single-wheel landing gear.

Based upon the existing and planned RDCs for each runway and the aircraft most likely to use the airport on a regular basis (illustrated in Tables 3-1, 3-2, and 3-3), the pavement strength ratings for both Runways 17-35 and 8-26 are adequate. Many B-I aircraft likely to use Runway 8-26 have a maximum takeoff weight of 12,500 pounds or less. Likewise, the majority of C-I type aircraft likely to use Runway 17-35 have a maximum takeoff weight far below the 160,000 pounds dual-wheel landing gear rating for the runway. As such, for planning purposes, the existing pavement strengths for both runways should be maintained for the planning period.

3.4.5 Taxiway and Taxilane Requirements

By definition, a taxiway is a defined path established for the taxiing of aircraft from one part of an airport to another. A taxilane is a taxiway designated for low speed and precise taxiing. Taxilanes are usually, but not always, located outside the movement area, providing access from taxiways to aircraft parking positions, hangars, and terminal areas.

FAA AC 150/5300-13A, *Airport Design*, provide planners with guidance on recommended taxiway and taxilane layouts to avoid runway incursions and to enhance the overall safety at the airport. According to the FAA, a runway incursion is “any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft.”

According to *Airport Design*, “good airport design practices keep taxiway intersections simple by reducing the number of taxiways intersecting at a single location and allows for proper placement of airfield markings, signage and lighting.” Existing taxiway geometry should be improved whenever feasible with emphasis on “hot spots,” and to the extent practical, the removal of existing pavement to correct confusing layouts should be permissible.

As discussed previously in Chapter 1, Section 1.13, to arrive at the best TDG, the undercarriage dimensions of the aircraft are used. The TDG design standards are based on the overall Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance. Taxiway/taxilane width and fillet standards, and in some instances, runway to taxiway and taxiway/taxilane separation requirements, are determined by the TDG. The FAA advises that it is appropriate for a series of taxiways on an airport to be built to a different TDG standards based on anticipated use.

Taxiway A2 at the Airport was recently reconstructed in 2013 to meet TDG 1 standards. Although it was designed under the previous FAA AC 150/5300-13 (Change 17), *Airport Design*, the existing standard still applies under the new FAA AC 150/5300-13A, *Airport Design*. Based on the design aircraft such as the Piper Navajo and the Lear 25, and the RDCs for Runways 17-35 and 8-26, it is recommended that all future taxiways should meet TDG 1 design standards for the Bisbee Douglas International Airport.

The Alternatives chapter will consider various taxiway and taxilane layout configurations to improve access to and from the aprons, hangars, and the terminal building.

3.4.6 AIRCRAFT APRON

An aircraft apron is typically located in the non-movement area of an airport near or adjacent to the terminal area. The function of an apron is to accommodate aircraft during loading and unloading of passengers and/or cargo. Activities such as fueling, maintenance, and short to long-term parking take place on an apron. The layout and size of an apron depends on aircraft and ground vehicle circulation needs and specific aircraft clearance requirements. There are several types of aircraft aprons:

- **Terminal / itinerant aircraft apron** – These aprons are adjacent to the terminal where passengers board and deplane from the aircraft. The apron also accommodates multiple activities such as fueling, maintenance, limited aircraft service, etc. Itinerant aprons handle itinerant aircraft activities which are usually only on the airport for a few days. The apron will also accommodate some larger itinerant aircraft. At general aviation airports, this type of apron can also provide some tie-down locations for both itinerant and based aircraft.

- **Tie-down apron** – Aircraft requiring a place to tie-down for both short-term and long-term parking (based and itinerant aircraft).

- **Other services apron** – Apron areas that will accommodate aircraft servicing, fueling, and the loading/unloading of cargo.

- **Hangar aprons** – This is an area on which aircraft move into and out of a storage hangar.

FAA AC 150/5300-13A, *Airport Design*, provides design criteria to assist in apron layout and capacity. For the purpose of calculating the aircraft apron size, the following planning criterion was used:

- 800 square yards of apron per aircraft for single-engine and multi-engine aircraft

- 1,500 square yards per aircraft for turboprops and business jets
- 5,000 square yards per aircraft for larger fire fighting aircraft
- 20% of single-engine (forecasted) based aircraft will require apron parking
- 10% of multi-engine (forecasted) based aircraft will require apron parking
- Itinerant aircraft apron requirements are based on the design hour operations

Based on the above criterion, additional aircraft apron is not required for the planning period. It is assumed that beyond 2028 additional apron may be needed that cannot be accurately predicted today because of unanticipated growth or other circumstances. The County should monitor the utilization of the apron and based on the above criterion, make adjustments in the apron size as needed. However, it is recommended that reconstruction and pavement maintenance projects take place on the existing apron as needed. **Table 3-8** depicts the aircraft apron requirements.

TABLE 3-8 AIRCRAFT APRON REQUIREMENTS

Aircraft Apron Requirements	Year				
	Available in 2013	2018	2023	2028	2033
Existing Parking Positions	10	-	-	-	-
Parking Positions For SE/ME Aircraft	-	8	8	10	10
Parking Positions For Turboprops and Business Jets	-	2	2	4	4
Parking For Fire Fighting Aircraft	-	2	2	2	2
Based Aircraft Apron Area (sy)[1]	-	19,400	19,400	24,000	24,000
Itinerant Aircraft Apron Area (sy)[1]	-	1,200	1,500	1,500	1,500
Total Aircraft Apron Area (sy)[1]	31,000	20,600	20,900	25,500	25,500

Note. Apron development will depend on actual demand
[1]Apron requirements based on 800 square yards x the design hour operations
Source: ACI

The Alternatives chapter will consider various aircraft parking apron layouts to maximize the use of the existing apron: The best course of action regarding the excess aircraft apron pavement will be determined.

3.4.7 INSTRUMENT AIDS TO NAVIGATION

The airport has non-precision, GPS and VOR/DME instrument approach procedures to Runway 17. These approaches provide for visibility minimums as low as 1- mile and cloud ceiling down to 500 feet. These approaches should be maintained in the future as they provide all-weather capabilities for the airport.

Non-precision Global Positioning System (GPS) approaches do not require ground-based facilities on or near the airport for navigation. The GPS receiver uses satellites for navigation. Therefore, it involves little or no cost for the airport sponsor. GPS was developed by the United States Department of Defense for military use and is now available for civilian use. GPS approaches are rapidly being commissioned at airports across the United States, having approach minimums of as low as 350-foot ceilings and 1-mile visibility are typical for this type of approach. An instrument approach increases the utility of the airport by providing for the capability to operate in inclement weather conditions. This is especially important for air ambulance, physician transport and business flights. It is also useful for conducting training and maintaining instrument currency.

Development of a Localized Performance with Vertical guidance (LPV) approach to Runway 17 and 35 is recommended, as it would provide enhanced safety and utility during hours of darkness and adverse weather conditions. Visibility minimums of lower than ¾-mile are not recommended for Runway 17-35. The cost of installing and maintaining the Medium-Intensity Approach Lighting System (MALSR) required for lower visibility minimums is prohibitive as the benefit from the lower visibility minimums is not anticipated to outweigh the costs.

3.4.8 Airfield Lighting, Signage, Marking and Visual Aids to Navigation

Based on findings from the airport inventory as discussed in Chapter 1, several recommendations for improvements to the airfield lighting, markings, signage, and visual aids to navigation are recommended for Bisbee Douglas International Airport. These recommendations include the following:

Rotating beacon – The existing beacon is dated but appears to be in good condition. Consequently, the age of the unit, along with the readily available newer, more energy efficient units, make it a candidate for replacement. The unit is recommended to be replaced with a tip down tower, which will eliminate the need to climb the tower or use a bucket-truck to replace parts or conduct maintenance. The Alternatives chapter will discuss recommended location(s) for a new airport beacon.

Wind cone and segmented circle – The existing lighted wind cone is reaching the end of its useful lifecycle and should be replaced with an FAA approved lighted wind cone assembly. A new segmented circle should also be installed in accordance with FAA Advisory Circular 150/5340-5D, *Segmented Circles Airport Marker System*.

Ceilometer – With the operation of the existing ASOS, the abandoned ceilometer is no longer needed and could be removed.

Runway 17-35 edge lights – The existing runway edge lights (MIRL) are in good condition. However, it is anticipated that they will need to be replaced at some point during the planning period. Recommendation for replacement of the MIRL would likely be sometime within the intermediate planning period (5-10 year timeframe). Furthermore, the threshold lights associated with the end of Runway 17 may need to be replaced during this time period as well. It is recommended that all incandescent lighting be replaced with more energy efficient light emitting diode (LED) lighting; this is recommended for all future runway and taxiway lighting.

Runway 35 threshold lights – The outermost outbound threshold light fixtures are currently missing. The remaining threshold lights are in poor condition. New based mounted threshold lights should be installed; LED models are recommended.

Runway 8-26 edge lights – The existing edge lights have been abandoned. New medium intensity runway edge lights (MIRL) should be installed to enhance safety and increase the reliability of the airport when crosswind conditions warrant use of the runway. LED models are recommended.

Runway end identification lights (REIL) – These lights are (basically) strobe lights located near the runway threshold on both sides of the runway. The lights provide rapid identification of the runway threshold. The FAA recommends that a REIL system be installed at runway ends that do not have, or are not planning to have, an approach lighting system (ALS). It is recommended that a REIL system be installed on both ends of Runway 17-35. Consideration will be given to installing a REIL system on both ends of Runway 8-26. LED models are recommended for both REIL systems.

Runway 17 VASI – The existing 2-box VASI is reaching the end of its useful lifecycle and should be upgraded to a 4-box PAPI system. A 4-box PAPI system is also recommended for Runway 35.

Taxiway edge lights and signage – There are many locations on the airfield where no taxiway edge lights exist or only taxiway reflectors and retro-reflective signage is in place. To enhance safety and increase the reliability of the airport during nighttime operations, all taxiways should have medium intensity taxiway lights (MITL) and lighted airfield signage installed. LED models of MITL are recommended.

Runway 8-26 hold sign panel – The markings on the retro-reflective sign panel are deteriorated and the panel should be replaced. Lighted, frangible signs are recommended to be installed in various required locations for Runway 8-26.

Runway 17-35 pavement markings – All runway pavement markings should be repainted.

Runway 8-26 pavement markings – All runway pavement markings should be repainted.

Taxiway and apron pavement markings – Taxiway and apron pavement markings (with the exception of Taxiway A2) should be repainted. Also, several hold-lines were faded and should also be repainted.

3.4.9 WEATHER AIDS

The existing Automated Surface Observing System (ASOS) is in good working condition as stated in the Inventory Chapter. Therefore, because it is operated and controlled by the National Weather Service (NWS), the FAA and the Department of Defense (DOD), no upgrades or other modifications are needed or eligible for FAA funding (if upgrades or modifications were necessary). The sponsor should continue to maintain the grass and brush around the ASOS to allow for easier maintenance of the system and to prevent any disruption in service.

3.5 LANDSIDE FACILITY REQUIREMENTS

Landside facilities are another important aspect of any airport as they handle aircraft and passengers while on the ground at the airport. Landside facilities serve as the processing interface between two modes of transportation -- air and ground. Likewise, landside facilities also offer travelers the first impression of the airport and the local community.

The capacity, condition, and functionality of the various facilities were examined in relation to the anticipated aviation demand presented in Chapter 2 to identify future facility needs.

3.5.1 TERMINAL BUILDING

The terminal building at general aviation airports typically offers various amenities to passengers, local and transient pilots, and airport management. Terminal buildings (often called pilot lounges at general aviation airports) most often house public restrooms, public telephones, a pilot's lounge area and information regarding airport services. The existing terminal building at the Bisbee Douglas International Airport is utilized by airport management and transient or local aircraft operators. It is recommended that an airport's terminal building be able to satisfy the forecasted peak hour general aviation pilot and passenger demand.

The accepted methodology used to project terminal building facility needs for general aviation airports is based on the number of airport users anticipated to use the facility during the design hour. The design hour is typically defined as the peak hour of an average day of the peak month. The design hour measures the number of passengers departing or arriving on aircraft in an elapsed hour of a typical busy (design) day. Estimating design hour passengers is typically a three-step process:

- Determine the peak month
- Determine the design day to be used
- Estimate the amount of daily activity that occurs in the design hour

The number of peak hour passengers and pilots was derived by assuming 3.4 passengers and pilots per design hour. The terminal function size is based on providing 150 square feet per peak design hour. This process is applied to both the existing (base year) and conditions as well as activity in future years. **Table 3-9** depicts the terminal building requirements.

TABLE 3-9 GENERAL AVIATION TERMINAL BUILDING REQUIREMENTS

Year	Design Hour Operations	Peak Hour Pilots and Passengers	Terminal Function Size (sf)
2013	1.5	5	750
2018	1.5	5	750
2023	1.8	6	900
2028	1.8	6	900
2033	1.8	6	900

Source: ACI

The existing 6,250 square foot terminal building meets the space requirements through the planning period. Overall the building appears to be in good condition, although it is very dated. It is likely that typical energy and water efficiency improvements for a mid-century building will be required such as: mechanical, electrical, and plumbing upgrades. In addition, windows, doors, interior wall finishes and flooring should be replaced. The age of the existing roof is not known, but it is assumed that it will require some level of maintenance and/or replacement in the planning period.

Energy efficient exterior lighting should be installed to enhance safety and reduce energy costs. Access from the vehicle parking area to the terminal is good and access to the aircraft apron is also good. The concrete sidewalk from the airside allows passengers easy access to the terminal building. Native/drought tolerant landscaping should be added around the terminal building to enhance the overall esthetics. In addition, rainwater harvesting (rain-barrels) could be added to take advantage of the annual monsoons.

After the terminal building is renovated, a recycling program should be put in place to reduce the solid waste that will be generated. The program should also be suggested as a requirement for each tenant. The County should also make sure that the dumpsters for the terminal building are adequately sized and coordinated with tenant activities to keep the overall number of dumpsters to a minimum, thereby reducing the waste haulers maneuvers and emissions on airport property.

The Alternatives chapter will consider various terminal concepts and will present additional recommendations.

3.5.2 Hangar Facilities

The existing four hangars present a challenge for the airport. The largest of the four is a 40,000 square feet wood-frame, metal-sided structure. The other three hangars are each approximately 12,500 square feet and are steel-framed, metal-sided structures. The total square footage of all hangars far exceeds the forecasted demand presented in Chapter 2. Therefore, the Alternatives chapter will discuss potential options for either renovation or demolition of the hangars.

Prefabricated conventional and T-hangar units are available from a variety of manufacturers throughout the nation. Storage space for based aircraft was determined using guidelines suggested in manufacturer's literature. Typical aircraft sizes were also reviewed in light of the evolution of business aircraft sizes.

Conventional hangar standards:

- 1,200 square feet for single-engine aircraft
- 1,400 square feet for multi-engine aircraft
- 1,800 square feet for turboprop or turbojet aircraft

T-hangar standards:

- 1,400 square feet for single- and multi-engine aircraft

The above hangar criterion was applied to the based aircraft forecasts to determine the actual hangar area requirements for each hangar type. **Table 3-10** depicts the assumptions that were made regarding the type of hangar needed for each type of aircraft.

TABLE 3-10 BREAKDOWN OF AIRCRAFT STORAGE TYPES

Percent of Aircraft Type	Type of Storage
100% of turbojet	Conventional hangar
55% of multi-engine	Conventional hangar
35% of multi-engine	T-hangar
10% of multi-engine	Parking apron
20% of single-engine	Conventional hangar
60% of single-engine	T-hangar
20% of single-engine	Parking apron

Source: ACI

Using the above criterion, combined with consideration of the potential fleet mix, **Table 3-11** depicts the demand requirements for hangar space at Bisbee Douglas International Airport. It should be noted that these requirements are not rigid, meaning that shifting of the space requirements between conventional and T-hangars is something that the County will need to consider as operations fluctuate and the need to satisfy user's specific requirements are identified.

TABLE 3-11 AIRCRAFT HANGAR REQUIREMENTS

	Year				
	2013	2018	2023	2028	2033
Based Aircraft	5	5	6	6	6
Total Aircraft to be Hangared (approx. 70%)	3	3	4	4	4
T-hangared Aircraft (approximation)	0	2	3	3	3
Conventional Hangared Aircraft (approximation)	3	1	1	1	1
Hangar Size Requirements					
T-hangar 4 to 8 bays (sf)[1]	-	10,000	10,000	10,000	10,000
Conventional Hangar (sf)[1]	-	10,000	10,000	10,000	10,000
Total Hangar Storage (sf)	-	20,000	20,000	20,000	20,000

Note. Hangar development will depend on actual demand
[1] A minimum hangar size of approximately 10,000 square feet is recommended
Source: ACI

The Alternatives chapter will consider various hangar modifications/configurations to maximize the potential use of the existing hangars. If it is determined that the existing hangars are not salvageable, new hangar configurations will be proposed and evaluated.

3.5.3 AVIATION FUEL FACILITIES

As discussed in Chapter 1, there are currently two fuel storage tanks on the Airport that are owned by the County and are operated by the airport operations staff. Each fuel tank has a capacity of 10,000 gallons; 100LL AvGas and Jet A are available. A self-service system with a credit card reader is not currently available, but is recommended. Self-service fueling is becoming more an expectation by pilots using small GA airports.

Additional fuel storage capacity should be planned when the airport is unable to maintain an adequate supply and reserve. For general aviation airports such as Bisbee Douglas International Airport, typically a 14 day supply is common. The presence of a Fixed Based Operator (FBO) on the airport would help in determining when additional fuel storage may be needed.

As the need for additional fuel storage becomes necessary, additional tanks should be added in 10,000 or 12,000 gallon increments. These increments will be the most economical to install.

3.5.4 AIRPORT ACCESS AND VEHICLE PARKING

The Bisbee Douglas International Airport is accessed from U.S. Highway 191 and is located approximately ten miles north of the City of Douglas. Traffic approaching the airport on U.S. Highway 191 is directed off the highway and on to the airport entrance road, which is also used to access the Arizona Department of Correction's (ADOC) State Prison Complex - Douglas. The two lane entrance road leads to a vehicle parking area adjacent to the airport terminal building. The existing entrance road is expected to be adequate to accommodate current and future activity for the planning period.

The existing parking area can accommodate approximately six vehicles. It is a common practice that an airport's vehicle parking be able to satisfy the forecasted peak hour (design hour) general aviation pilot and passenger demand. Using planning methods commonly accepted for calculating parking space requirements, **Table 3-12** depicts the vehicle parking space requirements for the 20-year planning period.

TABLE 3-12 VEHICLE PARKING REQUIREMENTS

Year	Parking Space Requirements	Parking Lot Requirements[1] (sy)
2018	5	175
2023	6	210
2028	6	210
2033	6	210

Note: Parking space requirements = forecasted based aircraft
[1]Each parking space = 35 square yards
Source: ACI

Based on the vehicle parking requirements, the existing parking area should be adequate for the planning period. If the County experiences periods where additional parking is warranted, there is sufficient area near the terminal building to expand the parking area as necessary.

3.5.5 FENCING

The airport has a four-strand barbed wire live stock fence around the perimeter. Various wire filled bar gates are also located along the fence line providing access to Highway 191. The fencing appears to be in good condition. The primary purpose of airport fencing is to restrict inadvertent entry to the airport by unauthorized people and wildlife. Recommendations for Bisbee Douglas International Airport include eight-foot high wildlife fencing and access gates around the airport perimeter. Also, chain-link fencing and electrified, mechanical gates are also recommended in the vicinity of the terminal area to separate the public area from the aircraft operations area. Typically, chain-link fencing at airports consists of eight-foot high chain-link fence with three strands of barbed wire.

3.5.6 SECURITY

There are several programs designed to increase general aviation airport security. For example, the Aircraft Owners and Pilots Association (AOPA) Airport Watch program created an around the clock telephone hotline answered by federal authorities for pilots and other airport users to report suspicious activity at GA airports. Also, the Transportation Security Administration's (TSA) *Security Guidelines for General Aviation Airports* provides a set of federally-endorsed recommendations to enhance security for municipalities, owners, operators, sponsors and other entities charged with oversight of general aviation airports. The TSA's guidance provides nationwide consistency with regard to security at general aviation facilities, as well as a rational method for determining when and where these enhancements may be appropriate based upon the operational profile of differing airports. The guidelines offer an extensive list of options, ideas, suggestions and proven best practices for the airport operator, sponsor, tenant and/or user to choose from when considering security enhancements. The TSA's guidelines are updated and modified as new security enhancements are developed and as input from the general aviation community is received. It is recommended that the Airport Sponsor review the latest version of the TSA's *Security Guidelines for General Aviation Airports* in order to assess the suggested security enhancements, if any, at Bisbee Douglas International Airport.

3.5.7 AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF) EQUIPMENT & STORAGE BUILDING

According to FAA guidance, operators of Part 139 certificated airports must provide Aircraft Recue and Fire Fighting (ARFF) services. Because Bisbee Douglas International Airport is not a Part 139 certificated airport, ARFF equipment is not required. Local municipal or volunteer fire departments typically provide fire protection to general aviation airports in their district. Mutual aid agreements may also be provided and developed with nearby fire departments to assist in emergency situations. In any case, procedures should be in place to ensure emergency response in case of an accident or emergency at the airport. Although statistically very safe, the most likely emergency situations at general aviation airports are an aircraft accident, fuel or aircraft fire, or a hazardous material (fuel) spill. The level of protection recommended in FAA AC 150/5210-6D, *Aircraft Fire and Rescue Facilities and Extinguisher Agents*, for small general aviation airports is 190 gallons of aqueous film forming foam (AFFF) supplemented with 300 pounds of dry chemical. Proximity suits should be utilized for fire fighter protection. Aviation rated fire extinguishers should be immediately available in the vicinity of the aircraft apron and fueling facilities. It is recommended that the Elfrida Fire Department maintain compliance with the recommendations contained in FAA AC 150/5210.6D, *Aircraft Fire and Rescue Facilities and Extinguishing Agent*, if they are currently noncompliant.

3.6 INFRASTRUCTURE NEEDS

The existing electric, water, and telecommunication utilities are considered adequate for the existing facility. Upgrades and improvements to the existing utilities are recommended, as needed, in order to accommodate recommended development. The need for additional utilities, or modifications to existing utilities, will be evaluated in more detail in the Alternatives chapter.

3.7 LAND USE COMPATIBILITY AND CONTROL

As previously discussed in Chapter 1, Section 1.14, 14 CFR Part 77 establishes several imaginary surfaces that are used as a guide to provide a safe and unobstructed operating environment for aviation. In addition to ensuring that penetrations to these imaginary surfaces are avoided or appropriately marked and lighted, the FAA recommends that the airport sponsor make reasonable efforts to prevent incompatible land uses, such as residential encroachment, from developing in the immediate area of the airport. Many times this can be achieved by the municipality creating an airport overlay zone. It is recommended that the County consider creating an airport overlay zone to preserve compatible land uses around the airport. The Airport Layout Plan (ALP) drawing set will include a land use plan that will depict any recommended changes to the current land uses.

Private development proposals should also be reviewed to ensure compatibility in the vicinity of the airport. Land use compatibility considerations include safety, height hazards and noise exposure. Although extremely rare, most aircraft accidents occur within 5,000 feet of a runway. Therefore, the ability of the pilot to bring the aircraft down in a manner that minimizes the severity of an accident is dependent upon the type of land uses within the vicinity of the airport.

Land uses are reviewed in four zones surrounding the airport; the Runway Protection Zone (RPZ), the Approach Zone, Airport Influence Zone and the Traffic Pattern Zone. The RPZ is a trapezoidal area extending 1,200 feet beyond the ends of the runway and is typically included within the airport property boundary. Residential and other uses that result in congregations of people are restricted from the RPZ. The approach zone generally falls within the CFR 14 Part 77 Approach Surface area. Within the approach zone, public land uses, such as schools, libraries, hospitals and churches should be avoided. Any new residential developments should include avigation easements and disclosure agreements. The Traffic Pattern Zone is generally the area within one mile of the airport. Within the Traffic Pattern Zone, avigation easements should be considered for residential and public uses and disclosure statements should be required. The Airport Influence Zone is the area where aircraft are transitioning to or from enroute altitude or airport over-flight altitude to or from the standard traffic pattern altitude.

In addition, according to FAA Advisory Circular 150/5200-33B, *Hazardous Wildlife Attractants On or Near Airports,* landfills and/or transfer stations are incompatible land uses with airports. Therefore, according to the FAA, these types of facilities should be located at least 5,000 feet from any point on a runway that serves piston type aircraft and 10,000 feet from any point on a runway that serves turbine powered aircraft. Furthermore, the FAA recommends that any facility which may attract wildlife (especially birds), such as sewage treatment ponds and wastewater treatment plants, should also be located this same distance from any point on the runway. Based on a review of the surrounding land uses, it does not appear that any of them would create a wildlife attractant, but the County should remain diligent to ensure future land uses remain compatible as it relates to wildlife attractants.

3.7.1 Airport Property

The existing airport property encompasses approximately 3,000 acres according to Cochise County property records. All of the existing Runway Protection Zones (RPZs) are controlled via fee simple, with the exception of approximately 3.5 acres in the outer portion of the Runway 8 RPZ. The land within this RPZ contains undeveloped state land.

It is not anticipated that any additional land will be required for the future development of the airport, although the Alternatives chapter of this Master Plan will identify any needed land and/or avigation easements.

3.7.2 Airport Zoning

Airport zoning ordinances should include height restrictions and land use compatibility regulations. Development around airports can pose certain hazards to air navigation if appropriate steps are not taken to ensure that existing, as well as future, buildings and other types of structures do not penetrate 14 CFR Part 77 imaginary surfaces.

The FAA therefore recommends that airport sponsors implement height restrictions in the vicinity of the airport to protect all 14 CFR Part 77 imaginary surfaces. The existing airport is zoned accordingly for airport use and is considered to be adequate for the planning period. There are currently no incompatible land uses in the vicinity of the airport. The surrounding land uses and zoning are compatible with airport operations.

3.8 Summary of Facility Requirements

The facility requirements for the Bisbee Douglas International Airport are summarized in **Table 3-13**. The recommendations are based on the types and volume of aircraft currently using, and expected to use, the airport in the short and long-term time frames. The recommended facilities will enable the airport to continue to serve its current and future users in a safe and efficient manner.

In the next chapter, Alternatives, the various airside and landside improvements will be presented and evaluated, which will then in turn lead to the preferred development alternative. Ultimately, an Airport Layout Plan (ALP) will be created to visually depict and communicate the County’s vision of the Airport.

TABLE 3-13 FACILITY REQUIREMENTS SUMMARY				
Item	**Base Year (2013)**	**Short Term**	**Medium Term**	**Long Term**
Runways				
17-35				
Runway Design Code (RDC)	C-I	Same as existing		
Length (ft)	6,430	Recommend lengthening to 6,810		
Width (ft)	100	Same as existing		
Pavement Strength (lbs)	30,000 S, 160,000 D, 250,000 DT	Same as existing		
Lighting	MIRL	Same as existing	Replace	Maintain
Markings	Non-precision	Repaint	Maintain	
8-26				
Runway Design Code (RDC)	B-I	Same as existing		
Length (ft)	4,966	Same as existing		
Width (ft)	60	Same a existing		
Pavement Strength (lbs)	12,500 S	Same as existing		
Lighting	No	Install MIRL	Maintain	
Markings	Visual	Repaint	Maintain	
Taxiways				
Taxiway A-2				
Taxiway Design Group (TDG)	TDG - 1	Same as existing		
Width (ft)	25	Same as existing		
Lighting	MITL	Same as existing		
Markings	Centerline	Repaint	Maintain	
Taxiway A-1, A-3 and A-4				
Taxiway Design Group (TDG)	TDG - 2	Reconstruct to TDG-1		
Width (ft)	35	Reconstruct to 25		
Lighting	Retro-reflectors	Install MITL		
Markings	Centerline	Paint centerline		
Taxiway A				
Taxiway Design Group (TDG)	TDG – 5	Reconstruct to TDG-1		
Width (ft)	75	Reconstruct to 25		
Lighting	Some MITL	Install MITL		
Markings	Centerline	Paint centerline		
Navigational and Weather Aids				
ASOS	Yes	Maintain existing		
Rotating Beacon	Yes	Replace	Maintain	
Approaches	Yes GPS & VOR/DME Runway 17	Add LPV Approach to Runway 17&35	Maintain LPV approach to Runway 17-35	
Visual Aids				
REIL	No	Install on Runway 17-35	Maintain	
VASI	Yes	Remove 17-35	-	
PAPI	No	Install on Runway 17-35	Maintain	
Wind cone / segmented circle	Yes	Replace	Maintain	
Terminal				
General Aviation (sf)	6,250	Same as existing		
Hangars[1]				

Table 3-13 Facility Requirements Summary Continued			
Conventional (sf)	77,500	Recommend 10,000	
T-hangars (sf)	0	Recommend 10,000	
Total	77,500	Recommend 20,000	
Aprons[1]			
Tie-down/transient (sy)	31,000	Recommend 21,000 to 26,000	
Vehicle Parking (spaces)			
GA Itinerant & Based Users	5	Same as existing	
Public	1	Same as existing	
Total	6	Same as existing	
Fuel Facility			
Jet A (gal)	10,000	Same as existing	
AVGAS (100LL) (gal)	10,000	Same as existing	
Total (gal)	20,000	Same as existing	
Fencing			
Perimeter	Yes	Replace/Install	Maintain
Note. S = Single-wheel landing gear, D = Dual-wheel landing gear, DT = Dual-tandem landing gear			

[1]Hangar and apron development will depend on actual demand.
Source: ACI