Chapter Three

AIRPORT FACILITY REQUIREMENTS

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To properly plan for the future of Lake Havasu City Municipal Airport, it is necessary to translate forecast aviation demand into the specific types and quantities of facilities than can adequately serve this identified demand. This chapter uses the results of the forecasts conducted in Chapter Two, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., terminal building, hangars, aircraft parking apron, and automobile parking) facility requirements.

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities and outline what new facilities may be needed and when these may be needed to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated in Chapter Four to determine the most cost-effective and efficient means for implementation.

The cost-effective, efficient, and orderly development of an airport should rely more upon actual demand at an airport than on a time-based forecast figure. In order to develop a Master Plan that is demand-based rather than time-based, a series of planning horizon milestones have been established for Lake Havasu City Municipal Airport that take into consideration the reasonable range of aviation demand projections prepared in the previous chapter.

It is important to consider that the actual activity at the airport may be higher or lower than projected activity levels. By planning according to activity milestones, the resulting plan can accommodate unexpected shifts or changes in the area's aviation demand. It is important that the plan accommodate these changes so that airport staff can respond to unexpected changes in a timely fashion. These milestones provide flexibility, while potentially extending this plan's useful life if aviation trends slow over time.

The most important reason for utilizing milestones is that they allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to actual demand at any given time over the planning period. The resulting plan provides airport officials with a financially responsible and need-based program. **Table 3A** presents the planning horizon milestones for each aircraft activity category. The planning milestones of short, intermediate, and long term generally correlate to the five, ten, and twenty-year periods used in the previous chapter.

TABLE 3A
Planning Horizon Activity Levels
Lake Havasu City Municipal Airport

	2006	Short Term	Intermediate Term	Long Term
Itinerant Operations				
Air Carrier	1,254	1,800	1,900	2,400
Air Taxi	1,600	2,100	2,700	4,400
General Aviation	22,600	28,000	29,900	38,300
Military	360	400	400	400
Total Itinerant	25,814	32,300	34,900	45,500
Local Operations				
General Aviation	23,360	30,300	36,500	46,900
Total Local	23,360	30,300	36,500	46,900
TOTAL OPERATIONS	**49,174**	**62,600**	**71,400**	**92,400**
ENPLANED PASSENGERS	**6,085**	**9,500**	**11,000**	**16,000**
TOTAL BASED AIRCRAFT	**229**	**265**	**295**	**355**

AIRFIELD PLANNING CRITERIA

The selection of appropriate Federal Aviation Administration (FAA) design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using or are expected to use the airport. The critical design aircraft is used to define the design parameters for the airport. The critical design aircraft is defined as the most demanding category of aircraft, or family of aircraft, which conducts at least 500 operations per year at the airport. Planning for future aircraft use is of particular importance since design standards are used to plan many airside and landside components. These future standards must be considered now to ensure that short term development does not preclude the long range potential needs of the airport.

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This airport reference code (ARC) has two components. The first component, depicted by letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while aircraft wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular (AC) 150/5300-13, Change 13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

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 greater than 166 knots.

The airplane design group (ADG) is based upon either the aircraft's wingspan or tail height, whichever is greater. For example, an aircraft may fall in ADG II for wingspan at 70 feet, but ADG III for tail height at 33 feet. This aircraft would be classified under ADG III. The six ADGs used in airport planning are as follows:

ADG	Tail Height (feet)	Wingspan (feet)
I	<20	<49
II	20-<30	49-<79
III	30-<45	79-<118
IV	45-<60	118-<171
V	60-<66	171-<214
VI	66-<80	214-<262

Source: AC 150/5300-13, Change 11

Exhibit 3A summarizes representative aircraft by ARC. As shown on the exhibit, the airport does not currently, nor is it expected to, regularly serve aircraft in ARCs C-III, D-III, C-IV, D-IV, or D-V. These are large transport aircraft commonly used by commercial air carriers and air cargo carriers which do not currently use nor are expected to use Lake Havasu City Municipal Airport through the planning period.

The FAA recommends designing airport functional elements to meet the requirements for the most demanding ARC for that airport. The majority of aircraft currently operating at the airport are small single engine aircraft weighing less than 12,500 pounds. The airport also has a significant volume of corporate aircraft ranging from the smaller Cessna Citation family to the Challenger 600, which can weigh more than 50,000 pounds.

In order to determine airfield design requirements, the critical aircraft and critical ARC should first be determined, and then appropriate airport design criteria can be applied. This process begins with a review of aircraft currently using the airport and those expected to use the airport through the long term planning period.

CRITICAL AIRCRAFT

In some cases, more than one specific make and model of aircraft comprises the airport's critical design aircraft. For example, one category of aircraft may be the most critical in terms of approach speed, while another is most critical in terms of wingspan. Smaller general aviation piston-powered aircraft within approach categories A and B and ADG I conduct the majority of operations at Lake Havasu City Municipal Airport. Turboprops and jets with longer wingspans and higher approach speeds also utilize the airport, but less frequently. While the airport is also utilized by helicopters, they are not included in this determination as they are not assigned an ARC.

In 2006, there were 201 based aircraft at Lake Havasu City Municipal Airport. The majority of these are single and multi-engine piston-powered aircraft which fall within approach categories A and B and ADG I. There were five turboprop aircraft and one jet based at the airport. The most demanding of these turboprops is the King Air 90, with an approach speed and wingspan that categorizes it as an ARC B-II aircraft. The one jet is a Cessna 551, which is in the Cessna Citation family of aircraft. This aircraft also falls in ARC B-II. Before making a final determination of the critical aircraft family, an examination of the transient turboprop and jet aircraft using the airport should also be considered.

Turboprop and Jet Operations

A wide range of transient turboprop and jet aircraft operate at the airport. In order to discern the number and type of turboprop and jet operations at Lake Havasu City Municipal Airport, an analysis of instrument flight plan data was conducted. Flight plan data was acquired for this study from the subscription service, *Airport IQ*. The data available includes documentation of flight plans that are opened and closed on the ground at the airport. Flight plans that are opened or closed from the air are not credited to the airport. Therefore, it is likely that there are more turboprop and jet operations at the airport that are not captured by the methodology. Additionally, some turboprops and jets conduct operations within the traffic pattern at the airport. These local operations are also not captured on instrument flight plans.

Table 3B presents private jet and turboprop operations at Lake Havasu City Municipal Airport from November 1, 2006, to October 31, 2007 (12-month operational count). These operations would be considered itinerant general aviation operations.

05MP08-3A-10/8/07

A-I

- Beech Baron 55
- Beech Bonanza
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- **Eclipse 500**
- Piper Archer
- Piper Seneca

C-I, D-I

- Beech 400
- **Lear** 25, 31, **35**, 45, 55, 60
- Israeli Westwind
- HS 125-400, 700

B-I *less than 12,500 lbs.*

- Beech Baron 58
- Beech King Air 100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I

C-II, D-II

- Cessna Citation III, VI, VIII, X
- **Gulfstream** II, III, **IV**
- Canadair 600
- ERJ-135, 140, 145
- CRJ-200, 700, 900
- Embraer Regional Jet
- Lockheed JetStar
- Super King Air 350

B-II *less than 12,500 lbs.*

- **Super King Air 200**
- Cessna 441
- DHC Twin Otter

C-III, D-III

- ERJ-170, 190
- Boeing Business Jet
- B 727-200
- **B 737-300 Series**
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- Gulfstream V
- Global Express

B-I, B-II *over 12,500 lbs.*

- Super King Air 300
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation II**, III, IV, V
- Saab 340
- Embraer 120

C-IV, D-IV

- **B-757**
- B-767
- C-130
- DC-8-70
- DC-10
- MD-11
- L1011

A-III, B-III

- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP

D-V

- **B-747** Series
- B-777

Note: Aircraft pictured is identified in bold type.

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Exhibit 3A
AIRPORT REFERENCE CODES

TABLE 3B
Private Jet and Turboprop Operations (Minimum)
November 1, 2006 – October 31, 2007
Lake Havasu City Municipal Airport

ARC	Aircraft Type	Annual Operations	%	Number of Jets	%
JETS					
B-I	Cessna 500	8	0.7%	3	1.7%
	Cessna 501	20	1.8%	3	1.7%
	Cessna 510	2	0.2%	1	0.6%
	Premier 390	28	2.5%	4	2.3%
	Mitsubishi MU-300	2	0.2%	1	0.6%
	Falcon 10	14	1.3%	2	1.2%
	Eclipse 500	2	0.2%	1	0.6%
Total B-I		**76**	**6.9%**	**15**	**8.7%**
B-II	Cessna 525	392	35.6%	23	13.3%
	Cessna 550	64	5.8%	19	11.0%
	Cessna 551	28	2.5%	3	1.7%
	Cessna 560	44	4.0%	10	5.8%
	Hawker 700	2	0.2%	1	0.6%
	Hawker 800	2	0.2%	1	0.6%
	Falcon 20	6	0.5%	3	1.7%
	Falcon 50	12	1.1%	2	1.2%
	Falcon 900	2	0.2%	1	0.6%
Total B-II		**552**	**50.2%**	**63**	**36.4%**
C-I	Lear 24	2	0.2%	1	0.6%
	Lear 25	4	0.4%	2	1.2%
	Lear 31	4	0.4%	2	1.2%
	Lear 35	20	1.8%	4	2.3%
	Lear 45	32	2.9%	4	2.3%
	Lear 55	2	0.2%	1	0.6%
	IAI Westwind	4	0.4%	2	1.2%
	Beechjet 400	12	1.1%	6	3.5%
Total C-I		**80**	**7.3%**	**22**	**12.7%**
C-II	Gulfstream G-200	4	0.4%	1	0.6%
	Gulfstream G-1159	14	1.3%	4	2.3%
	Challenger 600	6	0.5%	3	1.7%
	Challenger BD-100	4	0.4%	1	0.6%
	IAI Astra 1125	18	1.6%	3	1.7%
Total C-II		**46**	**4.2%**	**12**	**6.9%**
D-I	Lear 60	4	0.4%	2	1.2%
Total D-I		**4**	**0.4%**	**2**	**1.2%**
D-II	Gulfstream IV	10	0.9%	1	0.6%
Total D-II		**10**	**0.9%**	**1**	**0.6%**
Total Jet Activity		**768**	**69.8%**	**115**	**66.5%**
ARC	**Aircraft Type**	**Annual Operations**	**%**	**Number of Turboprops**	**%**
TURBOPROPS					
B-I	Piaggio P-180	4	0.4%	2	1.2%
	Turbo Commander 690	4	0.4%	2	1.2%
	Beech King Air 100	2	0.2%	1	0.6%
Total B-I		**10**	**0.9%**	**5**	**2.9%**
B-II	Beech King Air 90	40	3.6%	13	7.5%
	Beech King Air 200	198	18.0%	27	15.6%
	Beech King Air B300	48	4.4%	12	6.9%
	Swearingen Metroliner	36	3.3%	1	0.6%
Total B-II		**322**	**29.3%**	**53**	**30.6%**
Total Turboprop Activity		**332**	**30.2%**	**58**	**33.5%**
Total Activity (Jet+Turboprop)		**1,100**	**100.0%**	**173**	**100.0%**

Source: *Airport IQ* utilizing FAA flight plan data

There were a total of 1,100 operations by privately owned jet and turboprop aircraft. The greatest number of operations in any single ARC family was 874 in ARC B-II. This number overwhelmingly accounted for the majority of private jet and turboprop operations, at approximately 80 percent.

The table also presents the number of operations by specific aircraft type. The Cessna 525 model performed the most jet operations (392) at the airport. There were 23 different Cessna 525 aircraft which accounted for this total. The Cessna 525 conducted over 50 percent of the total jet operations according to these records. As for the turboprop aircraft, the King Air 200 conducted 198 operations, accounting for approximately 60 percent of total turboprop operations.

The most demanding privately operated aircraft, in terms of ARC design standard, has been the Gulfstream IV. The Gulfstream IV is classified by the FAA as ARC D-II. Several ARC C-II operations by the Gulfstream G-1159, IAI Astra 1124, and Challenger 600 were also conducted at the airport over the last year.

Another segment of corporate aviation users operate under Federal Aviation Regulation (F.A.R.) Part 135 (air taxi) rules for hire and through fractional-ownership programs. Air taxi operators are governed by the FAA rules which are more stringent than those required for private aircraft owners. For example, aircraft operating under Part 135 rules must increase their calculated landing length requirements by 20 percent for safety factors. Fractional-ownership operators are actual aircraft owners who acquire a portion of an aircraft with the ability to use any aircraft in the program's fleet. These programs have become quite popular over the last several years, especially since 9/11. Some of the most notable fractional ownership programs include NetJets, Bombardier Flexjet, Citation Shares, and Flight Options.

Table 3C provides additional information regarding the ARC of many of the aircraft utilized by the fractional and charter companies which operate at Lake Havasu City Municipal Airport. In addition to F.A.R. Part 135 operators, commercial service aircraft are also shown in the table.

There were a total of 1,476 operations by aircraft operating as commercial or air taxi operators from November 1, 2006, to October 31, 2007. Of this total, 100 were by jet aircraft, and the remaining 1,376 were by turboprop aircraft. The Beechcraft 1900 and Beech Airliner 99 used respectively for passenger and cargo transport accounted for a large majority of the total operations.

Critical Aircraft Design Conclusion

The largest based aircraft in terms of ARC will often account for the design standard to be applied to the airport. The largest aircraft currently based at Lake Havasu City Municipal Airport are the Cessna 551 and King Air 90, which are categorized as ARC B-II aircraft. The analysis then examined the itinerant aircraft operating at the airport. The largest itinerant aircraft operating at the airport include the Gulfstream II and Gulfstream IV, which are included in ARC D-II.

TABLE 3C
Commercial and Air Taxi Operations (Minimum)
November 1, 2006 – October 31, 2007
Lake Havasu City Municipal Airport

ARC	Aircraft Type	Annual Operations	%
JETS			
B-I	Mitsubishi MU-300	4	0.3%
Total B-I		**4**	**0.3%**
B-II	Cessna 550	6	0.4%
	Cessna 560	20	1.4%
	Cessna 680	2	0.1%
	Hawker 700	2	0.1%
Total B-II		**30**	**2.0%**
C-I	Lear 25	4	0.3%
	Lear 31	2	0.1%
	Lear 35	4	0.3%
	Lear 45	12	0.8%
	Beechjet 400	26	1.8%
Total C-I		**48**	**3.3%**
C-II	Cessna 750 (X)	4	0.3%
	Challenger 600	2	0.1%
Total C-II		**6**	**0.4%**
D-I	Lear 60	10	0.7%
Total D-I		**10**	**0.7%**
D-II	Gulfstream II	2	0.1%
Total D-II		**2**	**0.1%**
Total Jet Activity		**100**	**6.8%**
TURBOPROPS			
A-II	Pilatus	4	0.3%
	Piper Cheyenne	2	0.1%
Total A-II		**6**	**0.4%**
B-I	Turbo Commander 690	2	0.1%
Total B-I		**2**	**0.1%**
B-II	Beech King Air 90	16	1.1%
	Beech King Air 200	2	0.1%
	Swearingen Metroliner	138	9.3%
	Beech Airliner 99	600	40.7%
	Beech 1900	612	41.5%
Total B-II		**1,368**	**92.7%**
Total Turboprop Activity		**1,376**	**93.2%**
Total Activity (Jet+Turboprop)		**1,476**	**100.0%**

Source: *Airport IQ* utilizing FAA flight plan data

At non-towered airports, determining a reasonable operational count by aircraft type can be difficult. Fortunately, data provided by *Airport IQ* gives a good representation of the types of aircraft utilizing the airport. As mentioned in Chapter Two, airport staff has traditionally logged aircraft operations during the hours in which they are present. Their records indicate a breakdown of aircraft by single engine, multi-engine, jet, and helicopter. Over the past two years, their records show an average of 670 annual jet operations at the airport. The number of turboprop operations would be included in the single engine and multi-engine categories and is unable to be distinguished. Again, this data shown above represents the absolute minimum number of business, air taxi, and commercial jet and turboprop operations, as it does not take into account visual flight rules (VFR) operations or cancelled flight plans. Data from other airports suggests that actual general aviation turbine operations can range 20 to 50 percent higher than what was reported by *Airport IQ* and airport staff.

The combination of private, air taxi, and commercial jet and turboprop operations accounted for a minimum of 2,576 itinerant operations at Lake Havasu City Municipal Airport over a one-year time period, as presented in **Table 3D**. Of those, aircraft in ARC B-II accounted for 2,272 operations. Aircraft in ARC C-I and C-II conducted another 180 operations. Aircraft in ARC D-I and D-II accounted for 26 operations. Based upon operational estimates, operations by jet and turboprop aircraft within ARC B-II exceed the substantial use threshold of 500 operations per year to be considered the current critical design aircraft. In fact, ARC B-II aircraft totaled approximately 88 percent of all operations used in this analysis. Therefore, the current critical design aircraft for Lake Havasu City Municipal Airport is defined by aircraft in ARC B-II.

TABLE 3D
Total Jet and Turboprop Operations by ARC
Lake Havasu City Municipal Airport

Aircraft Reference Code (ARC)	Total Jet Operations	Total Turboprop Operations	Total Combined Operations
A-II	N/A	6	6
B-I	80	12	92
B-II	582	1,690	2,272
C-I	128	N/A	128
C-II	52	N/A	52
D-I	14	N/A	14
D-II	12	N/A	12
Totals	**868**	**1,708**	**2,576**

Source: *Airport IQ*

Future aircraft mix can expect to include a larger percentage of corporate aircraft. Increased corporate aircraft utilization is typical at general aviation airports surrounded by growing or established population and employment centers. Once utilized only by large conglomerate-type corporations, corporate aircraft (especially jets) have been increasingly utilized by a wider variety of companies. FAA trends indicate that businesses are increasingly utilizing corporate aircraft. This is also evident by the substantial growth of fractional-ownership programs. The fractional-ownership programs have shown significant growth in numbers of aircraft owners joining their programs. These national factors, coupled with a strong socioeconomic condition in the area, will influence corporate aircraft demand. The growing demand will elect to utilize those airports that provide facilities to meet their needs.

Lake Havasu City is expected to support positive population and employment growth in the future. These trends will position the airport well for serving the growing aviation demand. In addition, Lake Havasu City Municipal Airport has already developed a reputation as a clean, attractive airport with several aviation amenities being offered.

As previously discussed, one of the most visible trends in general aviation today is the growth of the fractional-ownership program, and corporate aircraft use in general. Planning for fractional-ownership aircraft is difficult as it is an on-demand service; however, since these aircraft currently operate at the airport, planning should consider meeting the needs of the majority of highly utilized fractional-ownership aircraft. Although these aircraft can range up to ARC D-III, most fractional-ownership aircraft are in ARC B-I to C/D-II. Thus, future facility planning should include the potential for the airport to be utilized by the majority of business jets on the market.

The primary aircraft used for scheduled airline service prior to May 2007 was the 19-seat Beechcraft 1900 turboprop aircraft. This aircraft falls within ARC B-II. The aviation demand forecasts noted the potential to shift to larger turboprop and regional jet aircraft in the future should air service return to the airport and the demand was present to warrant larger aircraft. Larger seating capacity turboprops include the Bombardier Q series of aircraft (ARC B-III) and Embraer and Canadair regional jets (ARC C-II). It is presumed that potential future commercial air service at Lake Havasu City Municipal Airport would fly to/from Phoenix and/or Las Vegas. The short nature of these flights with the long term boarding load factors forecast to be approximately 65 percent would continue to warrant the use of Beechcraft 1900 or aircraft with a similar seating capacity. Larger aircraft may be considered during times of the year when Lake Havasu City experiences its peak vacation travelers. Taking into consideration the potential changes in scheduled airline aircraft in the future, critical commercial aircraft could fall within ARC C-II over the long term.

While a forecast of enplaned air cargo has not been prepared, it can be expected to grow through the planning period as the local economy grows and new industries are developed in the region. It is expected that air cargo service would continue to be regional in nature, with feeder cargo aircraft continuing to serve nearby hub airports. This would limit the size of aircraft to multi-engine piston and turboprop aircraft. A wide variety of piston engine and turboprop aircraft could be used in air cargo service; however, it is not expected that this would include aircraft larger than ARC B-II.

Given all these considerations, the current planning should conform to ARC B-II to accommodate existing based aircraft, cargo, and commercial operations, as well as itinerant business jet and turboprop use. Ultimate planning, however, should conform to ARC C/D-II to meet the needs of business and commercial aircraft.

The airfield facility requirements outlined in this chapter correspond to the design standards described in FAA's Advisory Circular 150/5300-13, Change 13, *Airport Design*. The following airfield facilities are outlined to describe the scope of facilities that would be necessary to accommodate the airport's role throughout the planning period.

AIRFIELD REQUIREMENTS

Airfield requirements include the need for those facilities related to the arrival and departure of aircraft. The adequacy of existing airfield facilities at Lake Havasu City Municipal Airport has been analyzed from a number of perspectives, including:

- Airfield Capacity
- Runways
- Taxiways
- Navigational Approach Aids
- Airfield Lighting, Marking, and Signage

AIRFIELD CAPACITY

A demand/capacity analysis measures the capacity of the airfield facilities (i.e., runways and taxiways) in order to identify and plan for additional development needs. The capacity of the airport's runway system can provide up to 230,000 annual operations. FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), indicates that improvements should be considered when operations reach 60 percent of the airfield's annual service volume (ASV). If the projected long range planning horizon level of operations comes to fruition (92,400), the airfield's ASV will not exceed the 60 percent level. Thus, additional airfield capacity enhancements are not required.

RUNWAYS

Runway conditions such as orientation, length, pavement strength, width, and safety standards at Lake Havasu City Municipal Airport were analyzed. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

The airport is served by a single runway system. Runway 14-32 is orientated in a northwest/southeast manner. For the operational safety and efficiency of an airport, it is desirable for the runway to be orientated as close as possible to the direction of the prevailing wind. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off (defined as a crosswind).

FAA Advisory Circular 150/5300-13, Change 13, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides for less than 95 percent wind coverage for specific crosswind conditions. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for ARC A-I and B-I; 13 knots (15 mph) for ARC A-II and B-II; 16 knots (18 mph) for ARC C-I through D-II; and 20 knots for ARC A-IV through D-VI.

Wind data specific to the airport was not available; however, data for Needles Airport (2001-2007) provides information for use in this study. This data is graphically depicted on **Exhibit 3B**. As depicted on the exhibit, Runway 14-32 provides 91.30 percent wind coverage for 10.5 knot crosswinds, 95.70 percent at 13 knots, 99.01 percent at 16 knots, and 99.79 percent at 20 knots. According to this data, aircraft in ARC A-I and B-I could experience crosswinds exceeding 10.5 knots or greater 8.70 percent of the year.

The analysis indicates that a crosswind runway should be planned according to FAA planning standards, if feasible. It should be noted, however, that due to geographical differences, this data could be somewhat different from what is actually experienced at Lake Havasu City Municipal Airport. Without more applicable information, a site-specific determination cannot be made. Topographical features and surrounding terrain and development limit the feasibility of a crosswind runway at Lake Havasu City Municipal Airport. Further, the existing runway is 100 feet wide, which provides a greater safety margin for aircraft operating in crosswind conditions. As a result, no additional runway orientations will be planned as part of this study.

Runway Length

The determination of runway length requirements for the airport is based on five primary factors:

- Mean maximum temperature of the hottest month
- Airport elevation
- Runway gradient
- Critical aircraft type expected to use the airport
- Stage length of the longest nonstop destination (specific to larger aircraft)

The mean maximum daily temperature of the hottest month for Lake Havasu City Municipal Airport is 108 degrees Fahrenheit (F). The airport elevation is 781 feet above mean sea level (MSL). The maximum runway end elevation difference for Runway 14-32 is 33.9 feet, giving the runway a longitudinal gradient of 0.4 percent, which conforms to FAA design standards. For aircraft in approach categories A and B, the runway longitudinal gradient cannot exceed two percent. For aircraft in approach categories C and

D, the maximum allowable longitudinal runway gradient is 1.5 percent.

Table 3E outlines the runway length requirements for various classifications of aircraft that utilize Lake Havasu City Municipal Airport. These were derived utilizing the FAA Airport Design Computer Program for *Runway Lengths Recommended for Airport Design*. These runway lengths are based upon groupings or "families" of aircraft.

TABLE 3E
Runway Length Requirements
Lake Havasu City Municipal Airport

Airport and Runway Data	
Airport elevation	783 feet MSL
Mean daily maximum temperature of the hottest month	108 degrees F
Maximum difference in runway centerline elevation	34 feet
Length of haul for airplanes of more than 60,000 pounds	1,200 miles
Dry runways	
Runway Length Recommended for Airport Design	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	3,000 feet
95 percent of these small airplanes	3,500 feet
100 percent of these small airplanes	4,200 feet
Small airplanes with 10 or more passenger seats	4,700 feet
Large airplanes of 60,000 pounds or less	
75 percent of business jets at 60 percent useful load	5,500 feet
75 percent of business jets at 90 percent useful load	8,700 feet
100 percent of business jets at 60 percent useful load	7,300 feet
100 percent of business jets at 90 percent useful load	11,400 feet
Airplanes of more than 60,000 pounds	6,700 feet

Source: FAA Airport Design Computer Program utilizing Chapter Two of AC 150/5325-4A, *Runway Length Requirements for Airport Design*

Based upon the forecast of aircraft fleet mix through the long range planning period, Lake Havasu City Municipal Airport should be designed to accommodate, at a minimum, 75 percent of business jet aircraft at 60 percent useful load, which typically correlates to ARC C-II aircraft.

According to the FAA design program, to fully accommodate 75 percent of these aircraft at 60 percent useful load, the runway should be at least 5,500 feet. To accommodate 100 percent of business jets at 60 percent useful load (generally corresponding to ARC D-II), the runway should be at least 7,300 feet long. Currently, Runway 14-32 is 8,001 feet, which meets the requirements of ARC C/D-II aircraft. This provides length for longer haul flights than the minimum design consideration. As such, the current length of Runway 14-32 will be adequate through the planning period.

Runway Width

Runway 14-32 is currently 100 feet wide. FAA design standards call for a runway width of at least 75 feet to

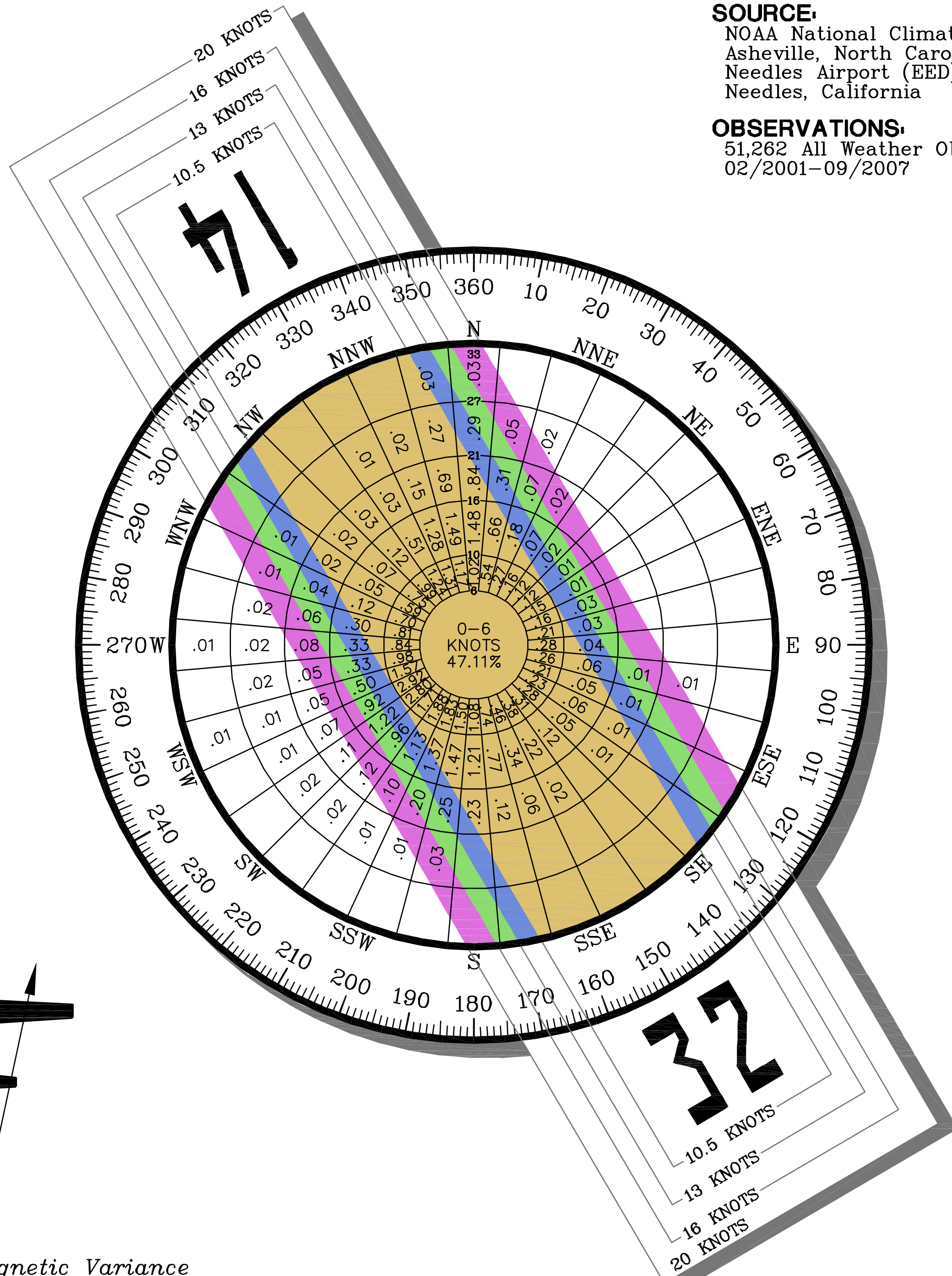
Draft 05MP08-3B-11/13/07

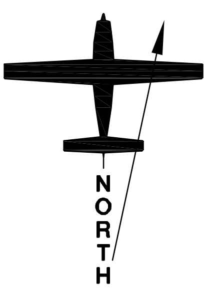
ALL WEATHER WIND COVERAGE

Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 14-32	*91.30%*	*95.70%*	*99.01%*	*99.79%*

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Needles Airport (EED)
Needles, California

OBSERVATIONS:
51,262 All Weather Observations
02/2001-09/2007





Magnetic Variance
12° 11' East (November 2007)
Annual Rate of Change
00° 06' West (November 2007)

LAKE HAVASU CITY, ARIZONA MUNICIPAL AIRPORT

Exhibit 3B
WINDROSE

serve aircraft up to ARC B-II, as long as the instrument approach minimums are not lower than three-quarters of a mile. For aircraft in approach categories C and D, the runway should be 100 feet wide. Runway 14-32 currently exceeds FAA criteria for ARC B-II aircraft and meets the future design for ARC C/D-II. As such, it should satisfy future needs of the airport with normal maintenance.

The runway shoulder width for Group II aircraft is ten feet on both sides. The shoulder areas provide resistance to blast erosion and must be capable of accommodating emergency and maintenance vehicles as well as the occasional passage of an aircraft veering from the primary runway surfaces. Typically, runway shoulders are paved surfaces, as is the case at Lake Havasu City Municipal Airport. The runway shoulders should be maintained on Runway 14-32.

Runway Strength

The officially published pavement strength rating for Runway 14-32 is 100,000 pounds single wheel loading (SWL). As previously mentioned, SWL refers to the aircraft weight based upon the landing gear configuration with a single wheel on each landing strut.

The future critical aircraft is likely to be in the ARC C/D-II design category. These aircraft typically have a dual wheel landing gear configuration. These types of landing gear allow the weight of the aircraft to be distributed on more wheels, thus allowing a heavier aircraft to safely use the airport pavements. The Gulfstream IV, a D-II aircraft, weighs up to 75,000 pounds with a dual wheel configuration. The Gulfstream V weighs up to 90,000 pounds and is a D-III aircraft. A runway with a strength-rating of 100,000 SWL will adequately support these aircraft which could utilize the airport on a more frequent basis in the future.

Runway/Taxiway Separation

FAA Advisory Circular 150/5300-13, Change 13, *Airport Design*, also discusses separation distances between aircraft and various areas on the airport. The separation distances are a function of the approaches approved for the airport and the runway's designated ARC. Under current conditions, (ARC B-II, approaches not lower than three-quarters of a mile), parallel taxiways need to be at least 240 feet from the Runway 14-32 centerline. Aircraft parking areas are required to be at least 250 feet from the runway centerline.

In order to meet ARC C/D-II standards with approaches not lower than three-quarters of a mile, parallel taxiways need to be at least 300 feet from the runway centerline, and aircraft parking areas are required to be at least 400 feet from the runway centerline.

Currently, parallel Taxiway A located on the west side of Runway 14-32 is located 340 feet from the runway centerline. The aircraft parking apron is located approximately 500 feet from the runway centerline. These distances exceed current and ultimate FAA design standards.

Runway Blast Pad

The blast pad is a surface adjacent to the ends of the runway provided to reduce the erosive effect of jet blast and propeller wash. Runway 14 is equipped with a 200-foot long by 200-foot wide blast pad, and Runway 32 is equipped with a 200-foot long by 140-foot wide blast pad. These dimensions exceed the length and width requirements for an ARC C and D runway.

SAFETY AREA DESIGN STANDARDS

The FAA has established several safety surfaces to protect aircraft operational areas and keep them free from obstructions that could affect the safe operation of aircraft. These include the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway protection zone (RPZ). The dimensions of these safety areas are dependent upon the critical aircraft and thus, the ARC of the runway. The current critical aircraft family is ARC B-II, as previously determined. Ultimate planning will examine the criteria necessary as ARC C/D-II becomes the critical aircraft family.

Runway Safety Area (RSA)

The RSA is defined in FAA Advisory Circular 150/5300-13, Change 13, *Airport Design*, as a "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 is centered on the runway, dimensioned in accordance to the approach speed of the critical aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the design aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose.

The FAA has placed a higher significance on maintaining adequate RSAs at all airports due to recent aircraft accidents. Under Order 5200.8, effective October 1, 1999, the FAA established a *Runway Safety Area Program*. The Order states, "The objective of the Runway Safety Area Program is that all RSAs at federally-obligated airports…shall conform to the standards contained in Advisory Circular 150/5300-13, *Airport Design*, to the extent practicable." Each Regional Airports Division of the FAA is obligated to collect and maintain data on the RSA for each runway at the airport and perform airport inspections.

For ARC B-II runways with not lower than three-quarters of a mile approach minimums, the FAA calls for the RSA to be 150 feet wide and extend 300 feet beyond the runway ends. Analysis in the previous section indicated that Runway 14-32 should be planned to accommodate aircraft up to and including ARC C/D-II. The RSA for ARC C/D-II aircraft is 500 feet wide and extending 1,000 feet beyond each runway end.

Object Free Area (OFA)

The runway OFA is "a two-dimensional ground area, surrounding runways, taxiways, and taxilanes, which is clear of objects except for objects whose location is fixed by function (i.e., airfield lighting)." The OFA is centered on the runway, extending out in accordance to the critical aircraft design category utilizing the runway.

For ARC B-II aircraft and approaches not lower than three-quarters of a mile, the FAA calls for the OFA to be 500 feet wide (centered on the runway), extending 300 feet beyond each runway end. In order to meet design criteria for the future critical aircraft (ARC C/D-II), the OFA would require a cleared area 800 feet wide, extending 1,000 feet beyond each runway end. Runway 14-32 conforms to RSA and OFA standards for current and future critical aircraft design.

Obstacle Free Zone (OFZ)

The OFZ is an imaginary surface which precludes object penetrations, including taxiing and parked aircraft. The only allowance for OFZ obstructions is navigational aids mounted on frangible bases which are fixed in their location by function, such as airfield signs. The OFZ is established to ensure the safety of aircraft operations. If the OFZ is obstructed, the airport's approaches could be removed or approach minimums could be increased.

FAA criterion requires the OFZ to extend 200 feet beyond the runway ends by 400 feet wide (200 feet on either side of the runway centerline) for runways utilized by large aircraft and served by an instrument approach. Currently, there are no OFZ obstructions at Lake Havasu City Municipal Airport. Future planning should maintain the OFZ.

Runway Protection Zone (RPZ)

The RPZ is a trapezoidal area centered on the runway, typically beginning 200 feet beyond the runway end. The RPZ has been established by the FAA to provide an area clear of obstructions and incompatible land uses in order to enhance the protection of approaching aircraft, as well as people and property on the ground. The dimensions of the RPZ vary according to the visibility requirements serving the runway and the type of aircraft operating on the runway.

The lowest existing visibility minimum for approaches to the runway at Lake Havasu City Municipal Airport is one and one-quarter miles. RPZ dimensions for ARC B-II call for a 500-foot inner width, extending outward 1,000 feet, to a 700-foot outer width.

The FAA does not necessarily require the fee simple acquisition (outright property purchase) of the RPZ area, but recommends that airports maintain positive control over development within the RPZ. It is preferred that the airport own the property through fee simple acquisition; however, avigation easements (acquiring control of designated airspace within the RPZ) can be pursued if fee simple purchase is not possible. It should be noted, however, that avigation easements can cost nearly as much as the underlying land value and may not fully prohibit incompatible land uses from the RPZ. Also, the area encompassed by the RPZ envelops a portion of the required RSA, OFA, and areas needed for installation of approach lighting systems, all of which would be required for purchase.

Currently, the airport owns and maintains positive control over all existing RPZs through fee simple acquisition or easement. It should be noted that the RPZ for ARC C/D-II aircraft would be larger than the current RPZ and would extend into areas outside the existing airport property line. The dimensions for RPZs considering ARC C/D-II aircraft are detailed in **Table 3F**.

TABLE 3F
Airfield Design Standards
Lake Havasu City Municipal Airport

	Runway 14-32	
	Existing	Ultimate
Airport Reference Code (ARC)	B-II	C/D-II
Approach Visibility Minimums	1.25 miles	3/4 mile
Runway Length (feet)	8,001	8,001
Runway Width (feet)	100	100
Runway Pavement Strength (pounds)	100,000 SWL	100,000 SWL
Runway Safety Area		
Width (feet)	150	500
Length Beyond Runway End (feet)	300	1,000
Object Free Area		
Width (feet)	500	800
Length Beyond Runway End (feet)	300	1,000
Obstacle Free Zone		
Width (feet)	400	400
Length Beyond Runway End (feet)	200	200
Runway Protection Zone		
Inner Width (feet)	500	1,000
Outer Width (feet)	700	1,510
Length Beyond Runway End (feet)	1,000	1,700
Runway Centerline to:		
Parallel Taxiway Centerline (feet)	340	300
Aircraft Parking Area (feet)	500	400
Taxiway Width (feet)	35-70	35
Taxiway Object Free Area Width (feet)	131	131
Taxiway Centerline to:		
Fixed or Moveable Object (feet)	66	66

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield.

As detailed in Chapter One, the taxiway system at Lake Havasu City Municipal Airport consists of a parallel taxiway and six entrance/exit taxiways serving Runway 14-32. **Table 3F** outlines the runway to taxiway separation standards. Parallel Taxiway A is 340 feet from Runway 14-32. This is adequate for the existing ARC B-II and future ARC C/D-II standards for not lower than three-quarter of a mile approach minimums.

Exit taxiways provide a means to enter and exit the runway at various points on the airfield. The type and number of exit taxiways can have a direct impact on the capacity and efficiency of the airport as a whole. Runway 14-32 has a total of six exit taxiways on the west side of the runway. Exit taxiways are most effective when planned at least 750 feet apart. The current taxiway layout appears efficient.

Dimensional standards for the taxiways are depicted in **Table 3F**. The airfield taxiways are at least 35 feet wide, with most equal to or exceeding 50 feet in width. All taxiways meet or exceed Design Group II standards and should be maintained through the planning period.

NAVIGATIONAL AIDS AND INSTRUMENT APPROACHES

Airport and runway navigational aids are based on FAA recommendations, as defined in DOT/FAA Handbook 7031.2B, *Airway Planning Standard Number One*, and FAA AC 150/5300-2D, *Airport Design Standards, Site Requirements for Terminal Navigation Facilities*.

Navigational Aids

Navigational aids are electronic devices that transmit radio frequencies which properly equipped aircraft and pilots translate into point-to-point guidance and position information. The very high frequency omnidirectional range (VOR), global positioning system (GPS), and LORAN-C are available for pilots to navigate to and from Lake Havasu City Municipal Airport. These systems are sufficient for navigation to and from the airport; therefore, no other navigational aids are needed at the airport.

Instrument Approach Procedures

Instrument approach procedures (IAPs) are a series of predetermined maneuvers established by the FAA using electronic navigational aids that assist pilots in locating and landing at an airport during low visibility and cloud ceiling conditions. At Lake Havasu City Municipal Airport, there is a circling VOR/DME or GPS-A approach to the airport. This approach allows aircraft to land at the airport when visibility is as low as one and one-quarter miles and cloud ceilings are as low as 1,017 feet above ground level (AGL) for aircraft with approach speeds less than 91 knots. For higher approach speeds, the visibility minimums increase to as much as three miles.

A GPS modernization effort is underway by the FAA and focuses on augmenting the GPS signal to satisfy requirements for accuracy, coverage, availability, and integrity. For civil aviation use, this includes the continued development of the Wide Area Augmentation System (WAAS), which was initially launched in 2003. The WAAS uses a system of reference stations to correct signals from the GPS satellites for improved navigation and approach capabilities. Where the non-WAAS GPS signal provides for enroute navigation and limited instrument approach (lateral navigation) capabilities, WAAS provides for approaches with both course and vertical navigation. This capability was historically only provided by an instrument landing system (ILS), which requires extensive on-airport facilities. After 2015, the WAAS upgrades are expected to allow for the development of approaches to most airports with cloud ceilings as low as 200 feet above the ground and visibilities restricted to one-half mile.

Weather conditions at Lake Havasu City Municipal Airport are very rarely below approach minimums to prevent an aircraft from landing. The GPS-WAAS would allow for lower approach minimums at the airport and could be an option in the future for improved approach procedures. Ultimate planning will consider the implementation of approach minimums down to not lower than three-quarters of a mile, utilizing GPS technologies, for Runway 14-32. It should be noted, however, that any approach providing less than one mile visibility minimums will require the installation of an approach lighting system. The possibility of implementing this type of approach will be studied in the next chapter.

Weather Reporting Aids

Lake Havasu City Municipal Airport has a wind cone and segmented circle as well as two supplemental wind cones. The wind cones provide information to pilots regarding wind conditions, such as direction and speed. The segmented circle consists of a system of visual indicators designed to provide traffic pattern information to pilots. Two of the three windcones are lighted for nighttime and/or poor weather conditions. The lighted windcones are located inside the segmented circle and near the Runway 32 threshold. It is recommended that the other windcone also be lighted during the planning period.

The airport is equipped with an Automated Weather Observation System III (AWOS-III) which provides automated weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur. The AWOS-III reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting, and density altitude. This system should be maintained through the planning period.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

There are a number of lighting and pavement marking aids serving pilots using the airport. These aids assist pilots in locating the airport and runway at night or in poor visibility conditions. They also assist in the ground movement of aircraft.

Airport Identification Lighting

The location of the airport at night is universally indicated by a rotating beacon. For civil airports, a rotating beacon projects two beams of light, one white and one green, 180 degrees apart. At Lake Havasu City Municipal Airport, the beacon is located directly south of the terminal building area adjacent to the fire station. The beacon is sufficient and should be maintained through the planning period.

Runway and Taxiway Lighting

Runway identification lighting provides the pilot with a rapid and positive identification of the runway and its alignment. Runway 14-32 is equipped with medium intensity runway lights (MIRL). Medium intensity taxiway lighting (MITL) is provided on Taxiway A and the entrance/exit taxiways leading to Runway 14-32. During the course of the planning period, MITL should be applied to all active taxiways. This includes Taxiway B, Taxiway C, and any future taxiways constructed at the airport.

Visual Approach Lighting

To provide pilots with visual glideslope and descent information, visual approach slope indicators (VASIs) or precision approach path indicators (PAPIs) are commonly found to the side of the runway. These systems can consist of either a two or four-box unit. Four-box systems are recommended for use by business jet aircraft. Currently, both ends of Runway 14-32 are served by four-box PAPIs. These are the recommended visual descent aids and should be maintained through the planning period.

In conjunction with the potential lowering of approach minimums at the airport to not lower than three-quarters of a mile, consideration should be given to a more sophisticated approach lighting system. Due to physical land constraints north of the airport, it is most likely that a straight-in instrument approach would not be served on Runway 14. The possibility exists that a straight-in approach could be implemented on Runway 32. Examples of approach lighting systems that could be implemented on Runway 32 include an omni-directional approach lighting system (ODALS), lead-in lighting system (LDIN), or medium intensity approach lighting system (MALS).

Runway End Identification Lighting

Runway end identification lights (REILs) are flashing lights located at each runway end that facilitate identification of the runway end at night or during poor visibility conditions. REILs provide pilots with the ability to identify the runway ends and distinguish the runway end lighting from other lighting on the airport and in the approach areas. The FAA indicates that REILs should be considered for all lighted runway ends not planned for a more sophisticated approach lighting system.

Currently, REILS are located on both ends of Runway 14-32. In the event that a more sophisticated approach lighting system will be installed on one of the runway ends (most likely Runway 32), the REILs to that particular runway end can be removed.

Pilot-Controlled Lighting

Lake Havasu City Municipal Airport is equipped with pilot-controlled lighting (PCL). PCL allows pilots to control the intensity of the runway and taxiway lighting using the radio transmitter in the aircraft. PCL also provides for more efficient use of energy. This system should be maintained through the planning period.

Airfield Signs

Airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. Lighted signs are installed on all runway and taxiway intersections serving Runway 14-32. All of these signs should be maintained throughout the planning period. It should be noted that the airport is planning to have its runway and taxiway signage upgraded in 2008 to better conform to FAA standards.

Pavement Markings

Runway markings are designed according to the type of instrument approach available on the runway. FAA Advisory Circular 150/5340-1F, *Marking of Paved Areas on Airports*, provides guidance necessary to design an airport's markings. Runway 14-32 is equipped with non-precision markings. The non-precision markings are adequate even if additional approaches are approved. These markings should be properly maintained.

Helipads

The airport currently has marked parking dedicated for the use of helicopters immediately adjacent to the east side of Taxiway B. Helicopter and fixed-wing aircraft should be segregated to the extent possible. Facility planning should include establishing a designated transient helipad at the airport, including at least two parking positions. Lighting should be provided to allow the safe operation to the helipad at night.

AIR TRAFFIC CONTROL

Lake Havasu City Municipal Airport does not have an operational airport traffic control tower (ATCT); therefore, no formal terminal air traffic control services are available at the airport.

Federal funding for the construction and operation of an ATCT is governed by Title 14 of the Code of Federal Regulations (CFR) Part 170, *Establishment and Discontinuance Criteria For Air Traffic Control Services and Navigational Facilities*.

14 CFR Part 170.13 Airport Traffic Control Tower (ATCT) Establishment Criteria, provides the general criteria along with general facility establishment standards that must be met before an airport can qualify for an ATCT. These are as follows:

1. The airport, whether publicly or privately owned, must be open to and available for use by the public as defined in the Airport and Airway Improvement Act of 1982;

2. The airport must be recognized by and contained within the National Plan of Integrated Airport Systems;

3. The airport owners/authorities must have entered into appropriate assurances and covenants to guarantee that the airport will continue in operation for a long enough period to permit the amortization of the ATCT investment;

4. The FAA must be furnished appropriate land without cost for construction of the ATCT; and;

5. The airport must meet the benefit-cost ratio criteria utilizing three consecutive FAA annual counts and projections of future traffic during the expected life of the tower facility. (An FAA annual count is a fiscal year or a calendar year activity summary. Where actual traffic counts are unavailable or not recorded, adequately documented FAA estimates of the scheduled and nonscheduled activity may be used.)

An airport meets the establishment criteria when it satisfies the criterion above and its benefit-cost ratio equals or exceeds one. The benefit-cost ratio is the ratio of the present value of the ATCT life cycle benefits (BPV) to the present value of ATCT life cycle costs (CPV).

The benefits of establishing an ATCT result from the prevention of aircraft collisions, the prevention of other type of preventable accidents, reduced flying time, emergency response notification, and general security oversight. Benefits from preventable collisions are further broken down into mid-air collisions, airborne-ground collisions, and ground collisions. Data collected for analyzing the establishment of an ATCT include scheduled and nonscheduled commercial service and noncommercial traffic which includes military operations.

Since the cost data fluctuates each year based on new control tower operational cost estimates, development cost estimates, and aircraft operational costs, the benefit/costs analysis ratios change frequently and cannot be readily determined for the airport in the future. The FAA has sole authority over the benefit/cost analysis.

Facility planning should include identifying and reserving a location for the future development of an ATCT, should one be required in the future or the community wish to participate in the FAA Contract Tower Program.

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for the handling of aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacity of the various components of each area was examined in relation to projected demand to identify future landside facility needs. This includes components for commercial service and general aviation needs such as:

- Passenger Airline Terminal
- Aircraft Hangars
- Aircraft Parking Aprons
- Auto Parking and Access
- Airport Support Facilities

AIRLINE TERMINAL AREA

Lake Havasu City Municipal Airport has a passenger terminal building. This building totals approximately 5,700 square feet. The terminal building houses airport administration, two rental car agencies, and amenities for commercial airline service to include passenger waiting areas, a baggage claim area, a vending area, and a ticket counter.

Generalized facility needs have been developed based upon scheduled passenger enplanement levels of 9,500, 11,000, and 16,000. These represent reasonable planning levels derived from the forecasting effort. Terminal area requirements have been considered for the following functional areas:

- Ticketing
- Departure Area/Public Lobby
- Baggage Claim
- Concessions and Terminal Services
- Auto Rental Car Area
- Automobile Parking
- Terminal Curb
- Aircraft Gate Positions and Apron Space

This section identifies the terminal area facilities required to meet the airport's needs through the planning period. These requirements are based upon specific passenger enplanement thresholds, rather than a given year. In this manner, the airport's management can reference the guidelines, even if growth varies from the forecasts.

The existing airline terminal area facilities were evaluated based on planning guidelines relating to the major functional elements of the terminal area as presented in FAA Advisory Circular 150/5360-13, *Planning and Design of Airport Terminal Facilities*, the consultant's database of terminal planning criteria, and information collected during the inventory element to prepare estimates of various terminal building requirements. It should be noted that FAA Advisory Circular 150/5360-13 only provides formulas for recommended square footage for terminal facilities starting at about 30 peak hour enplanements. Lake Havasu City Municipal Airport is not forecast to reach that threshold until the long term planning period. As a result, the current facilities are primarily evaluated based on consultant experience at similar commercial service airports.

The methodology utilized in analysis of the passenger terminal building involved the potential design hour passenger demands. The evaluation process includes the major terminal building areas that are normally affected by peaking characteristics. **Table 3G** depicts square footage space required to satisfy potential passenger enplanements for each planning period.

TABLE 3G
Commercial Terminal Building Requirements
Lake Havasu City Municipal Airport

	Existing	Short Term	Intermediate Term	Long Term
Ticketing/Check-in				
No. of Airlines	1	1	1	1
Number of Pax/Half Hr. Peak	7	11	15	23
No. of Agent Positions	1	1	1	2
Counter Frontage (l.f.)	7	8	10	15
Ticket Lobby Queue (s.f.)	100	90	246	380
Airline Operations (s.f.)				
Counter Area	50	76	98	152
Airline Ops	220	759	983	1,519
Subtotal Airline Operations	270	835	1,081	1,671
Gate Facilities				
Peak Occupants	10	17	22	34
Holdroom Area (s.f.)	900	374	484	748
Baggage Claim				
Pax Claiming Bags	6	10	13	20
Claim Display (l.f.)	15	17	22	34
Claim Display Floor Area (s.f.)	50	102	132	204
Claim Lobby Area (s.f.)	450	483	618	942
Total Bag Claim Area (s.f.)	500	585	750	1,146
Rental Car Counters				
Counter Frontage (l.f.)	24	33	33	35
Counter Office Area (s.f.)	150	660	660	700
Counter Queue Area (s.f.)	140	198	198	210
Total Rental Car Area (s.f.)	290	858	858	910
Concessions (s.f.)				
Food and Beverage	400	676	854	1,306
Gift Shops	0	85	107	163
Total Concessions	400	761	961	1,469
Public Waiting Lobby (s.f.)				
Public Lobby/Seating	1,040	367	462	715
Greeting Lobby	300	101	124	188
Total Public Waiting Lobby	1,340	468	586	903
TSA Security Area (s.f.)				
Security Queuing Area	200	161	206	314
Restrooms (s.f)				
Men's/Women's	400	124	156	241
Administration Offices/Conf. (s.f.)				
Office, Conference	1,300	1,095	1,110	1,160
Gross Terminal Building Space (s.f.)	**5,700**	**6,200**	**7,400**	**10,000**

As depicted in the table, 6,200 square feet will be needed to meet all the typical passenger terminal design standards in the short term. By the long term planning period, up to 10,000 square feet would be needed for the passenger terminal. It should be noted that these square footages are the ideal planning scenario and do not consider financial constraints to constructing to this standard.

Ticketing

The first destination for enplaning passengers in the terminal building is the airline ticket counter. The ticketing area consists of the ticket counters, queuing area for passengers to approach the counters, and the ticket lobby which provides circulation. The ticket lobby should be arranged so that the enplaning passenger has immediate access and clear visibility to the individual airline ticket counter upon entering the building.

Circulation patterns should allow the option of bypassing the counters with minimum interference. Airline ticket counter frontage, counter area, ticketing lobby, airline office, and baggage makeup area requirements for each potential enplanement level have been calculated.

Departure Area/Public Lobby

The lobby/departure lounge is the designated waiting area used by passengers immediately prior to boarding an aircraft. Direct access from the curb, with space for waiting and seating, should be provided adjacent to the ticketing area. The lobby must be large enough to accommodate passengers who arrive early, passengers with delayed flights, and people who accompany passengers to the airport. This area is the hub of the circulatory route through the terminal and should not conflict with passengers queuing at the ticket counters or with passenger traffic flow.

Baggage Claim Facilities

The baggage claim area should be sufficiently segregated from ticketing passengers and seating areas so that public circulation in minimally affected. The current location of the baggage claim area should be adequate through the long term planning horizon.

Concessions

The concession functional area should consider areas for snacks and gifts. This could be accommodated with vending machines through the planning period, as is currently the case in the terminal building. A display case with an assortment of gifts such as embroidered shirts and hats is always a good practice for a public-use airport.

Auto Rental Car Area

Locating a rental car agency in the terminal building is a common practice for commercial service airports. There are currently two rental car agencies located in the terminal building. The planning forecast calls for making at least one parking space available for a rental car in the short term and increasing to five spaces available in the long term. Currently, there are 20 spaces available for rental car parking in the airport terminal building parking lot.

Terminal Curb Frontage

The curb element is the interface between the terminal building and the ground transportation system. The length of the curb required for loading and unloading of passengers and baggage is determined by the type and volume of ground transportation vehicles anticipated in the peak period on the design day. Only in the long term would even approximately 70 feet of terminal curb be forecast, thus the current curb length of 200 feet is sufficient.

Airline Gate Positions and Apron Area

Ground level boarding is appropriate for Lake Havasu City Municipal Airport. The airport is not forecast to have a second air carrier through the planning period. Thus, there will not be a need for additional gates.

The terminal apron consists of the area and facilities used for gate parking and aircraft support and servicing operations. In addition to the actual gate position, sufficient room must be provided for aircraft servicing, taxilanes, and service/fire lanes designated for vehicles used for aircraft ground servicing.

Currently, there are approximately 11,000 square yards of apron space designated for commercial service. This is adequate space considering the planning standard of 1,300 square yards for each ground level gate.

Airline Terminal and Automobile Parking

Vehicle parking for the terminal complex includes the two marked parking lots directly to the west of the terminal building. **Table 3H** shows the passenger terminal parking requirements. The number of necessary spaces takes into account arriving and departing passengers as well as those people there to greet them or drop them off.

TABLE 3H
Airline Terminal Building Requirements
Lake Havasu City Municipal Airport

	Existing	Short Term	Intermediate Term	Long Term
Terminal Curb				
Enplane Curb (ft.)	120	15.3	19.8	30.6
Deplane Curb (ft.)	80	17.9	23.1	35.7
Total Curb (ft.)	200	33.2	42.9	66.3
Auto Parking				
Total Public Parking	151	62	72	106
Employee Parking	N/A	5	6	8
Rental Car Parking	20	1	2	5
Total All Parking	171	68	80	119

Security and Screening

Terminal security requirements are related to the *Aviation and Transportation Security Act* of 2001, which was passed in response to the terrorist acts of September 11. Major provisions of the law are applicable to terminal planning, including the creation of the Transportation Security Administration (TSA) for the purpose of managing screening operations at commercial service airports.

Currently, the TSA is located in a facility directly north of the terminal building. The next chapter will examine ways to provide office space for TSA employees in the airport terminal building.

GENERAL AVIATION FACILITIES

Hangars

The demand for aircraft storage hangars typically depends upon the number and type of aircraft expected to be based at the airport. For planning purposes, it is necessary to estimate hangar requirements based upon forecast operational activity. However, hangar development should be based on actual demand trends and financial investment opportunities.

Hangar facilities at Lake Havasu City Municipal Airport consist of shade hangars, Port-A-Port hangars, and box (conventional/executive) hangars. These different types of hangars offer varying levels of privacy, security, and protection from the elements. Demand for hangars also varies with the number of aircraft based at the airport. Another important factor is the type of based aircraft. Smaller single engine aircraft usually prefer shade, Port-A-Port hangars, or T-hangars, while larger multi-engine aircraft and business jets will prefer conventional or executive hangars. Rental costs will also be a factor in the choice.

While a majority of aircraft owners prefer enclosed aircraft storage, a number of based aircraft will still tiedown outside (due to lack of hangar availability, hangar rental rates/ and/or operational needs). Therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft. At Lake Havasu City Municipal Airport, the majority of based aircraft are currently stored in hangars (70 percent). According to airport records, there are approximately 62 aircraft which utilize the tiedown spaces available on the airport.

Airport staff maintains a waiting list of aircraft owners desiring to store their aircraft in a City-owned box hangar or shade hangar storage space. It is assumed that several aircraft that are currently located in tiedown positions on the airport would move into a hangar facility as they become available. Conversion of the waiting list to signed hangar leases was taken into consideration when developing hangar storage requirements.

Presently, all of the shade hangar and Port-A-Port hangars on the airfield are occupied and there is a waiting list for units. The airport has 45 shade hangar and Port-A-Port hangar storage units. Shade hangar and Port-A-Port hangar space available at the airport totals approximately 57,200 square feet for aircraft storage. Analysis of future shade hangar, Port-A-Port hangar, and T-hangar requirements, as depicted on **Table 3J**, indicates additional hangar positions which will be needed through the long range planning horizon.

Box hangar space makes up a much larger portion of hangar space at the airport. These hangars are typically utilized by owners of larger aircraft or multiple aircraft. Often a corporate flight department will operate out of an executive hangar as well. Box hangar space at Lake Havasu City Municipal Airport currently totals approximately 103,400 square feet. Future requirements show a demand for additional hangar space in the form of box (conventional and/or executive) hangar space.

TABLE 3J
Aircraft Storage Hangar Requirements
Lake Havasu City Municipal Airport

		Future Requirements		
	Currently Available	Short Term	Intermediate Term	Long Term
Total Based	201	265	295	355
Aircraft to be Hangared	139	185	209	260
T-Hangars/Shade Hangars/Port-A-Ports	45	95	110	137
Box (Conventional/Executive) Hangars (aircraft positions)	94	90	99	123
Hangar Area Requirements				
T-Hangars/Shade Hangars/Port-A-Ports	57,200	99,600	112,200	140,400
Box (Conventional/Executive) Hangars	103,400	166,000	188,000	234,000
Maintenance	10,000	24,900	28,200	35,100
Total Hangar Area (s.f.)	**170,600**	**290,500**	**328,400**	**409,500**

Table 3J compares existing hangar space to the future hangar requirements. It is evident from the table that there is a need for additional hangar space throughout the planning period. As previously mentioned, Lake Havasu City Municipal Airport has approximately 100,000 square feet of hangar space, mainly in the form of executive and conventional hangars, proposed to be developed over the next several years. The analysis also indicates a potential need for additional maintenance and office space through the planning period. It is expected that the aircraft storage hangar requirements will continue to be met through a combination of hangar types.

Aircraft Parking Apron

FAA Advisory Circular 150/5300-13, Change 13, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At Lake Havasu City Municipal Airport, the number of itinerant spaces required was determined to be approximately 15 percent of the busy-day itinerant operations. A planning criterion of 800 square yards per aircraft was applied to determine future transient apron requirements for single and multi-engine aircraft. For business jets (which can be much larger), a planning criterion of 1,600 square yards per aircraft position was used. Locally based tiedowns typically will be utilized by smaller single engine aircraft; thus, a planning standard of 650 square yards per position is utilized.

A parking apron should provide space for the number of locally based aircraft that are not stored in hangars, transient aircraft, and for maintenance activity. For local tie-down needs, an additional 20 spaces are identified for maintenance activity. Maintenance activity would include the movement of aircraft into and out of hangar facilities and temporary storage of aircraft on the ramp.

Total apron parking requirements are presented in **Table 3K**. Currently, there are 148 transient positions available for single and multi-engine aircraft on the airport. This includes City tiedowns and tiedowns associated with FBO leases. Approximately eight business jet positions are available. Finally, there are 62 positions utilized for locally based aircraft.

As shown in the table, there may be a need for additional locally based aircraft parking for single and multi-engine aircraft in the future. It appears that there is adequate transient and jet aircraft parking through the planning period. In order to satisfy the increased need for locally based positions, considerations should be given to conversion of some of the transient tiedown spaces to locally based aircraft parking.

TABLE 3K
General Aviation Aircraft Parking Apron Requirements
Lake Havasu City Municipal Airport

	Available	Short Term	Intermediate Term	Long Term
Single, Multi-engine Transient Aircraft Positions	148	24	26	34
Apron Area (s.y.)	125,100	19,100	21,000	27,200
Transient Business Jet Positions	8	4	5	7
Apron Area (s.y.)	20,000	6,400	8,000	11,200
Locally-Based Aircraft Positions	62	80	86	95
Apron Area (s.y.)	52,400	64,000	68,800	76,000
Total Positions	**218**	**108**	**117**	**136**
Total Apron Area (s.y.)	**197,500**	**89,500**	**97,800**	**114,400**

General Aviation Terminal Facilities

General aviation terminal facilities have several functions. Space is required for a pilots' lounge, flight planning, concessions, management, storage, and various other needs. This space is not necessarily limited to a single, separate terminal building, but can include space offered by FBOs for these functions and services.

The methodology used in estimating general aviation terminal building space needs is based on the number of itinerant 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. Design hour itinerant passengers are determined by multiplying design hour itinerant operations by the number of passengers on the aircraft (multiplier). An increasing passenger count per aircraft (from 1.9 to 2.2) is used to account for the likely increase in the number of passengers utilizing general aviation services. **Table 3L** outlines the general aviation terminal facility space requirements for Lake Havasu City Municipal Airport.

As presented in the table, the existing public space will need to be addressed in the short term of the plan. By the long term, approximately 5,148 square feet of space could be needed. As mentioned earlier, the desired space can be made up of a combination of facilities at the airport. The 4,000 square feet of current available building space listed in **Table 3L** accounts for the approximate amount of space dedicated to general aviation use within D2 Aero General Aviation Services and Desert Skies Executive Air Terminal. The airport terminal building was not taken into consideration since in the past it has been dedicated for commercial service use.

An additional consideration for terminal space is the emergence of a new class of aircraft. As mentioned in Chapter Two, a number of aircraft manufacturers are beginning to produce low cost microjets, commonly referred to as very light jets (VLJs). The VLJs typically have a capacity of up to six passengers. A number of new companies are positioning themselves to utilize the VLJs for on-demand air taxi services. The air taxi businesses are banking on a desire by business travelers to avoid delays at major commercial service airports by taking advantage of the nationwide network of general aviation airports such as Lake Havasu City Municipal Airport. General aviation airports with appropriate terminal building services are better positioned to meet the needs of this new class of business traveler.

TABLE 3L
General Aviation Terminal Area Facilities
Lake Havasu City Municipal Airport

	Available	Short Term	Intermediate Term	Long Term
Design Hour Operations	29	36	42	54
Design Hour Itinerant Operations	15	18	20	26
Multiplier	1.8	1.9	2	2.2
Total Design Hour Itinerant Passengers	27	34	40	57
General Aviation Building Spaces (s.f.)	4,000	3,078	3,600	5,148

Automobile Parking

General aviation vehicular parking demands have been determined for Lake Havasu City Municipal Airport. Space determinations were based on an evaluation of the existing airport use, as well as industry standards. Automobile parking spaces required to meet general aviation itinerant demands were calculated by taking the design hour itinerant passengers and using a multiplier of 1.9, 2.0, and 2.2 for each planning period. This multiplier represents the anticipated gradual increase in the number of passengers per aircraft utilizing general aviation services. Currently, D2 Aero General Aviation Services has approximately ten marked parking spaces and Desert Skies Executive Air Terminal has approximately 16 marked spaces. When taking these facilities into account, approximately 26 vehicle parking spaces with 10,000 square feet of parking area are available. North of the fixed base operators (FBOs) is an area that encompasses approximately 41,000 square feet that is dedicated for leased automobile parking. In total, approximately 51,000 square feet of parking area providing 154 vehicle spaces is provided. Parking spaces related to the airport terminal building were not taken into consideration since they have traditionally served the needs of commercial passengers.

The parking requirements of based aircraft owners should also be considered. Although some owners prefer to park their vehicles in their hangars, safety can be compromised when automobile and aircraft movements are intermixed. For this reason, separate parking requirements, which consider one-half of based aircraft at the airport, were applied to general aviation automobile parking space requirements. Parking requirements for the airport are summarized in **Table 3M**.

TABLE 3M
GA Vehicle Parking Requirements
Lake Havasu City Municipal Airport

		Future Requirements		
	Available	Short Term	Intermediate Term	Long Term
Design Hour Itinerant Passengers	27	34	40	57
FBO Vehicle Spaces	26	62	73	103
Parking Area (s.f.)	10,000	24,600	29,000	41,100
General Aviation Spaces	128	40	50	63
Parking Area (s.f.)	41,000	16,000	20,000	25,200
Total Parking Spaces	154	102	123	166
Total Parking Area (s.f.)	51,000	40,600	49,000	66,300

By the short term planning period, there appears to be a need for additional vehicle parking spaces and parking area for the FBOs. There is adequate general aviation parking spaces and parking area through the long term planning period. In order to satisfy the need for additional FBO vehicle parking spaces and parking area, consideration should be given to the conversion of some the leased automobile spaces to FBO vehicle spaces.

SUPPORT REQUIREMENTS

Various facilities that do not logically fall within the classifications of airside or landside facilities have also been identified. These other areas provide certain functions related to the overall operation of the airport.

FUEL STORAGE

There are two fuel farms located on the airport that currently store fuel for aviation use. D2 Aero General Aviation Services and Desert Skies Executive Air Terminal, the two major FBOs at the airport, each operate a fuel storage facility. D2 Aero owns their facility and Desert Skies leases their facility from the Lake Havasu City Municipal Airport.

D2 Aero General Aviation Services has one 10,000-gallon capacity Avgas storage tank and one 10,000-gallon capacity Jet A storage tank. Both tanks are aboveground. They use two fuel trucks to deliver fuel to aircraft that include a 1,500-gallon capacity Avgas truck and a 2,200-gallon capacity Jet A truck. D2 Aero also provides self-service Avgas fuel capability. By using a credit card, one can access Avgas fuel at their convenience.

Desert Skies Executive Air Terminal operates three underground fuel storage tanks consisting of two 12,000-gallon capacity Avgas tanks and one 12,000-gallon capacity Jet A tank. They use four fuel trucks for delivery of fuel that include two Avgas fuel trucks that store 1,100 and 1,200 gallons of fuel, and two Jet A fuel trucks that store 1,700 and 2,200 gallons of fuel.

It should be noted that Havasu Air Center, a third FBO that opened for business in July 2008, has constructed a fuel farm also. A 12,000-gallon capacity Avgas storage tank and a 15,000-gallon capacity Jet A storage tank have been included with the development of the FBO. Fuel trucks are also available to transport the fuel to aircraft.

Fuel storage requirements are typically based upon maintaining a two-week supply of fuel during an average month. However, more frequent deliveries can reduce the fuel storage capacity requirement. Generally, fuel tanks should be of adequate capacity to accept a full refueling tanker, which is approximately 8,000 gallons, while maintaining a reasonable level of fuel in the storage tank. Maintaining storage to meet a two-week supply for each is currently available.

Future Avgas and Jet A fuel storage requirements for the airport, based upon a two-week supply during the peak month, will likely exceed the existing total storage capacities. One option to address this potential storage issue is to increase the frequency of fuel deliveries. For the long term planning period, additional fuel storage facilities should be planned.

SECURITY FENCING / GATES

Lake Havasu City Municipal Airport operations areas are completely enclosed by an eight-foot chain link fence topped by three-strand barbed wire. The fence does not always follow the airport property line due to the layout of physical features and actual boundary lines. There are currently five controlled access gates located at the airport to provide enhanced security of the airfield.

F.A.R. PART 139 CERTIFICATION REQUIREMENTS

Federal Aviation Regulation (F.A.R.) Part 139, *Certification and Operations: Land Airports Serving Certain Air Carriers*, was amended to include those airports with scheduled passenger air service utilizing aircraft with a seating capacity of less than 31 passengers. In the past, Lake Havasu City Municipal Airport has been served by a 19-seat air carrier aircraft.

Under the amended Part 139 requirements, there are four classes of airports: Classes I, II, III, and IV. Airports serving all types of scheduled operations of large air carrier aircraft and any other type of air carrier operations are known as Class I airports. Class II airports are those airports that serve scheduled operations of small air carrier aircraft (10-30 seats) and unscheduled operations of larger air carrier aircraft (more than 30 seats). Class III airports are those airports that serve only scheduled operations of air carrier aircraft with 10-30 seats. Class IV airports are those airports serving only unscheduled air carrier operations in aircraft with more than 30 seats. Lake Havasu City Municipal Airport is designated as a Class III. Should the airport regain commercial air service in the future and be served by an air carrier aircraft with more than 30 passenger seats, it would be required to comply with Class I of the regulation.

AIRPORT RESCUE AND FIREFIGHTING (ARFF)

Lake Havasu City Municipal Airport is currently served by an aircraft rescue and firefighting facility (ARFF). Lake Havasu City's Fire Station #6, located south of the airport terminal building, is designed to provide emergency and rescue services to the airport and the surrounding area. There are 12 ARFF-certified personnel working for the Lake Havasu City Fire Department, and a certain number of them are present at Fire Station #6 24 hours per day, seven days per week. A primary ARFF vehicle and a fire engine are kept at the facility. The ARFF vehicle is a 1999 Emergency One Titan and has 1,640 gallons of storage capacity and is capable of carrying 223 gallons of ARFF foam and 500 pounds of Purple K dry chemical. A 750-gallon capacity fire engine is also stationed at the facility.

Part 139 airports, such as Lake Havasu City Municipal Airport, are required to provide ARFF services during air carrier operations that require a Part 139 certificate. Each certified airport maintains equipment and personnel based on the ARFF index established according to the length of aircraft and scheduled daily flight frequency. There are five indices, designated as A through E, with A applicable to the smallest aircraft and E to the largest aircraft (based on wingspan). Lake Havasu City Municipal Airport is categorized within ARFF Index A. ARFF equipment at the airport currently exceeds Index A requirements and meets Index B level ARFF capability.

AIRPORT MAINTENANCE BUILDING

Presently, there is not a dedicated airport maintenance facility at the airport. Airport maintenance personnel utilize an existing hangar and other outside locations for equipment storage. Consideration should be given to developing a maintenance facility for the storage of maintenance equipment and to provide work areas for airport maintenance employees.

SURFACE TRANSPORTATION ACCESS

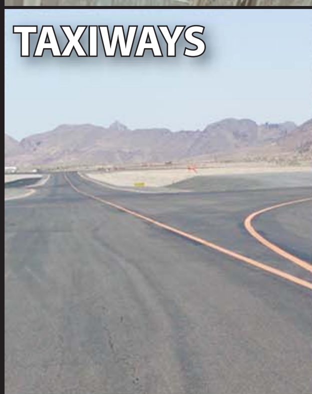
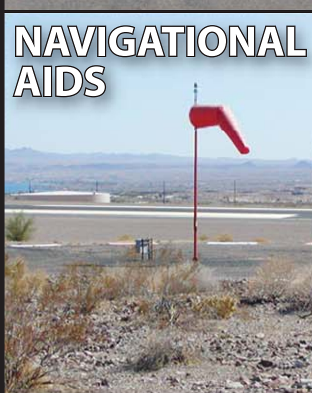
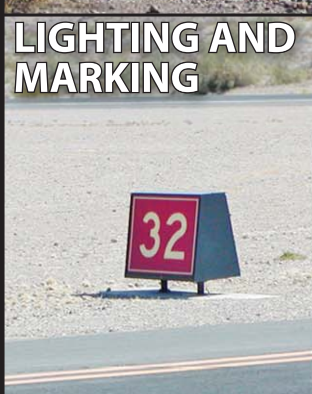
Primary access to the airport is provided by Airport Centre Boulevard, which is accessed directly from State Highway 95. Patton Drive is located east of State Highway 95 and provides access to various businesses and hangars on the airport. The airport terminal building is accessed by Airport Centre Boulevard. Besides routine maintenance and pavement improvements, the existing roadway access to the airport should be capable of supporting aviation-related growth at the airport. Expansion of roadways and new roadway development at the airport will be a function of future development at the airport.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for Lake Havasu City Municipal Airport for the planning horizon. A summary of the airside and landside requirements is presented on **Exhibits 3C** and **3D**.

Following the facility requirements determination, the next step is to determine a direction of development which best meets these projected needs through a series of Airport Development Alternatives. The remainder of the Master Plan will be devoted to outlining this direction, its schedule, and its cost.

05MP08-3C-10/8/07

	AVAILABLE	SHORT TERM	LONG TERM
RUNWAYS 	**Runway 14-32** 8,001′ x 100′ 100,000 SWL 1.25-Mile Visibility ARC B-II Design	**Runway 14-32** 8,001′ x 100′ 100,000 SWL 1.25-Mile Visibility ARC B-II Design	**Runway 14-32** 8,001′ x 100′ 100,000 SWL **.75-Mile Visibility (32)** **ARC C/D-II Design**
TAXIWAYS 	**Runway 14-32** Full parallel Taxiway A 340′ Seperation 6 exits West All taxiways 35′-70′ wide Hold apron on each runway end	**Runway 14-32** Full parallel Taxiway A 340′ Seperation 6 exits West All taxiways 35′-70′ wide Hold apron on each runway end **Extend Taxiway B North**	**Runway 14-32** Full parallel Taxiway A 340′ Seperation 6 exits West All taxiways 35′-70′ wide Hold apron on each runway end **Extend Taxiway B North** **Extend Taxiway C South**
NAVIGATIONAL AIDS 	VOR and GPS AWOS-III Segmented Circle 3 windcones (two lighted) **Runway 14-32** VOR/DME or GPS-A approach (circling)	VOR and GPS AWOS-III Segmented Circle **All 3 windcones lighted** **Runway 14-32** VOR/DME or GPS-A approach (circling)	VOR and GPS AWOS-III Segmented Circle **All 3 windcones lighted** **Potential ATCT** **Runway 14-32** VOR/DME or GPS-A approach (circling) **Runway 32** **GPS straight-in approach**
LIGHTING AND MARKING 	Airport Beacon MITL on taxiway A and entrance / exit taxiways **Runway 14-32** MIRL PAPI-4 REIL's PCL Non-Precision Marking	Airport Beacon **MITL on all active taxiways** **Helipads (2)** **Runway 14-32** MIRL PAPI-4 REIL's PCL Non-Precision Marking	Airport Beacon **MITL on all active taxiways** **Helipads (2)** **Runway 14-32** MIRL PAPI-4 REIL's PCL Non-Precision Marking **Runway 32** **Approach lighting system (MALS, LDIN, ODALS)**

KEY

ATCT- Airport Traffic Control Tower
AWOS- Automated Weather Observation System
MIRL- Medium Intensity Runway Lighting
MITL- Medium Intensity Taxiway Lighting
PAPI - Precision Approach Path Indicator
PCL- Pilot Controlled Lighting
REIL- Runway End Identification Lights
SWL- Single Wheel Loading

Bold red print indicates recommended / required changes

LAKE HAVASU CITY, ARIZONA • MUNICIPAL AIRPORT •

Exhibit 3C
AIRFIELD FACILITY REQUIREMENTS

05MP08-3D-10/8/07

AIRCRAFT STORAGE HANGARS

	AVAILABLE	SHORT TERM	INTERMEDIATE TERM	LONG TERM
T-HANGARS / SHADE HANGARS / PORT-A-PORTS	45	95	110	137
BOX (CONVENTIONAL / EXECUTIVE) HANGARS	94	90	99	123
HANGAR AREA REQUIREMENTS (s.f.)				
T-HANGARS / SHADE HANGARS / PORT-A-PORTS	57,200	99,600	112,200	140,400
BOX (CONVENTIONAL / EXECUTIVE) HANGARS	103,400	166,000	188,000	234,000
Maintenance	10,000	24,900	28,200	35,100
TOTAL HANGAR AREA (s.f.)	**170,600**	**290,500**	**328,400**	**409,500**

AIRCRAFT PARKING APRON REQUIREMENTS

	AVAILABLE	SHORT TERM	INTERMEDIATE TERM	LONG TERM
Single, Multi-engine Transient Aircraft Positions	148	24	26	34
Transient Business Jet Positions	8	4	5	7
Locally-Based Aircraft Positions	62	80	86	95
TOTAL POSITIONS	**218**	**108**	**117**	**136**
TOTAL APRON AREA (s.y.)	**197,500**	**89,500**	**97,800**	**114,400**

TERMINAL SERVICES AND VEHICLE PARKING

	AVAILABLE	SHORT TERM	INTERMEDIATE TERM	LONG TERM
Terminal Building Space (s.f.)	5,700	6,200	7,400	10,000
General Aviation Building Spaces (s.f.)	4,000	3,078	3,600	5,148
TOTAL TERMINAL PARKING	**171**	**68**	**80**	**119**
FBO Vehicle Spaces	26	62	73	103
General Aviation Vehicle Spaces	128	40	50	63
TOTAL GENERAL AVIATION PARKING SPACES	**154**	**102**	**123**	**166**
TOTAL PARKING AREA (s.f.)	**51,000**	**40,600**	**49,000**	**66,300**

Exhibit 3D
LANDSIDE FACILITY
REQUIREMENTS