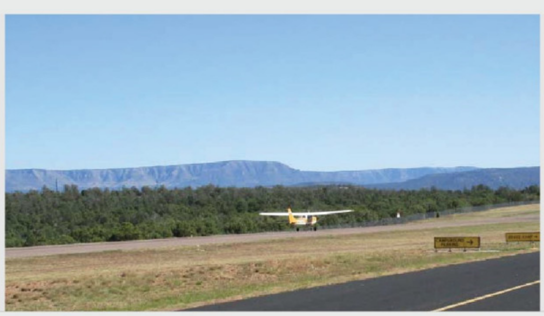
CHAPTER THREE

FACILITY REQUIREMENTS

Proper airport planning requires the translation of forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter will analyze the existing capacities of Payson Municipal Airport (PAN) facilities. The existing capacities will then be compared to the forecast activity levels prepared in Chapter Two to determine the adequacy of existing facilities, as well as to identify if deficiencies currently exist or may be expected to materialize in the future. The chapter will present the following elements:

- Planning Horizon Activity Levels
- Airfield Capacity
- Airport Physical Planning Criteria
- Airside and Landside Facility Requirements

This exercise is intended to identify the adequacy of existing airport facilities, outline what new facilities may be needed, and determine when these may be needed to accommodate forecast demands. Once these facility needs have been identified, various alternatives for providing these facilities will be detailed for both the airside and the landside. Each alternative will be evaluated to determine the most feasible, cost-effective, and efficient means for implementation.


The facility requirements for PAN were evaluated using guidance contained in several Federal Aviation Administration (FAA) publications, including the following:

- Advisory Circular (AC) 150/5300-13B, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B, *Runway Length Requirements for Airport Design*
- Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*
- FAA Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems* (*NPIAS) and the Airports Capital Improvement Plan (ACIP)*

DEMAND-BASED PLANNING HORIZONS

An updated set of aviation demand forecasts for PAN has been established and was detailed in Chapter Two. These activity forecasts include annual aircraft operations, based aircraft, aircraft fleet mix, and peaking characteristics. The forecasts were submitted to the FAA for their review and were approved for planning purposes in a letter dated May 15, 2023, which is included as **Appendix B**. With this information, specific components of the airfield and landside system can be evaluated to determine their capacity to accommodate future demand.

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 has been established that takes into consideration the reasonable range of aviation demand projections. The planning horizons are the short term (years 1-5), the intermediate term (years 6-10), and the long term (years 11-20).

It is important to consider that the actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand by allowing airport management the flexibility to make decisions and develop facilities based upon need generated by actual demand levels, rather than dates in time. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program. **Table 3A** presents the short-, intermediate-, and long-term planning horizon milestones for each aircraft activity level forecasted in Chapter Two.

Table 3A | Aviation Demand Planning Horizons

	Base Year (2022)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
BASED AIRCRAFT				
Single Engine	59	61	64	70
Multi-Engine	1	1	1	0
Turboprop	0	1	2	4
Jet	0	0	0	1
Helicopter	1	2	2	3
Other	5	5	5	5
On-Airport Based Aircraft	*33*	*37*	*41*	*50*
Off-Airport Based Aircraft	*33*	*33*	*33*	*33*
TOTAL BASED AIRCRAFT	**66**	**70**	**74**	**83**
ANNUAL OPERATIONS				
Itinerant				
Air Carrier	0	0	0	0
Air Taxi	1,750	1,800	2,100	2,800
General Aviation	20,000	22,900	24,700	28,500
Military	500	500	500	500
Total Itinerant	*22,250*	*25,200*	*27,300*	*31,800*
Local				
General Aviation	12,000	14,100	15,400	18,100
Military	0	0	0	0
Total Local	*12,000*	*14,000*	*15,400*	*18,100*
TOTAL OPERATIONS	**34,250**	**39,300**	**42,700**	**49,900**

Source: Coffman Associates analysis

AIRFIELD CAPACITY

An airport's airfield capacity is expressed in terms of its annual service volume (ASV). ASV is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year without incurring significant delay factors. As aircraft operations near or surpass the ASV, delay factors increase exponentially. PAN's ASV was examined utilizing FAA AC 150/5060-5, *Airport Capacity and Delay*.

FACTORS AFFECTING ANNUAL SERVICE VOLUME

This analysis takes into account specific factors about the airfield in order to calculate the airport's ASV. These various factors are depicted in **Exhibit 3A**. The following describes the input factors as they relate to PAN and include airfield layout, weather conditions, aircraft mix, and operations.

- **Runway Configuration** – The existing airfield configuration consists of a single runway supported by a full-length parallel taxiway. Runway 6-24 is 5,504 feet long and 75 feet wide, oriented northeast/southwest.

- **Runway Use** – Runway use in capacity conditions is controlled by wind and/or airspace conditions. For PAN, the direction of takeoffs and landings is typically determined by the speed and direction of the wind. It is generally safest for aircraft to take off and land into the wind, avoiding a crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components during

AIRFIELD LAYOUT

Runway Configuration

Runway Use

Number of Exits

WEATHER CONDITIONS

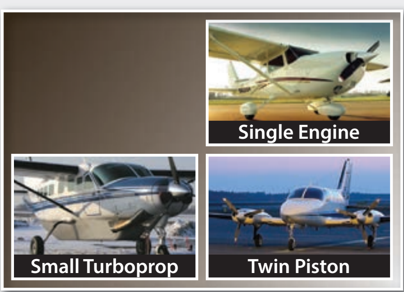
VMC (VFR)
Visual Meteorological Conditions

IMC (IFR)
Instrument Meteorological Conditions

PVC
Poor Visibility Conditions

AIRCRAFT MIX

Category A & B Aircraft



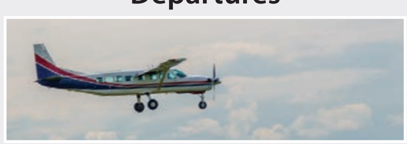
Category C Aircraft

Category D Aircraft

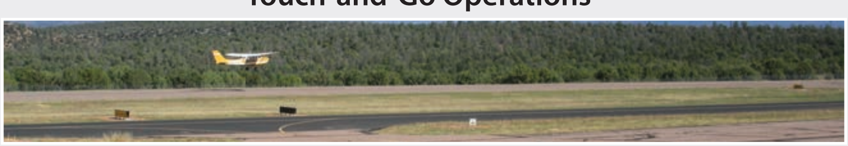
OPERATIONS

Arrivals

Departures



Touch-and-Go Operations



Total Annual Operations

Exhibit 3A
AIRFIELD CAPACITY FACTORS

these operations. Wind conditions dictate the use of Runway 24 approximately 31 percent of the time, and Runway 6 approximately 24 percent of the time. Calm wind conditions are present approximately 45 percent of the time. Runway 24 is the designated calm wind runway.

- **Exit Taxiways** – Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determine the occupancy time of an aircraft on the runway. The airfield capacity analysis gives credit to taxiway exits located within the prescribed range from a runway's threshold. This range is based upon the mix index of the aircraft that use the runways. Based upon mix, only exit taxiways between 2,000 feet and 4,000 feet from the landing threshold count in the exit rating at PAN. The exits must be at least 750 feet apart to count as separate exit taxiways. Utilizing these criteria, both runways are credited with one exit taxiway (Taxiway A3).

- **Weather Conditions** – Weather conditions can have a significant impact on airfield capacity. Airfield capacity is usually highest in clear weather when flight visibility is at its best and is diminished as weather conditions deteriorate and cloud ceilings and visibility are reduced. As weather conditions deteriorate, the spacing of aircraft must increase to provide allowable margins of safety and air traffic vectoring. The increased distance between aircraft reduces the number of aircraft which can operate at the airport during any given period, thus reducing overall airfield capacity.

  According to local meteorological data, the airport operates under visual meteorological conditions (VMC) approximately 96.5 percent of the time. VMC exist whenever the cloud ceiling is greater than 1,000 feet above ground level (AGL) and visibility is greater than three statute miles. Instrument meteorological conditions (IMC) are defined when cloud ceilings are between 500 and 1,000 feet AGL or visibility is between one and three miles. Poor visibility conditions (PVC) apply for cloud ceilings below 500 feet and visibility minimums below one mile. **Table 3B** summarizes the weather conditions experienced at the airport over a 10-year period of time.

Table 3B | Weather Conditions

Condition	Cloud Ceiling	Visibility	Percent of Total
VMC	≥ 1,000' AGL	≥ 3 statute miles	96.53%
IMC	≥ 500' AGL and < 1,000' AGL	≥ 1 to < 3 statute miles	1.51%
PVC	< 500' AGL	< 1 statute mile	1.96%

VMC: Visual Meteorological Conditions
IMC: Instrument Meteorological Conditions
PVC: Poor Visibility Conditions
AGL: Above Ground Level

Source: Payson Airport Automated Weather Observation System (AWOS), Station ID 72374500374, Observations from 1/1/2012 thru 12/31/2021

- **Aircraft Mix** – The aircraft mix for the capacity analysis is defined in terms of four aircraft classifications. Classes A and B consist of small- and medium-sized propeller and some jet aircraft, all weighing 12,500 pounds or less. These aircraft are associated primarily with general aviation activity, but do include some air taxi, air cargo, and commuter aircraft. Class C consists of aircraft weighing between 12,500 pounds and 300,000 pounds. These aircraft include most business jets and some turboprop aircraft which utilize the airport on a regular basis. Class D aircraft consist of aircraft weighing more than 300,000 pounds.

Most operations at PAN are by Classes A and B aircraft. According to the FAA's Traffic Flow Management System Count (TFMSC) data for 2022, there were approximately 66 total operations by Class C aircraft at PAN, which represents approximately 0.19 percent of all operations. There were no operations by Class D aircraft reported in the TFMSC.

- **Percent Arrivals** – The percentage of arrivals as they relate to total operations of the airport is important in determining airfield capacity. Under most circumstances, the lower the percentage of arrivals, the higher the hourly capacity. The aircraft arrival-departure percentage split is typically 50/50, which is the case at PAN.

- **Touch-and-Go Activity** – A touch-and-go operation involves an aircraft making a landing and then an immediate takeoff without coming to a full stop or exiting the runway. As previously discussed in Chapter Two, these operations are normally associated with general aviation training activity and classified as a local operation. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and takeoff occurs within a shorter time period than individual operations. Touch-and-go operations at PAN accounted for 35 percent of total annual operations in 2022. This percentage is anticipated to remain stagnant, increasing to 36 percent by the end the planning period.

- **Peak Period Operations** – Average daily operations and average peak hour operations during the peak month are utilized for the airfield capacity analysis. Operations activity is important in the calculation of an airport's ASV as "peak demand" levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times throughout the year.

AIRFIELD CAPACITY SUMMARY

Given the factors outlined above, the airfield's ASV will range between 200,000 and 230,000 annual operations. The ASV does not indicate a point of absolute gridlock for the airfield; however, it does represent the point at which operational delay for each aircraft operation will increase exponentially.

As previously detailed, PAN experienced 34,250 operations in 2022. This operational level for the airport represents approximately 17 percent of the airfield's ASV, if the ASV is considered at the low end of the typical range of 200,000 annual operations. By the end of the long-term planning period, total annual operations are expected to represent approximately 25 percent of the airfield's ASV.

FAA Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems (NPIAS) and the Airports Capital Improvement Plan (ACIP)*, indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the annual service volume. This is an approximate level to begin the detailed planning of capacity improvements. At the 80 percent level, the planned improvements should be made. While no significant capacity improvements will be necessary, options to improve airfield efficiency will still be considered in the master plan.

AIRSIDE FACILITY REQUIREMENTS

Airside facilities include those facilities related to the arrival, departure, and ground movement of aircraft. Airside facility requirements are based primarily upon the Runway Design Code (RDC) for the runway. Analysis in Chapter Two identified the existing and ultimate RDC as B-I(Small)-5000 for Runway 6-24.

RUNWAYS

Runway conditions, such as orientation, length, width, and pavement strength, were analyzed at PAN. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. FAA AC 150/5300-13B, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for any aircraft forecast to use the airport on a regular basis. **Table 3C** details the allowable crosswind component for each RDC.

Table 3C | Allowable Crosswind Component by RDC

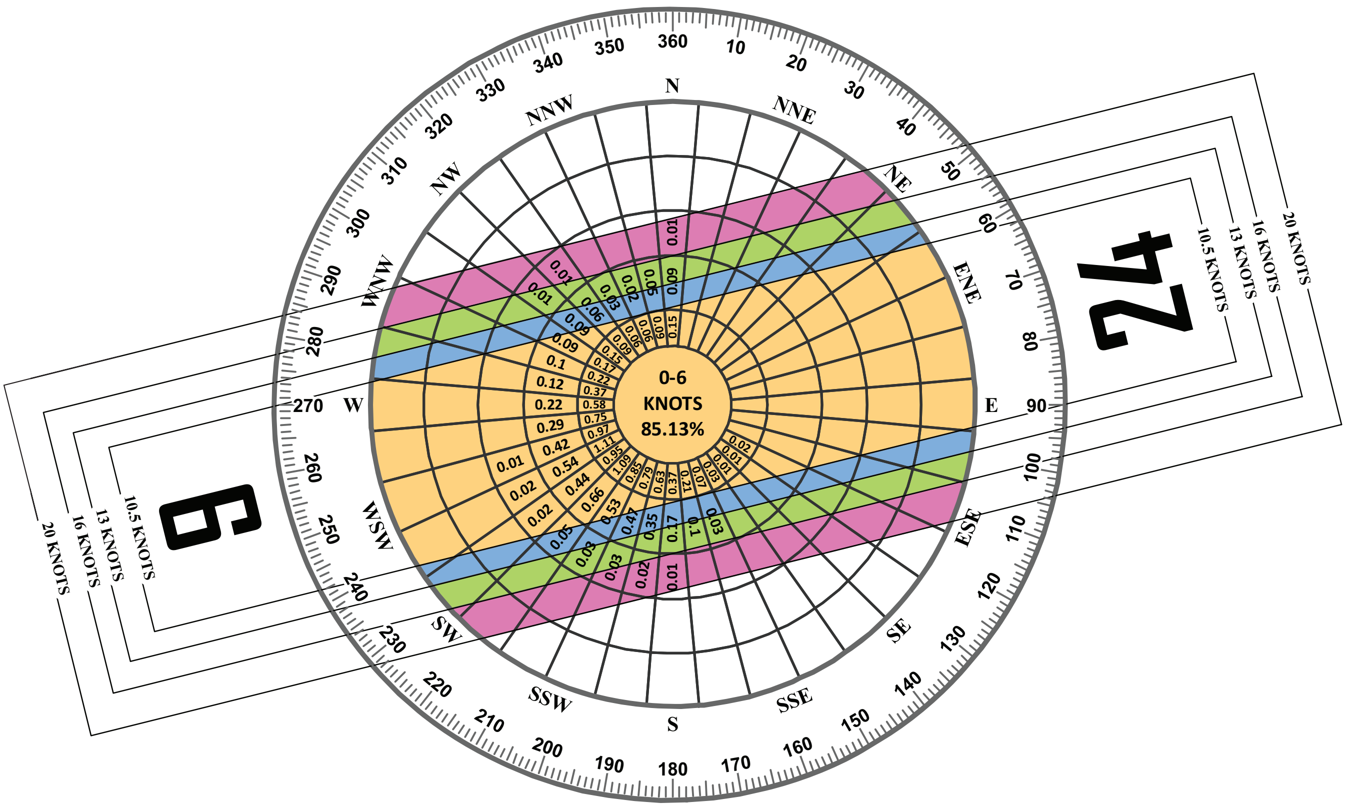
RDC	Allowable Crosswind Component
A-I and B-I (includes small aircraft)	10.5 knots
A-II and B-II	13 knots
A-III and B-III C-I through D-III	16 knots
A-IV and B-IV C-IV through C-VI D-IV through D-VI E-I through E-VI	20 knots

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

Exhibit 3B presents the all-weather and instrument flight rules (IFR) wind roses for the airport. The previous 10 years of wind data[1] was obtained from the on-airport automated weather observation station (AWOS) and has been analyzed to identify wind coverage provided by the existing runway orientations. At PAN, the orientation of the runway provides 97.75 percent coverage for the 10.5-knot component and greater than 99 percent coverage for 13-, 16-, and 20-knot components in all weather conditions. In IFR conditions, the runway provides 97.44 percent coverage for the 10.5-knot crosswind component, and greater than 98.5 percent coverage in 13-knot components and greater. Thus, the current runway orientation at PAN provides adequate wind coverage for all weather conditions.

[1] 206,865 observations were collected for the period January 1, 2013 through December 31, 2022.

ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 6/24	97.75%	99.10%	99.85%	99.98%



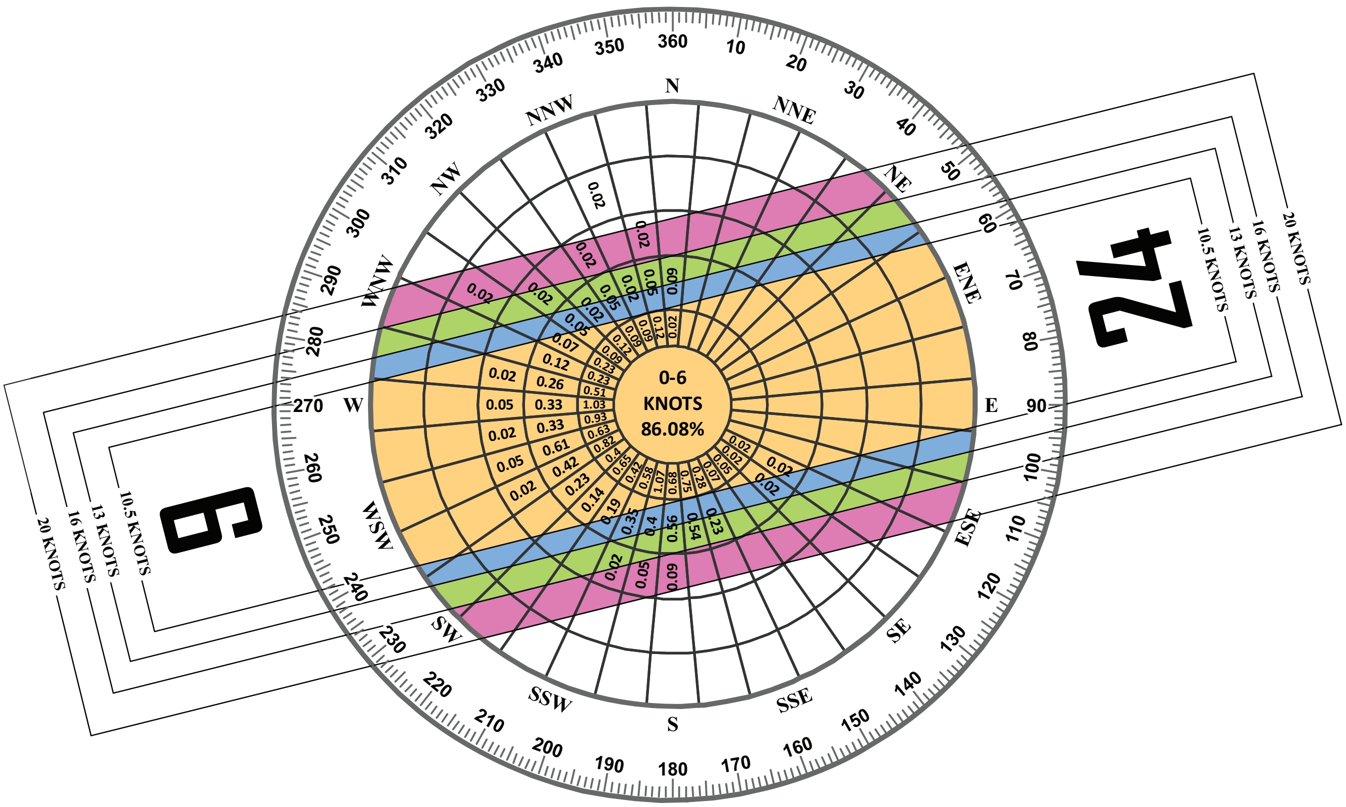
SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Payson Airport
Payson, Arizona

OBSERVATIONS:
206,865 All Weather Observations
Jan. 1, 2013 - Dec, 31 2022

Exhibit 3B
WIND ROSES

IFR WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 6/24	97.44%	98.54%	99.65%	99.93%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Payson Airport
Payson, Arizona

OBSERVATIONS:
4,705 IFR Observations
Jan. 1, 2013 - Dec, 31 2022

Runway Designations

A runway's designation is based upon its magnetic headings, which are determined by the magnetic declination for the area. The magnetic declination near PAN is 9° 42' E ± 0° 6' W per year. The runway has a true heading of 076°/256°. Adjusting for the magnetic declination, the current magnetic heading of the runway is 066°/246°, which would result in a runway designation of 7-25. As a result, consideration should be given to redesignating the runway as Runway 7-25. Any re-designation should be coordinated with FAA to ensure its necessity and that all appropriate publications are updated. If it is confirmed that the runway should be re-designated, new runway end designation markings can be incorporated concurrent with a future pavement rehabilitation project.

Runway Length

AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. The determination of runway length requirements for the airport is based on five primary factors:

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

The mean maximum daily temperature of the hottest month for PAN is 92.5 degrees Fahrenheit (F), which occurs in July. The airport elevation is 5,156.8 feet mean sea level (MSL). Runway 6-24 has a gradient of 0.33 percent, which conforms to FAA design standards for gradient.

Airplanes operate on a wide variety of available runway lengths. Many factors will govern the sustainability of runway lengths for aircraft, such as elevation, temperature, wind, aircraft weight, wing flap settings, runway condition (wet or dry), runway gradient, vicinity airspace obstructions, and any special operating procedures. Airport operators can pursue policies that maximize the sustainability of the runway length. Policies such as area zoning and height and hazard restricting can protect an airport's runway length. Airport ownership (fee simple easement) of land leading to the runway ends reduces the possibility of natural growth or man-made obstructions. Planning for runways should include an evaluation of aircraft types expected to use the airport now and in the future. Future planning should be realistic, supported by the FAA-approved forecasts, and based on the critical aircraft (or family of aircraft).

General Aviation Aircraft

Most operations occurring at PAN are conducted using smaller GA aircraft weighing less than 12,500 pounds. Following guidance from AC 150/ 5325-4B, to accommodate 95 percent of these small aircraft with less than 10 passenger seats, a runway length of 6,500 feet is recommended. For 100 percent of these small aircraft, a runway length of 6,600 feet is recommended. For small aircraft with 10 or more passenger seats, 6,600 feet of runway length is recommended.

The airport is also utilized by aircraft weighing more than 12,500 pounds, including small- to medium-sized business jet aircraft. Runway length requirements for business jets weighing less than 60,000 pounds have also been calculated. These calculations take into consideration the runway gradient and landing length requirements for contaminated runways (wet). Business jets tend to need greater runway length when landing on a wet surface because of their increased approach speeds. AC 150/5325-4B stipulates that runway length determination for business jets consider a grouping of airplanes with similar operating characteristics. The AC provides two separate "family groupings of airplanes," each based upon their representative percentage of aircraft in the national fleet. The first grouping is those business jets that make up 75 percent of the national fleet, and the second group is those making up 100 percent of the national fleet. **Table 3D** presents a partial list of common aircraft in each aircraft grouping. A third group considers business jets weighing more than 60,000 pounds. Runway length determination for these aircraft must be based on the performance characteristics of the individual aircraft.

Table 3D | Business Jet Categories for Runway Length Determination

Aircraft	MTOW (lbs.)
75 Percent of the National Fleet	
Lear 35	20,350
Lear 45	20,500
Cessna 550	14,100
Cessna 560XL	20,000
Cessna 650 (VII)	22,000
IAI Westwind	23,500
Beechjet 400	15,800
Falcon 50	18,500
75-100 Percent of the National Fleet	
Lear 55	21,500
Lear 60	23,500
Hawker 800XP	28,000
Hawker 1000	31,000
Cessna 650 (III/IV)	22,000
Cessna 750 (X)	36,100
Challenger 604	47,600
IAI Astra	23,500
Greater than 60,000 Pounds	
Gulfstream II	65,500
Gulfstream IV	73,200
Gulfstream V	90,500
Global Express	98,000
Gulfstream 650	99,600
MTOW: Maximum Takeoff Weight	

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

Table 3E presents the results of the runway length analysis for business jets developed following the guidance provided in AC 150/5325-4B. To accommodate 75 percent of the business jet fleet at 60 percent useful load, a runway length of 7,100 feet is recommended. This length is derived from a raw length of 6,885 feet that is adjusted, as recommended, for runway gradient and consideration of landing length needs on a contaminated runway (wet and slippery). To accommodate 100 percent of the business jet fleet at 60 percent useful load, a runway length of 11,200 feet is recommended.

Table 3E | Runway Length Requirements

Fleet Mix Category	TAKEOFF LENGTHS		LANDING LENGTHS	Final Runway Length
	Raw Runway Length from FAA AC	Runway Length with Gradient Adjustment (+360')	Wet Surface Landing Length for Jets (+15%)*	
75% of fleet at 60% useful load	6,885	7,067	5,500	7,100
100% of fleet at 60% useful load	11,000	11,182	5,500	11,200
75% of fleet at 90% useful load	8,600	8,782	7,000	8,800
100% of fleet at 90% useful load	11,000	11,182	7,000	11,200

*Max 5,500' for 60% useful load and max 7,000' for 90% useful load in wet condition.

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

Utilization of the 90 percent category for runway length determination is generally not considered by the FAA unless there is a demonstrated need at an airport. This could be documented activity by a business jet operator that flies out frequently with heavy loads. To accommodate 75 percent of the business jet fleet at 90 percent useful load, a runway length of 8,800 feet is recommended. To accommodate 100 percent of business jets at 90 percent useful load, a runway length of 11,200 feet is recommended.

Another method to determine runway length requirements for aircraft at PAN is to examine aircraft flight planning manuals under conditions specific to the airport. Several aircraft were analyzed for takeoff length requirements at a design temperature of 92.5 degrees F at a field elevation of 5,156.8 feet MSL with a 0.33 percent runway grade. **Table 3F** provides a detailed runway length analysis for several of the most common turbine aircraft in the national fleet. This data was obtained from Ultranav software, which computes operational parameters for specific aircraft based on aircraft manual data. The analysis includes the maximum takeoff weight (MTOW) allowable and the percent useful load from 60 percent to 100 percent.

TABLE 3F | Business Aircraft Takeoff Length Requirements – Runway 6-24

		TAKEOFF LENGTH REQUIREMENTS (feet)				
		Useful Load				
Aircraft Name	**MTOW**	**60%**	**70%**	**80%**	**90%**	**100%**
Pilatus PC-12	9,921	3,103	3,390	3,694	4,016	4,355
King Air C90GTi	10,100	3,514	3,777	4,066	4,354	4,642
King Air 200 GT	12,500	4,720	4,846	4,989	Acceleration Go Limited	Acceleration Go Limited
Citation (525) CJ1	10,600	5,974	6,644	Climb Limited	Climb Limited	Climb Limited
King Air 350	15,000	4,997	5,191	5,408	5,823	Climb Limited
Premier 1A	12,500	5,995	6,676	Climb Limited	Climb Limited	Climb Limited
Lear 40	21,000	6,684	7,520	8,515	9,787	Field Limited

Note: Green cells are less than or equal to the length of the runway at PAN; red cells are greater than the length of the runway at PAN.
MTOW - Maximum Takeoff Weight
Climb Limited – Input data is outside the operating limits of the aircraft planning manual.
Acceleration Go Limited – Minimum horizontal distance required to continue the takeoff and climb 50' not met
Field Limited – Takeoff field length limited
Source: Ultranav software

Of the aircraft analyzed, only the Pilatus PC-12 and the King Air 90 are capable of departing at MTOW on the existing runway length during hot weather. The King Air 200 and 350 can take off with useful loads up to 80 percent, while the Citation CJ1, the Premier 1A, and the Lear 40 cannot take off with 60 percent or greater loads. Several of the aircraft become limited due to operational constraints relating to climb out or acceleration requirements.

Table 3G presents the runway length required for landing under three operational categories: Title 14 Code of Federal Regulations (CFR) Part 25, CFR Part 135, and CFR Part 91k. CFR Part 25 operations are those conducted by individuals or companies which own their aircraft. CFR Part 135 applies to all for-hire charter operations, including most fractional ownership operations. CFR Part 91k includes operations in fractional ownership which utilize their own aircraft under direction of pilots specifically assigned to said aircraft. Part 91k and Part 135 rules regarding landing operations require operators to land at the destination airport within 60 percent of the effective runway length. An additional rule allows for operators to land within 80 percent of the effective runway length if the operator has an approved destination airport analysis in the airport's program operating manual. The landing length analysis conducted accounts for both scenarios.

TABLE 3G | Business Aircraft Landing Length Requirements – Runway 6-24

		LANDING LENGTH REQUIREMENTS (feet)					
		Dry Runway Condition			Wet Runway Condition		
Aircraft Name	**MLW**	**Part 25**	**80% Rule**	**60% Rule**	**Part 25**	**80% Rule**	**60% Rule**
King Air 350	15,000	3,203	4,004	5,338	3,683	4,604	6,138
Lear 40	19,200	3,359	4,199	5,598	4,387	5,484	7,312
Citation (525) CJ1	9,800	3,421	4,276	5,702	4,682	5,853	7,803
Premier 1A	11,600	3,943	4,929	6,572	5,156	6,445	8,593
King Air C90GTi	9,600	1,639	2,049	2,732	N/A	N/A	N/A
King Air 200 GT	12,500	1,441	1,801	2,402	N/A	N/A	N/A
Pilatus PC-12	9,921	2,215	2,769	3,692	N/A	N/A	N/A

Note: Green cells are less than or equal to the length of the runway at PAN; red cells are greater than the length of the runway at PAN.
MLW - Maximum Landing Weight
N/A – Not Applicable. Turboprop aircraft landing lengths are not adjusted for wet runway conditions
Source: Ultranav software

The landing length analysis shows that all Part 25 and Part 91k operations can land on the available runway length at PAN during dry runway conditions, as well as about half of the aircraft analyzed if they were operating under Part 135. During wet or contaminated runway conditions, Part 25 operations can land, but fewer aircraft are able to operate under Part 91k. None of the aircraft evaluated meet the landing length requirements under Part 135.

Runway Length Summary

Many factors are considered when determining appropriate runway length for safe and efficient operations of aircraft at PAN. The airport should strive to accommodate smaller business jets and turboprop aircraft to the greatest extent possible as demand would dictate. Runway 6-24 is currently 5,504 feet long and, as detailed in the tables above, can accommodate several of the more common business jets operating at PAN under moderate loading conditions.

Justification for any runway extension to meet the needs of turbine aircraft would require regular use on the order of 500 annual itinerant operations. This is the minimum threshold required to obtain FAA grant funding assistance. The Citation CJ1, which has similar operating characteristics to the existing/ultimate critical aircraft, the Citation M2, is unable to operate on the existing runway length at even 60 percent useful load, and becomes climb limited at 80 percent useful load. With many of the turbine aircraft currently using and anticipated to use the runway at PAN unable to operate when taking on greater useful loads, runway extension options should be considered; however, given the existing land uses and constraints (i.e., Mazatzal Mountain Residential Airpark and Sky Park Industrial Park to the west, roads and housing to the east, and a significant decrease in elevation east of the Runway 24 threshold), a runway extension is unlikely to garner support locally or with the FAA. Nevertheless, the alternatives in the next chapter will examine potential extensions up to 6,000 feet to Runway 6-24, while considering appropriate safety design standards (these standards will be detailed later in this chapter).

Runway Width

Runway width design standards are primarily based on the critical aircraft but can also be influenced by the visibility minimums of published instrument approach procedures. For Runway 6-24, existing/ultimate RDC B-I(Small)-5000 design criteria stipulate a runway width of 60 feet. At 75 feet wide, Runway 6-24 exceeds the width requirement. While the additional width provides added safety enhancements for aircraft that operate at the airport, it is likely that the FAA will only participate in maintaining the recommended width of 60 feet for Runway 6-24. Future runway maintenance/rehabilitation projects should account for the potential that the airport sponsor may be responsible for maintaining the additional width beyond the standard on the runway in the event it wants to maintain 75 feet.

Pavement Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft of varying weights. The FAA reports the pavement strength for Runway 6-24 as 40,000 pounds for single wheel aircraft (S), 50,000 pounds for dual wheel aircraft (D), and 100,000 pounds for dual tandem wheel aircraft (2D). The strength rating of a runway does not preclude aircraft weighing more than the published strength rating from using the runway. All federally obligated airports must remain open to the public, and it is typically up to the pilot of the aircraft to determine if a runway can support their aircraft safely. An airport sponsor cannot restrict an aircraft from using the runway simply because its weight exceeds the published strength rating. On the other hand, the airport sponsor has an obligation to properly maintain the runway and protect the useful life of the runway, typically for 20 years.

The strength rating of a runway can change over time. Regular usage by heavier aircraft can decrease the strength rating, while periodic runway resurfacing can increase the strength rating. The current runway strength rating on Runway 6-24 is adequate to accommodate the aircraft that currently operate at the airport. The existing/ultimate critical aircraft, represented by the Citation M2, can weigh 10,700 pounds on single-wheel main landing gear; therefore, the existing pavement strength is sufficient throughout the planning period.

Runway Line-of-Sight and Gradient

The FAA has instituted various line-of-sight requirements to facilitate coordination among aircraft and between aircraft and vehicles that are operating on active runways. This allows departing and arriving aircraft to verify the location and actions of other aircraft and vehicles on the ground that could create a conflict.

Line-of-sight standards for an individual runway are based on whether there is a parallel taxiway available. When a full-length parallel taxiway is available, thus facilitating faster runway exit times, then any point five feet above the runway centerline must be mutually visible with any other point five feet above the runway centerline that is located at less than half the length of the runway. Runway 6-24 meets the line-of-sight standard.

The surface gradient of a runway affects aircraft performance and pilot perception. The surface gradient is the maximum allowable slope for a runway. For runways designated for approach categories A and B, the maximum longitudinal grade is 2.0 percent. The Runway 24 end is 18.2 feet higher than the Runway 6 end which results in a longitudinal runway gradient of 0.33 percent, which is within standard in both the existing and ultimate conditions.

Blast Pads

Each runway end is equipped with blast pads measuring 150 feet long by 95 feet wide. The blast pads are marked with yellow chevrons and function to reduce the erosive effect of jet blast and propellor wash. FAA AC 150/5300-13B, *Airport Design*, recommends that blast pads for RDC B-I(Small)-5000 measure 60 feet long by 80 feet wide. The blast pads at PAN should be maintained throughout the planning period; however, as they exceed the recommended dimensional standard, pavement maintenance and rehabilitation associated with the additional surface area may be the responsibility of the Town of Payson.

SAFETY AREA DESIGN STANDARDS

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions. These include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (ROFZ), and runway protection zone (RPZ).

The entire RSA, ROFA, and ROFZ must be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. RPZs should also be under airport ownership. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place which ensure the RPZ remains free of incompatible development. The various airport safety areas and their dimensions, as sourced from FAA AC 150/5300-13B, *Airport Design*, are presented graphically on **Exhibit 3C**.

Runway Safety Area

The RSA is defined in FAA AC 150/5300-13B, *Airport Design,* as a “defined area surrounding the runway consisting of a prepared surface suitable for reducing the risk of damage to aircraft in the event of undershoot, overshoot, or excursion from the runway.” The RSA is centered on the runway and dimensioned in accordance with 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 critical aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose, such as runway edge lights or approach lights.

The FAA has placed a higher significance on maintaining adequate RSA at all airports. Under Order 5200.8, effective October 1, 1999, the FAA established the *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 AC 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.

As shown on **Exhibit 3C**, for existing/ultimate RDC B-I(Small)-5000 design standards on Runway 6-24, the FAA calls for the RSA to be 120 feet wide and extend 240 feet beyond the runway ends. At these dimensions, the RSA is fully contained within existing airport property; however, there is vegetation within the RSA east of the Runway 24 threshold, which is considered an obstruction to this safety area. The longitudinal gradient of the RSA east of the Runway 24 threshold is also outside the standard allowable grade. As stated in the above-referenced AC, the allowable longitudinal grade for the first 200 feet of the RSA is between 0 and 3.0 percent, with any slope being downward from the ends. Beyond the first 200 feet, the maximum allowable negative grade is 5.0 percent. At PAN, when measuring from the Runway 24 threshold, the RSA meets the gradient standard for approximately the first 190 feet before the terrain begins to slope downward more significantly. Portions of the last 50 feet (approximately) of the RSA exceed the allowable standard for longitudinal gradient, as depicted on **Figure 3A**. The airport sponsor should consider removal of the vegetation and filling/grading of the RSA to mitigate these non-standard conditions.

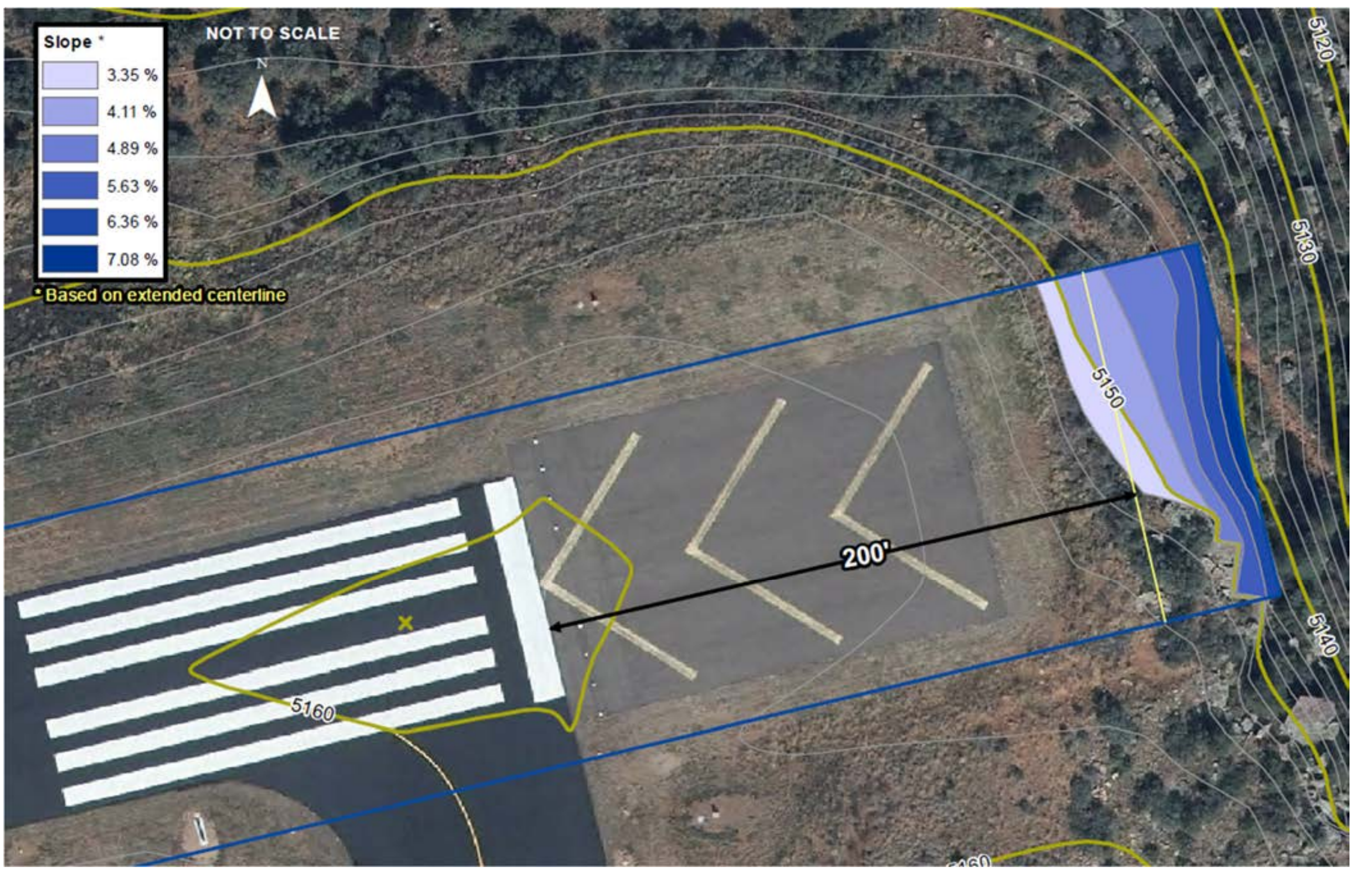
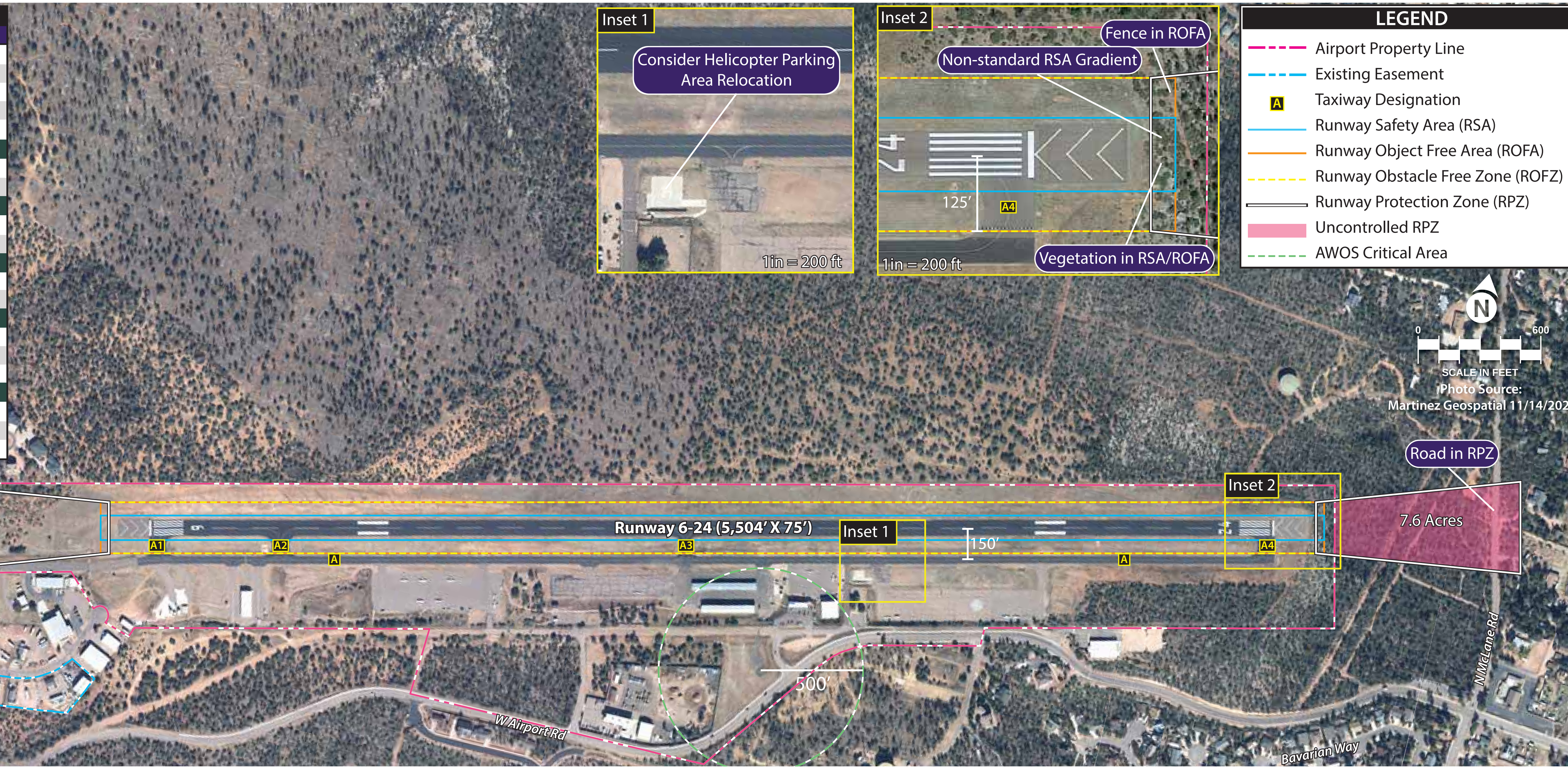


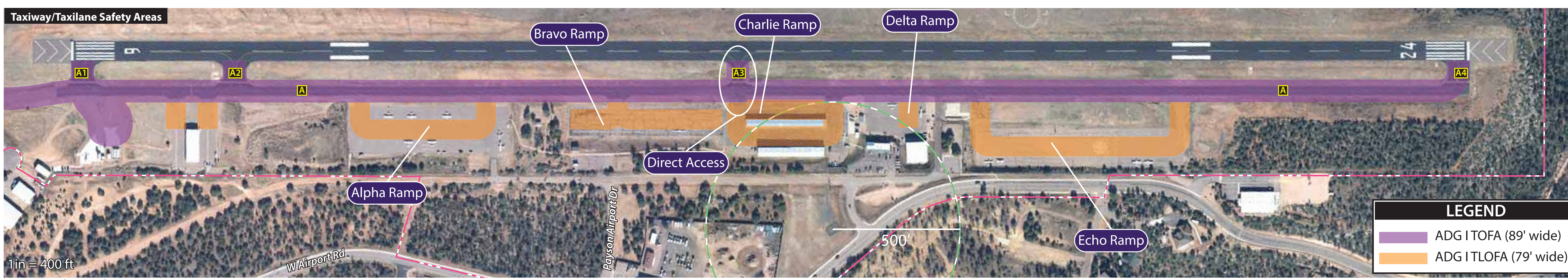
Figure 3A – RSA Gradient

FAA Runway Design Standards

RUNWAY 6-24	Existing/Ultimate
Runway Design Code	B-I(Small)-5000
Visibility Minimums	1-mile
Runway Width	60'
Blast Pad Width	80'
Blast Pad Length	60'
RSA	
Width	120'
Length beyond end	240'
ROFA	
Width	250'
Length beyond end	240'
ROFZ	
Width	250'
Length beyond end	200'
RPZ - Approach and Departure	
Length	1,000'
Inner portion width	250'
Outer portion width	450'
RUNWAY SEPARATION	
Runway Centerline to:	
Parallel Taxiway	150'
Holding Position Marking	125'



Taxiway/Taxilane Safety Areas



*Acreages depicted are approximate

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Runway Object Free Area

The ROFA is "a clear area limited to equipment necessary for air and ground navigation, and provides wingtip protection in the event of an aircraft excursion from the runway." It 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 ROFA does not have to be graded and level like the RSA; instead, the primary requirement for the ROFA is that no object in the ROFA penetrates the lateral elevation of the RSA. The ROFA is centered on the runway, extending out in accordance with the critical aircraft utilizing the runway.

For existing/ultimate RDC B-I(Small)-5000 design standards on Runway 6-24, the FAA calls for the ROFA to be 250 feet wide, extending 240 feet beyond each runway end. In the existing/ultimate condition, the ROFA is fully contained within airport property but is obstructed by vegetation and the airport's perimeter fencing east of Runway 24. Vegetation in the ROFA should be removed, and the perimeter fence relocated beyond the ROFA to mitigate these non-standard conditions.

Obstacle Free Zone

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

For runways serving small aircraft under 12,500 pounds but with approach speeds greater than or equal to 50 knots, the ROFZ is 250 feet wide, centered on the runway, and extends 200 feet beyond the runway ends. This standard applies to Runway 6-24 at PAN. Under the current evaluation with available data, there are no ROFZ obstructions at the airport.

Runway Protection Zone

An RPZ is a trapezoidal area centered on the extended runway centerline beginning 200 feet from the end of the runway. This safety area has been established to protect the end of the runway from airspace penetrations and incompatible land uses. The RPZ dimensions are based upon the established RDC and the approach visibility minimums serving the runway. While the RPZ is intended to be clear of incompatible objects or land uses, some uses are permitted with conditions and other land uses are prohibited. According to AC 150/5300-13B, the following land uses are permissible within the RPZ:

- Farming that meets the minimum buffer requirements.
- Irrigation channels, as long as they do not attract birds.
- Airport service roads, as long as they are not public roads and are directly controlled by the airport operator.

- Underground facilities, as long as they meet other design criteria, such as RSA requirements, as applicable.
- Unstaffed navigational aids (NAVAIDs) and facilities, such as required for airport facilities that are fixed-by-function in regard to the RPZ.
- Above-ground fuel tanks associated with back-up generators for unstaffed NAVAIDS.

In September 2022, the FAA published AC 150/5190-4B, *Airport Land Use Compatibility Planning*, which states that airport owner control over RPZs is preferred. Airport owner control over RPZs may be achieved through:

- Ownership of the RPZ property in fee simple;
- Possessing sufficient interest in the RPZ property through easements, deed restrictions, etc.;
- Possessing sufficient land use control authority to regulate land use in the jurisdiction containing the RPZ;
- Possessing and exercising the power of eminent domain over the property; or
- Possessing and exercising permitting authority over proponents of development within the RPZ (e.g., where the sponsor is a state).

AC 150/5190-4B further states that "control is preferably exercised through acquisition of sufficient property interest and includes clearing RPZ areas (and keeping them clear) of objects and activities that would impact the safety of people and property on the ground." The FAA does recognize that land ownership, environmental, geographical, and other considerations can complicate land use compatibility within RPZs. Regardless, airport sponsors are to comply with FAA Grant Assurances, including but not limited to Grant Assurance 21, Compatible Land Use. Sponsors are expected to take appropriate measures to "protect against, remove, or mitigate land uses that introduce incompatible development within RPZs." For proposed projects that would shift an RPZ into an area with existing incompatible land uses, such as a runway extension or construction of a new runway, the sponsor is expected to have or secure sufficient control of the RPZ, ideally through fee simple ownership. Where existing incompatible land uses are present, the FAA expects sponsors to "seek all possible opportunities to eliminate, reduce, or mitigate existing incompatible land uses" through acquisition, land exchanges, right-of-first-refusal to purchase, agreement with property owners on land uses, easements, or other such measures. These efforts should be revisited during master plan or ALP updates, and periodically thereafter, and documented to demonstrate compliance with FAA Grant Assurances. If new or proposed incompatible land uses impact an RPZ, the FAA expects the airport to take the above actions to control the property within the RPZ, along with adopting a strong public stance opposing the incompatible land uses.

For new incompatible land uses that result from a sponsor-proposed action (i.e., an airfield project such as a runway extension, a change in the critical aircraft that increases the RPZ dimension, or lower minimums that increase the RPZ dimension), the airport sponsor is expected to conduct an Alternatives Evaluation. The intent of the Alternatives Evaluation is to "proactively identify a full range of alternatives and prepare a sufficient evaluation to be able to draw a conclusion about what is 'appropriate and reasonable.'" For incompatible development off-airport, the sponsor should coordinate with the Airports District Office (ADO) as soon as they are aware of the development, with the Alternatives Evaluation conducted within 30 days of becoming aware of the development within the RPZ. The following items are typically necessary in an Alternatives Evaluation:

- Sponsor's statement of the purpose and need of the proposed action (airport project, land use change or development)
- Identification of any other interested parties and proponents
- Identification of any federal, state, and local transportation agencies involved
- Analysis of sponsor control of the land within the RPZ
- Summary of all alternatives considered including:
  - Alternatives that preclude introducing the incompatible land use within the RPZ (e.g., zoning action, purchase, and design alternatives such as implementation of declared distances, displaced thresholds, runway shift or shortening, raising minimums)
  - Alternatives that minimize the impact of the land use in the RPZ (e.g., rerouting a new roadway through less of the RPZ, etc.)
  - Alternatives that mitigate risk to people and property on the ground (e.g., tunnelling, depressing and/or protecting a roadway through the RPZ, implementing operational measures to mitigate any risks, etc.)
- Narrative discussion and exhibits or figures depicting the alternative
- Rough order of magnitude cost estimates associated with each alternative, regardless of potential funding sources
- A practicability assessment based on the feasibility of the alternative in terms of cost, constructability, operational impacts, and other factors.

Once the Alternatives Evaluation has been submitted to the ADO, the FAA will determine whether or not the sponsor has made an adequate effort to pursue and give full consideration to appropriate and reasonable alternatives. **The FAA will not approve or disapprove the airport sponsor's preferred alternative; rather, the FAA will only evaluate whether an acceptable level of alternatives analysis has been completed before the sponsor makes the decision to allow or not allow the proposed land use within the RPZ.**

In summary, the RPZ guidance published in September 2022 shifts the responsibility of protecting the RPZ to the airport sponsor. The airport sponsor is expected to take action to control the RPZ or to demonstrate that appropriate actions have been taken. It is ultimately up to the airport sponsor on whether or not to permit existing or new incompatible land uses within an RPZ, with the understanding that they still have grant assurance obligations, and the FAA retains the authority to review and approve or disapprove portions of the ALP that would adversely impact the safety of people and property within the RPZ.

RPZs have been further designated as approach and departure RPZs. The approach RPZ is a function of the Aircraft Approach Category (AAC) and approach visibility minimums associated with the approach runway end. The departure RPZ is a function of the AAC and departure procedures associated with the runway. For a particular runway end, the more stringent RPZ requirements (usually associated with the approach RPZ) will govern the property interests and clearing requirements that the airport sponsor should pursue.

As shown on **Exhibit 3C**, portions of both RPZs extend beyond airport property in the existing and ultimate conditions, totaling approximately 9.4 acres of uncontrolled property. In addition to being uncontrolled, both RPZs encompass public roadways – Earhart Parkway and W. Bravo Taxiway to the west and N. McLane Road to the east. As mentioned previously, public roadways are considered incompatible uses within an RPZ; however, the FAA can opt to "grandfather" the condition so that no corrective action is necessary. It should be noted that a change to the runway environment that alters the size of the RPZ may negate the "grandfathered" condition. The Runway 6 RPZ also extends over and encompasses a portion of a building within the Sky Park Industrial Park, which may also be considered an incompatible land use. The alternatives discussion in the next chapter will explore options for the airport to gain control over each of the RPZs and mitigate incompatibilities.

SEPARATION STANDARDS

There are several other standards related to separation distances from runways and taxiways. Each of these is designed to enhance the safety of the airfield.

Runway/Taxiway Separation

The design standard for the separation between runways and parallel taxiways is a function of the critical aircraft and the instrument approach visibility minimums. The separation standard for Runway 6-24 in the existing/ultimate condition [RDC B-I(Small)-5000] is 150 feet from the runway centerline to the parallel taxiway centerline. Parallel Taxiway A is currently separated from the runway by 150 feet.

It should be noted that previous analyses determined that an ultimate RDC of B-II-5000 should be planned. The runway/taxiway separation standard for an RDC B-II-5000 runway is 240 feet, exceeding the current separation by 90 feet. As described previously in Chapter Two, current data suggests an RDC of B-I(Small)-5000 is now a more reasonable planning standard, given the current operational fleet mix and projected activity over the next 20 years. As such, Taxiway A meets FAA design standards in the existing and ultimate conditions and should be maintained 150 feet from Runway 6-24, centerline to centerline, throughout the planning period of this master plan.

Hold Line Position Separation

Hold line position markings are placed on taxiways leading to runways. When instructed, pilots are to stop short of the holding position marking line. The existing and ultimate design standard calls for holding positions to be separated from the runway centerline by 125 feet. At PAN, hold line position markings are situated 125 feet from the runway centerline, meeting existing and ultimate design standards.

Aircraft Parking Area Separation

According to FAA AC 150/5300-13B, aircraft parking positions should be located to ensure that aircraft components (wings, tail, and fuselage) do not:

1. Conflict with the object free area for adjacent runway or taxiways:
    a. Runway Object Free Area (ROFA)
    b. Taxiway Object Free Area (TOFA)
    c. Taxilane Object Free Area (TLOFA)

2. Violate any of the following aeronautical surfaces and areas:
    a. Runway approach or departure surface
    b. Runway Visibility Zone (RVZ)
    c. Runway Obstacle Free Zone (ROFZ)
    d. Navigational aid equipment critical areas

Existing aircraft parking positions at PAN are located on each of the five aircraft parking ramps. The nearest marked parking position to the parallel taxiway is located on Delta ramp, identified on **Exhibit 3C**, and is approximately 52 feet from the Taxiway A centerline. In their existing locations, each of the marked aircraft parking positions are clear of the safety areas and aeronautical surfaces and areas detailed above. It should be noted that the north tiedown on the southeast corner of Charlie ramp is just outside of the ADG I TLOFA, and an aircraft parked in this location may obstruct this TLOFA, depending on the size of the aircraft. **Figure 3B** highlights this area.

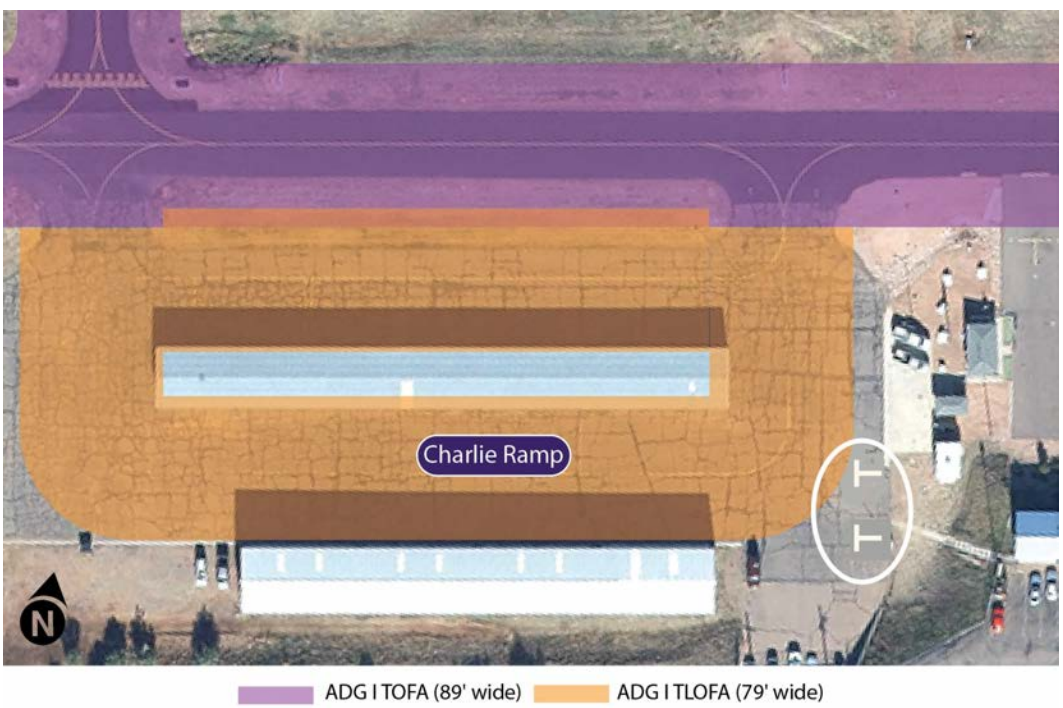

Figure 3B – Aircraft Parking Positions

TAXIWAYS

The design standards associated with taxiways are determined by the Taxiway Design Group (TDG) or the ADG of the critical aircraft. As determined previously, the applicable ADG for Runway 6-24 is ADG I(Small). **Table 3H** presents the various taxiway design standards related to ADG I. The table also shows those taxiway design standards related to TDG. The TDG standards are based on the Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance of the critical aircraft expected to use those taxiways. Different taxiway and taxilane pavements can and should be planned to the most appropriate TDG design standards based on usage.

The current design for taxiways serving the runway is TDG 2A, based upon the Beechcraft King Air 90/100, which dictates a width of 35 feet. Currently, the entire taxiway system at PAN is at least 35 feet wide, with the exception of Taxiway A3, which is 30 feet wide at its narrowest point. It should be noted that the TDG associated with the existing/ultimate critical aircraft (Citation M2) falls within TDG 1A, which calls for 25-foot-wide taxiways. While the greater width currently offered at PAN provides an added safety margin for aircraft operating at the airport, the FAA may elect not to fund regular pavement maintenance for the portions of taxiway pavement that exceed the standard. If the airport chooses to maintain the taxiways at their current widths, the costs may need to come from a local funding source rather than federal or state grant monies. Certain portions of the landside area that are utilized exclusively by small aircraft, such as the T-hangar areas, should adhere to TDG 1A/1B standards.

Table 3H | Taxiway Dimensions and Standards

STANDARDS BASED ON WINGSPAN	ADG I	
Taxiway and Taxilane Protection		
Taxiway Safety Area width (TSA)	49’	
Taxiway Object Free Area width (TOFA)	89’	
Taxilane Object Free Area width (TLOFA)	79’	
Taxiway and Taxilane Separation		
Taxiway Centerline to Parallel Taxiway Centerline	70’	
Taxiway Centerline to Fixed or Moveable Object	44.5’	
Taxilane Centerline to Parallel Taxilane Centerline	64’	
Taxilane Centerline to Fixed or Moveable Object	39.5’	
Wingtip Clearance		
Taxiway Wingtip Clearance (feet)	20’	
Taxilane Wingtip Clearance (feet)	15’	
STANDARDS BASED ON TDG	**TDG 1A/B**	**TDG 2A/B**
Taxiway Width Standard	25’	35’
Taxiway Edge Safety Margin	5’	7.5’
Taxiway Shoulder Width	10’	15’

ADG: Airplane Design Group
TDG: Taxiway Design Group
Note: All dimensions in feet

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

Exhibit 3C depicts the TOFA and TLOFA, which are based upon ADG I standards. The TOFA for taxiways serving Runway 6-24 is 89 feet wide, while the TLOFA for taxilanes serving hangar areas is 79 feet wide. Like the ROFA, these areas should be cleared of objects and parked aircraft except for objects needed for air navigation or aircraft ground maneuvering purposes. The TOFAs associated with the airfield taxiways and TLOFAs associated with hangar areas are clear of obstructions. The exception to this is the TLOFA between the hangars on Charlie ramp, which was depicted previously on **Figure 3B**. Currently, there is approximately 70 feet of separation between the hangars, which is nine feet less than a standard ADG I TLOFA. However, taxilanes can be designed based on the types of aircraft using that pavement. At PAN, the taxilane on Charlie ramp is utilized exclusively by the aircraft based in the T-hangars and linear box hangar facilities on the ramp. As such, the TLOFA for this taxilane is based upon the largest wingspan of an aircraft based in one of these hangars. Using the FAA's calculation for reduction of taxilane standards, only aircraft with wingspans 41 feet or less should plan to base in these hangars in order to maintain a clear TLOFA.

Taxiway and Taxilane Design Considerations

FAA AC 150/5300-13B, *Airport Design*, provides guidance on recommended taxiway and taxilane layouts to enhance safety by avoiding runway incursions. A runway incursion is defined as "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." The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation included in the current AC as well as previous FAA safety and design recommendations.

1. **Taxiing Method**: Taxiways are designed for "cockpit over centerline" taxiing with pavement being sufficiently wide to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, upgrading existing intersections should be undertaken to eliminate "judgmental oversteering," which is where the pilot must intentionally steer the cockpit outside the marked centerline in order to assure the aircraft remains on the taxiway pavement.
2. **Curve Design**: Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees, the generally accepted value to prevent excessive tire scrubbing.
3. **Three-Path Concept**: To maintain pilot situational awareness, taxiway intersections should provide a pilot with a maximum of three choices of travel. Ideally, these are right, left, and a continuation straight ahead.
4. **Channelized Taxiing**: To support visibility of airfield signage, taxiway intersections should be designed to meet standard taxiway width and fillet geometry.
5. **Designated Hot Spots and Runway Incursion Mitigation (RIM) Locations**: A hot spot is a location on the airfield with elevated risk of a collision or runway incursion. For areas the FAA designates as a hot spot or RIM location, mitigation measures should be prioritized.
6. **Intersection Angles**: Design turns to be 90 degrees wherever possible. For acute-angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.
7. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.
    - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiway systems simple using the "three-path" concept.

- *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.
- *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold – through a simple reduction in the number of occurrences, and through a reduction in air traffic controller workload.
- *Avoid "High Energy" Intersections*: These are intersections in the middle third of runways. By limiting runway crossings to the first and last thirds of the runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.
- *Increase Visibility*: Right-angle intersections, both between taxiways and runways, provide the best visibility. Acute-angle runway exits provide greater efficiency in runway usage but should not be used as runway entrance or crossing points. A right-angle turn at the end of a parallel taxiway is a clear indication of approaching a runway.
- *Avoid "Dual Purpose" Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway and only a runway.
- *Direct Access*: Do not design taxiways to lead directly from an apron to a runway. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway.
- *Hot Spots*: Confusing intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other hot spots should be corrected as soon as practicable.

8. **Runway/Taxiway Intersections**
   - *Right Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for an acute-angled exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs so they are visible to pilots.
   - *Acute Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high-speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage. The construction of high-speed exits is typically only justified for runways with regular use by jet aircraft in approach categories C and above.
   - *Large Expanses of Pavement*: Taxiways must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, making it difficult to provide proper signage, marking, and lighting.

9. **Taxiway/Runway/Apron Incursion Prevention**: Apron locations that allow direct access into a runway should be avoided. Increase pilot situational awareness by designing taxiways in such a manner that forces pilots to consciously make turns. Taxiways originating from aprons and forming a straight line across runways at mid-span should be avoided.
   - *Wide Throat Taxiways*: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and make lighting and marking more difficult.
   - *Direct Access from Apron to a Runway*: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout or no-taxi island that forces pilots to make a conscious decision to turn.

- *Apron to Parallel Taxiway End*: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

The taxiway system at PAN generally provides for the efficient movement of aircraft, and there are no FAA-designated hot spots at the airport; however, there is direct access from Charlie ramp to the runway via Taxiway A3, which is a non-standard condition. Potential solutions to correct this issue will be examined in the alternatives chapter. Analysis in the next chapter will also consider improvements which could be implemented on the airfield to minimize runway incursion potential, improve efficiency, and conform to FAA standards for taxiway design.

Taxilane Design Considerations

Taxilanes are distinguished from taxiways in that they do not provide access to or from the runway system directly. Taxilanes typically provide access to hangar areas and can be planned to varying design standards depending on the type of aircraft utilizing the taxilane, as described previously.

HELIPAD

A 50-foot by 50-foot helipad, designated H1, is located between the terminal apron (Delta ramp) and Echo ramp, approximately 50 feet from the Taxiway A centerline. Through discussions with airport and town staff, consideration should be given to relocating the helipad and designating it as a helicopter parking area. The Delta ramp, which fronts the Crosswinds restaurant, experiences the most significant amount of transient traffic, leading to congestion around H1. The alternatives in the next chapter will examine the potential for closure of H1 and development of a new helicopter parking area.

NAVIGATIONAL AND APPROACH AIDS

Navigational aids are devices that provide pilots with guidance and position information when utilizing the runway system. Electronic and visual guidance to arriving aircraft enhance the safety and capacity of the airfield. Such facilities are vital to the success of an airport and provide additional safety to pilots and passengers using the air transportation system. While instrument approach aids are especially helpful during poor weather, they are often used by pilots conducting flight training and operating larger aircraft when visibility is good.

Instrument Approach Aids

PAN has one published instrument approach – a circling GPS-A approach that is authorized for daytime use only. This area navigation (RNAV) approach has visibility minimums down to 1-mile for Categories A and B aircraft, two miles for Category C aircraft, and three miles for Category D aircraft. Airport management and town officials have indicated a desire for a straight-in GPS approach to Runway 24. There is no ground-based equipment necessary to implement a GPS approach; however, it is the purview and responsibility of the FAA to develop an instrument approach procedure. For planning purposes, the airside alternatives in the next chapter will include the addition of a straight-in GPS approach with visibility minimums down to 1-mile.

Visual Approach Aids

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, electronic visual approach aids are commonly provided at airports. Currently, both ends of Runway 6-24 are equipped with a two-box precision approach path indicator (PAPI-2). As more turbine aircraft begin to operate at the airport, consideration should be given to upgrading the PAPI-2 to a PAPI-4 (four-box system) on each runway end.

Runway end identification lights (REILs) are flashing lights located at the runway threshold end that facilitate rapid identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify the runway thresholds and distinguish the runway end lighting from the 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 more sophisticated approach lighting systems. Both runway ends are equipped with REILs, which should be maintained.

Weather Reporting Aids

PAN has a lighted wind cone and segmented circle located north of the runway, equidistant between Taxiways A3 and A4, as well as supplemental wind cones at both runway ends. The wind cones provide information to pilots regarding wind speed and direction. The segmented circle consists of a system of visual indicators designed to provide traffic pattern information to pilots. The wind cones and segmented circle should be maintained in their current locations through the planning period.

The airport is also equipped with an AWOS, which provides weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur in real time. This information is then transmitted via a designated radio frequency at regular intervals. FAA siting criteria indicate that the AWOS should be located between 1,000 and 3,000 feet from the runway threshold and between 500 to 1,000 feet perpendicular to the runway centerline. The AWOS also has a 500-foot radius critical area that must be kept free of obstructions that could interfere with its sensors. The AWOS should be maintained in its current location through the planning period. While there are buildings and other structures located within the AWOS's 500-foot critical area, the sensors are elevated and the terrain slopes down from the equipment, allowing for an unobstructed signal.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

There are several lighting and pavement marking aids serving pilots using the airport. These aids assist pilots in locating an airport and runway at night or in poor visibility conditions. They also serve aircraft navigating the airport environment on the ground when transitioning to/from aircraft parking areas to the runway.

Airport Identification Lighting | PAN's rotating beacon is located on the south side of the field, southwest of Crosswinds restaurant. The beacon is in good working order and should be maintained throughout the planning period.

Runway and Taxiway Lighting | Runway 6-24 is equipped with a medium intensity runway lighting (MIRL) system. This system is adequate and should be maintained. The taxiway system is equipped with medium intensity taxiway lighting (MITL). This system is also adequate and should be maintained. Planning should consider expansion of the MIRL and MITL systems if/when new pavements are constructed.

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 the runway and taxiway systems on the airfield. The signage system includes lighted runway and taxiway designations, routing/directional, and noise abatement/elevation signage. All these signs should be maintained throughout the planning period.

It should be noted that many airports are transitioning to light emitting diode (LED) systems. LEDs have many advantages, including lower energy consumption, longer lifespan, increased durability, reduced size, greater reliability, and faster switching. While a larger initial investment is required upfront, the energy savings and reduced maintenance costs will outweigh any additional costs in the long run. At PAN, the taxiway lighting, REILs, and west side PAPIs are LED, while the runway lighting and east side REILs are incandescent bulbs. When these systems need to be repaired/replaced, consideration should be given to upgrading them to LED systems.

Pavement Markings | Runway markings are typically designed to the type of instrument approach available on the runway. FAA AC 150/5340-1K, *Standards for Airport Markings*, provides guidance necessary to design airport markings. Both runway ends are equipped with non-precision markings. These runway markings should be maintained throughout the long-term planning horizon.

A summary of the airside facilities at PAN is presented on **Exhibit 3D**.

LANDSIDE FACILITY 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 element was examined in relation to projected demand to identify future landside facility needs. At PAN, this includes components for general aviation needs such as:

- General Aviation Terminal Facilities and Auto Parking
- Aircraft Storage Hangars
- Aircraft Parking Aprons
- Airport Support Facilities

Projections made for aircraft storage hangars, aircraft parking aprons, and marked parking positions are based upon the number of aircraft currently based and forecast to base on the airport property over the 20 years. Aircraft based outside the airport's property have not been forecast, and thus are not

CATEGORY	EXISTING	ULTIMATE
Runways	***6-24***	***7-25***
Runway Design Code (RDC)	B-I(Small)-5000	B-I(Small)-5000
Dimensions	5,504' x 75'	Consider extension; maintain width if feasible
Pavement Strength	40,000 lbs S | 50,000 lbs D | 100,000 lbs 2D	Maintain
Safety Areas		
RSA	Obstructions present (vegetation) - mitigation measures required	Remove obstructions; grade RSA
ROFA	Obstructions present (vegetation and perimeter fencing) - mitigation measures required	Remove/relocate obstructions
ROFZ	Standard ROFZ	Maintain
RPZ	Portions of both RPZs uncontrolled and contain public roads; building in Runway 6 RPZ - mitigation measures may be necessary	Analyze mitigation options in Alternatives
Taxiways		
Design Group	2A	Maintain
Parallel Taxiway	Taxiway A	Maintain
Parallel Taxiway Separation from Runway	150'	Maintain
Widths	Taxiway A 35' | Connectors 30'-80'	Maintain
Holding Position Separation	125'	Maintain
Notable Conditions	Direct Access from Charlie Ramp via Taxiway A3	Consider Corrective Measures
Navigational and Weather Aids		
Instrument Approaches	Circling GPS-A (daytime use only)	Consider straight-in GPS approach
Weather Aids	AWOS, wind cones, rotating beacon	Maintain equipment in existing locations
Approach Aids	PAPI-2 & REILS on both runway ends	Consider upgrade to PAPI-4; maintain REILs
Lighting and Marking		
Runway Lighting	MIRL	Maintain
Runway Marking	Non-precision on both runway ends	Maintain
Taxiway Lighting	MITL	Maintain

KEY

- **2D -** Dual Tandem Wheel Gear Type
- **AWOS** - Automated Weather Observing System
- **D** - Dual Wheel Landing Gear Type
- **GPS** - Global Positioning System
- **MIRL -** Medium Intensity Runway Lighting
- **MITL** - Medium Intensity Taxiway Lighting
- **REILs** - Runway End Identifier Lights
- **ROFZ -** Runway Obstacle Free Zone
- **ROFA -** Runway Object Free Area
- **RPZ -** Runway Protection Zone
- **RSA -** Runway Safety Area
- **PAPI** - Precision Approach Path Indicator
- **S** - Single Wheel Landing Gear Type

Exhibit 3D
AIRSIDE FACILITY REQUIREMENTS

included in the projections for landside facility requirements. Terminal facilities, auto parking, and other airport support facilities are based on the annual number of operations projected to occur over the planning period.

In addition to landside facility requirements, potential non-aeronautical land uses will also be evaluated. These are portions of airport property that are suitable for non-aviation purposes and can generate revenue for the airport, such as agriculture or industrial. While airport property is generally subject to Airport Improvements Program (AIP) grant assurances, airports can request a release of aeronautical federal obligations for certain areas of property that are not necessary for aviation uses. These requests are facilitated under the *FAA Reauthorization Act of 2018*, Section 163, which governs the FAA's authority over non-aeronautical development.

GENERAL AVIATION TERMINAL SERVICES

The general aviation terminal facilities at an airport are often the first impression of the community that corporate officials and other visitors will encounter. General aviation terminal facilities at an airport provide space for passenger waiting, pilots' lounge, flight planning, concessions, management, storage, and many other various needs. This space is not necessarily limited to a single, separate terminal building, but can include space offered by fixed base operators (FBOs) and other specialty operators for these functions and services. Currently, there is no terminal building at PAN, and some of the general aviation services typically provided in a terminal building are available in an airport operations office.

The methodology used in estimating general aviation terminal facility needs was based on the number of airport users expected to utilize general aviation facilities during the design hour. Space requirements for terminal facilities were based on providing 125 square feet (sf) per design hour itinerant passenger. A multiplier of 1.5 in the short term, increasing to 2.2 in the long term, was also applied to terminal facility needs to better determine the number of passengers associated with each itinerant aircraft operation. This increasing multiplier indicates an expected increase in larger aircraft operations throughout the long term. These operations typically support larger turboprop and jet aircraft, which can accommodate an increasing passenger load factor. Such is the case at PAN, where an increasing number of turbine operations are anticipated.

Table 3J outlines the space requirements for general aviation terminal services at PAN through the long-term planning period. The amount of space currently offered in the airport operations office is approximately 450 sf. As shown in the table, additional terminal space may be needed as early as the short term, with 4,300 sf projected to be needed by the end of the long-term period. Consideration should be given to the addition of a new, dedicated terminal building, sized to accommodate projected demand, and capable of offering a full array of terminal services typically available at a GA airport.

General aviation vehicle parking demands have also been determined for PAN. Space determinations for passengers were based on an evaluation of existing airport use, as well as standards set forth to help calculate projected terminal facility needs. There are currently 47 marked, individual spaces provided at the airport, with 32 spaces at the front of Crosswinds restaurant and 15 spaces in the observation area. Additional unmarked parking is available adjacent to the campground. Most based aircraft owners park near their hangar. As can be seen in the table, vehicle parking is another segment that is anticipated to grow over the course of the planning period, with 59 spaces estimated to be needed by the end of the long term. This includes spaces for itinerant passengers, based aircraft owners, and other visitors to the airport.

Table 3J | General Aviation Terminal Area Facilities

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need
Terminal Services Building (sf)	450	2,300	3,000	4,300
General Aviation Design Hour Passengers		18	24	34
Passenger Multiplier		1.5	1.8	2.2
Visitor/Tenant Vehicle Parking	47	34	46	59

Source: Coffman Associates analysis

AIRCRAFT HANGARS

Utilization of hangar space varies as a function of local climate, security, and owner preference. The trend in general aviation aircraft is toward more sophisticated (and consequently, more expensive) aircraft; therefore, many aircraft owners prefer enclosed hangar space as opposed to outside tiedowns.

The demand for aircraft storage hangars is dependent upon the number and type of aircraft expected to be based at the airport in the future. For planning purposes, it is necessary to estimate hangar requirements based upon forecast operational activity; however, hangar development should be based upon actual demand trends and financial investment conditions.

While most aircraft owners prefer enclosed aircraft storage, several based aircraft will still use outdoor tiedown spaces, usually due to lack of available hangar space, high hangar rental rates, or operational needs. Therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft.

Hangar types vary greatly in size and function. T-hangars, box hangars, and shade hangars are popular with aircraft owners that need to store one private aircraft. These hangars often provide individual spaces within a larger structure or in standalone portable buildings. There is approximately 17,000 sf of T-hangar storage space at the airport. For determining future aircraft storage needs, a planning standard of 1,200 sf per aircraft is utilized for this type of hangar.

Executive box hangars are open-space facilities with no interior supporting structure. These hangars can vary in size between 1,500 and 2,500 sf, with some approaching 10,000 sf. They are typically able to house single engine, multi-engine, turboprop, and jet aircraft, as well as helicopters. Executive box hangar space at PAN is estimated at 9,400 sf. For future planning, a standard of 3,000 sf per turboprop, 5,000 sf per jet, and 1,500 sf per helicopter is utilized for executive box hangars.

Conventional hangars are the large, open-space facilities with no supporting interior structure. These hangars provide for bulk aircraft storage and are often utilized by airport businesses, such as an FBO or an aircraft maintenance operator. Conventional hangars are generally larger than executive box hangars and can range in size from 10,000 sf to more than 20,000 sf. Often, a portion of a conventional hangar is utilized for non-aircraft storage needs, such as maintenance or office space. There are no conventional hangars at PAN. For planning purposes, the same aircraft sizing standards utilized for executive hangars is also utilized for conventional hangars.

Requirements for maintenance/service hangar area have also been calculated. There are two maintenance/service providers on the airport operating out of an executive hangar approximately 6,300 sf in size. To determine service hangar needs, a planning standard of 250 sf per based aircraft has been calculated.

Future hangar requirements for the airport are summarized in **Table 3K**. While some based aircraft will continue to utilize aircraft parking apron space as opposed to enclosed hangar space, the overall percentage of aircraft seeking hangar space is projected to increase during the long-term planning period.

Table 3K | Aircraft Hangar Requirements

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need	Difference
Total On-Airport Based Aircraft	33	37	41	50	+17
Hangar Area Requirements					
T-Hangar (sf)	17,000	26,600	35,600	48,200	+31,200
Executive Box/Conventional Hangar Area (sf)	9,400	18,400	22,900	32,400	+23,000
Service Hangar Area (sf)	6,300	9,300	10,300	12,500	+6,200
Total Hangar Area (sf)	**32,700**	**54,300**	**68,800**	**93,100**	**+60,400**

Source: Coffman Associates analysis

The analysis shows that future hangar requirements indicate a potential need for more than 60,000 sf of new hangar storage capacity through the long-term planning period. This includes a mixture of hangar types, with the largest need projected in the T-hangar category. Due to the projected increase in based aircraft, the existing demand for hangar space, annual general aviation operations, and hangar storage needs, facility planning will consider additional hangars at the airport. It is expected that the aircraft storage hangar requirements will continue to be met through a combination of hangar types.

It should be noted that hangar requirements are general in nature and based upon the aviation demand forecasts. The actual need for hangar space will further depend on the usage within the hangars. For example, some hangars may be utilized entirely for non-aircraft storage, such as maintenance; yet from a planning standpoint, they have an aircraft storage capacity. Therefore, the needs of an individual user may differ from the calculated space necessary.

AIRCRAFT PARKING APRONS

The aircraft parking apron is an expanse of paved area intended for aircraft parking and circulation. Typically, a main apron is centrally located near the airside entry point, such as the terminal building or FBO facility. Ideally, the main apron is large enough to accommodate transient airport users as well as a portion of locally based aircraft. Often, smaller aprons are available adjacent to FBO or specialty aviation service operator (SASO) hangars and at other locations around the airport. The apron layout at PAN generally follows this typical pattern, with Delta and Echo ramps on the east side primarily serving transient users. Charlie ramp, located west of the airport office and Crosswinds, consists mainly of taxilane pavement but does have two tiedowns that are used by transient operators. Farther east, Bravo and Alpha ramps provide dedicated aircraft parking space for both transient and local operators.

To determine future apron needs, a planning criterion of 800 square yards (sy) was used for single and multi-engine itinerant aircraft, while a planning criterion of 1,600 sy was used to determine the area for transient turboprop and jet aircraft. A parking apron should also provide space for locally based aircraft that require temporary tiedown storage. Locally based tiedowns typically will be utilized by smaller single engine aircraft; thus, a planning standard of 650 sy per position is utilized.

The total apron parking requirements are presented in **Table 3L**. Currently, the existing parking aprons at PAN encompass approximately 36,500 sy of space divided among Alpha, Bravo, Delta, and Echo ramps. Using the planning standards described above and factoring in assumptions regarding operational and based aircraft growth, additional apron space is projected to be needed beginning in the short term. By the long term, approximately 57,300 sy of aircraft parking apron pavement is needed.

There are currently 78 marked parking positions available for based and itinerant aircraft at the airport, including the helipad. As shown in the table, the total number of marked parking positions at PAN is sufficient through the long-term; however, dedicated parking should be made available for jets and additional parking provided for helicopters.

Table 3L | Aircraft Parking Apron Requirements

	Available	Short Term	Intermediate Term	Long Term
Aircraft Parking Positions				
Based/Local GA Aircraft	24	19	16	15
Transient GA Aircraft	53	30	44	51
Corporate Jet Aircraft	0	0	1	3
Helicopter	1	1	2	3
Total Parking Positions	**78**	**50**	**63**	**72**
Total Apron Area	**36,500**	**36,700**	**48,800**	**57,300**

Source: Coffman Associates analysis

SUPPORT FACILITIES

Various other landside facilities that play a supporting role in overall airport operations have also been identified. These support facilities include:

- Aviation Fuel Storage
- Perimeter Fencing and Gates

Aviation Fuel Storage

MPG East provides fuel for the airport and owns the two tanks located on the southwest side of the airfield. Each tank, one containing 100LL and one with Jet A fuel, has a storage capacity of 12,000 gallons. Based on historic fuel flowage records from the last three years, the airport pumped an average of 53,112 gallons of Jet A and 79,626 gallons of 100LL per year. Dividing the total fuel flowage by the total number of operations provides a ratio of fuel flowage per operation. Between 2020 and 2022, the airport pumped approximately 1.55 gallons of Jet A per turbine operation and 2.32 gallons of 100LL per piston operation.

Maintaining a 14-day fuel supply would allow the airport to limit the impact of a disruption of fuel delivery. Currently, the airport has enough static fuel storage to meet the 14-day supply criteria for both Jet A and 100LL fuel. Based on these usage assumptions and projected design day operations, no additional storage for either Jet A or 100LL is projected to be needed. **Table 3M** summarizes the forecasted fuel storage requirements through the planning period.

Fuel storage requirements are typically based upon keeping a two-week supply of fuel during an average month; however, more frequent deliveries can reduce the fuel storage capacity requirements. 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. Future aircraft demand experienced at the airport will determine the need for additional fuel storage capacity. It is important that airport personnel work with the town to plan for adequate levels of fuel storage capacity through the long-term planning period of this study. Planning should also consider an additional tank to store unleaded aviation fuel (100UL). The FAA has recently approved the use of 100UL in piston-powered aircraft, although unknowns regarding infrastructure and distribution remain.

Table 3M | Fuel Storage Requirements

			PLANNING HORIZON		
	Capacity	2022 Need	Short-Term	Intermediate-Term	Long-Term
Jet A					
Daily Usage (gal.)	12,000	171	197	214	250
14-Day Supply (gal.)		2,388	2,757	2,996	3,495
Annual Usage (gal.)		62,100	71,700	77,900	90,900
AvGas (100LL)					
Daily Usage (gal.)	12,000	256	295	321	374
14-Day Supply (gal.)		3,580	4,134	4,492	5,240
Annual Usage (gal.)		93,100	107,500	116,800	136,200

Sources: Historic fuel flowage data provided by airport staff; Fuel supply projections prepared by Coffman Associates.

Perimeter Fencing and Gates

Perimeter fencing is used at airports primarily to secure the aircraft operational area. The physical barrier of perimeter fencing provides the following functions:

- Gives notice of legal boundary of the outermost limits of the facility or security-sensitive areas;
- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary;
- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion detection equipment and closed-circuit television (CCTV);
- Deters casual intruders from penetrating the aircraft operations areas on the airport;
- Creates a psychological deterrent;
- Demonstrates a corporate concern for facilities; and
- Limits inadvertent access to the aircraft operations area by wildlife.

As detailed in Chapter One, PAN operations areas are completely enclosed by fencing, including an 8-foot chain link fence topped by 3-strand barbed-wire. Controlled access gates are also available for use at the airport. All fencing and gates should be maintained throughout the planning period and should be regularly inspected to ensure they are functioning properly and are undamaged.

Consideration will be given in the next chapter to the addition of a new gated access road near the air ambulance facilities on the west end of the field. Currently, ambulances accessing the airfield to drop off patients for air transport must drive onto Taxiway A to access the Native Air facilities. In order to better segregate vehicle and aircraft movements, the alternatives will evaluate different access points for emergency vehicle access on the west end.

A summary of the overall general aviation landside facilities is presented in **Exhibit 3E**.

SUMMARY

This chapter has outlined the safety design standards and facilities required to meet potential aviation demand projected at PAN for the next 20 years. In an effort to provide a more flexible master plan, the yearly forecasts from Chapter Two have been converted to planning horizon levels. The short term roughly corresponds to a 5-year timeframe, the intermediate term is approximately 10 years, and the long term is 20 years. By utilizing planning horizons, airport management can focus on demand indicators for initiating projects and grant requests rather than on specific dates in the future.

In Chapter Four, potential improvements to the airside and landside systems will be examined through a series of airport development alternatives. Most of the alternatives discussion will focus on those capital improvements that would be eligible for federal and state grant funds. Other projects of local concern will also be presented. Ultimately, an overall airport development plan that presents a vision beyond the 20-year scope of this master plan will be developed for PAN.

Aircraft Storage Hangar Requirements

	Available	Short Term	Intermediate Term	Long Term
Aircraft to be Hangared	19	24	33	48
T-Hangar Area (sf)	17,000	26,600	35,600	48,200
Executive/Conventional Hangar Area (sf)	9,400	18,400	22,900	32,400
Service/Maintenance Area (sf)	6,300	9,300	10,300	12,500
Total Hangar Storage Area (sf)	**32,700**	**54,300**	**68,800**	**93,100**

Aircraft Parking Apron

	Available	Short Term	Intermediate Term	Long Term
Aircraft Parking Positions	78	50	63	72
Total Public Apron Area (sy)	36,500	36,700	48,800	57,300

General Aviation Terminal Facilities and Parking

	Available	Short Term	Intermediate Term	Long Term
Building Space (sf)	450	2,300	3,000	4,300
Total GA Parking Spaces	47	34	46	59

Support Facilities

	Available	Short Term	Intermediate Term	Long Term
14-Day Fuel Storage - 100LL (Gallons)	12,000	4,134	4,492	5,240
14-Day Fuel Storage - Jet A (Gallons)	12,000	2,757	2,996	3,495

Exhibit 3E
LANDSIDE FACILITY REQUIREMENTS