CHAPTER THREE

FACILITY REQUIREMENTS

FACILITY REQUIREMENTS

To properly plan for the future of Cox Field Airport (PRX), it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve this identified demand. In this chapter, existing components of the airport are evaluated so that the capacities of the overall system are identified. Once identified, the existing capacity is compared to the forecast activity levels to determine where deficiencies currently exist or may be expected to materialize in the future. Once deficiencies in a component are identified, a more specific determination of the approximate sizing and timing of the new facilities can be made.

As indicated earlier, airport facilities include both airfield and landside components. Airfield facilities include those that are related to the arrival, departure, and ground movement of aircraft. The components include:

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

Landside facilities are needed for the interface between air and ground transportation modes. This includes components for general aviation needs such as:

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

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 they may be needed to accommodate forecast demands. Having established these facility require-

ments, alternatives for providing these facilities will be evaluated in Chapter Four to determine the most practical, cost-effective, and efficient direction for future development.

PLANNING HORIZONS

Cost-effective, safe, efficient, and orderly development of an airport should rely more upon actual demand at an airport than 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 for Cox Field Airport that takes into consideration the reasonable range of aviation demand projections prepared in the previous chapter.

It is important to consider that the actual activity at any given time 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 management 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 needs-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 20-year periods used in the previous chapter.

TABLE 3A
Planning Horizon Activity Summary
Cox Field Airport

	2009	Short Term	Intermediate Term	Long Term
BASED AIRCRAFT				
Single Engine	46	50	55	66
Multi-Engine	4	4	4	4
Turboprop	0	1	2	3
Jet	5	6	6	8
Helicopter	1	1	1	2
TOTAL BASED AIRCRAFT	***56***	***62***	***68***	***83***
ANNUAL OPERATIONS				
Itinerant	3,050	4,600	6,400	9,900
Local	5,000	5,850	8,350	12,750
Total	8,050	10,450	14,750	22,650
PEAKING OPERATIONS				
Peak Month (10.7% of annual)	861	1,118	1,578	2,424
Busy Day	40	52	74	113
Design Day	29	37	53	81
Design Hour	5	7	9	14
Annual Instrument Approaches	N/A	138	256	495

DESIGN STANDARDS

The design standards applied to an airport are based on the type of aircraft with the most demanding Airport Reference Code (ARC) expected to regularly use the facility. Regular use is defined in the State of Texas as that aircraft or family of aircraft that will perform at least 250 annual operations.

DESIGN AIRCRAFT

The ARC, as described in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13, Change 16, *Airport Design*, is a coding system to help identify and determine the appropriate design criteria for an individual airport. The ARC correlates the design and layout of the airport to the operational and physical characteristics of the critical design aircraft. The identified critical design aircraft directly influences pertinent safety criteria such as runway length, runway width, separation distances, building setbacks, and the dimensions of required safety areas surrounding the runway and taxiway system.

The ARC has two components. The first component, depicted by a letter, is the aircraft approach category, which relates to aircraft approach speed (operational characteristic). The second component, depicted by a Roman numeral, is the airplane design group (ADG) which relates to aircraft wingspan and tail height (physical characteristics). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities. **Table 3B** presents the ARC criteria.

As an example, a Beech King Air 200 with an approach speed of 103 knots and wingspan of 54.5 feet would have an ARC of B-II, while a larger corporate jet, such as a Cessna 750 Citation X, with an approach speed of 123 knots and a wingspan of 63.6 feet would have an ARC of C-II. **Exhibit 3A** presents examples of ARC categories and their corresponding aircraft type.

TABLE 3B
Airport Reference Code

Aircraft Approach Category		
Category	*Speed*	
A	< 91 Knots	
B	91- < 121 Knots	
C	121- < 141 Knots	
D	141- <166 Knots	
E	>= 166 Knots	
Airplane Design Group[1]		
Group	*Tail Height (ft)*	*Wingspan (ft)*
I	< 20	< 49
II	20- < 30	49- < 79
III	30- < 45	70- < 118
IV	45- < 60	118- < 171
V	60- < 66	171- < 214
VI	66- < 80	214- < 262

Source: FAA AC 150/5300-13, Airport Design
[1] Utilize the most demanding category.

CURRENT CRITICAL AIRCRAFT

As previously discussed, the critical design aircraft is defined as the most demanding category of aircraft which conduct 250 or more operations at the airport each year. 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 and II conduct the majority of operations at Cox Field Airport. Business turboprops and jets with longer wingspans and higher approach speeds also utilize the airport less frequently. While the airport is used by a number of helicopters, they are not included in this determination as they are not assigned an ARC.

As of April 2010, there were 56 based aircraft at PRX. The majority of these are single and multi-engine piston-powered aircraft which fall within approach categories A and B and ADG I. There are five jets based at the airport; however, two of the five are aged fighter jet aircraft and one of these jets is not currently operational. The remaining three business jets include two Cessna Citation 525 models and one Falcon 50. The Cessna 525s and Falcon 50 are all designated as ARC B-II aircraft. As a result, the current critical based aircraft falls in ARC B-II. Next, consideration needs to be given to itinerant business jet operations.

A wide range of transient jet aircraft operate at the airport. Jet operations are typically those that will influence required airport facilities as the critical aircraft. In order to discern the number and type of jet aircraft operations at Cox Field Airport, an analysis of instrument flight plan data was conducted. Flight plan data was acquired for this study from a private subscription service, *Airport IQ*. The data available includes documentation of instrument 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 jet operations at the airport that are not captured by this methodology.

Table 3C presents business jet operations at Cox Field Airport for the calendar years 2005 through 2009. The figures include both private aircraft operators and charter aircraft operated under Code of Federal Regulation (CFR) Federal Aviation Regulations FAR Part 135 (primarily fractional owners and charters). All of these operations would be considered itinerant general aviation operations.

There were a total of 146 business jet aircraft operations recorded by Airport IQ for calendar year 2009. This is down from the period high of 300 operations recorded in 2005. For each year examined, aircraft in the grouping of ARC B-I and B-II represented the majority of business jet operations. In fact, the ARC B-I and B-II groupings range from a low of 74 percent to a high of 85 percent of all logged business jet operations. The declining trend in business jet operations is a definite indicator of the economic recession and high fuel prices indicative of the period.

09MP11-3A-04/12/10

A-I

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

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

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

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

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

- Super King Air 350
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation II**, III, IV, V
- Saab 340
- Embraer 120

A-III, B-III

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

C-I, D-I

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

C-II, D-II

- Cessna Citation III, VI, VIII, X
- **Gulfstream II, III, IV**
- Canadair 600
- ERJ-135, 140, 145
- CRJ-200/ 700

C-III, D-III

- ERJ-170, 190
- CRJ 700/900
- Boeing Business Jet
- **B 737-300 Series**
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- Gulfstream V
- Global Express

C-IV, D-IV

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

D-V

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

Note: Aircraft pictured is identified in bold type.

Exhibit 3A
AIRPORT REFERENCE CODES

TABLE 3C Business Jet Operations Cox Field Airport						
ARC	**Aircraft Type**	**2005**	**2006**	**2007**	**2008**	**2009**
A-I	Eclipse 500	**0**	**0**	**0**	4	**0**
Total A-I		**0**	**0**	**0**	**4**	**0**
B-I	Falcon 10	8	8	6	0	0
B-I	Cessna 500/525	116	130	122	98	64
B-I	Beech 390	0	0	8	2	0
B-I	MU-300	6	4	0	2	2
B-II	Cessna 525A/550	32	34	34	28	22
B-II	Cessna 560/560XL	24	32	26	28	22
B-II	Hawker 800	6	2	0	0	0
B-II	Falcon 20	0	4	0	0	2
B-II	Falcon 50	10	0	0	2	0
B-II	Falcon 2000	10	8	0	0	2
Total B-I and B-II		**212**	**222**	**196**	**160**	**114**
C-I	Beechjet 400	8	12	8	4	4
C-I	IAI 1124 Westwind	4	0	2	0	0
C-I	Lear 24/25	16	2	2	0	0
C-I	Lear 31/35	4	18	4	2	6
C-I	Lear 45	2	6	16	6	2
C-I	Lear 55	4	0	4	0	0
C-II	Cessna 650/680	2	2	6	2	10
C-II	Cessna 750 Citation X	4	4	0	0	6
C-II	Challenger 300/600	0	4	0	2	0
C-II	Hawker 800XP	0	8	0	0	0
C-II	Hawker 1000 Horizon	0	0	0	0	0
C-II	IAI 1125 Astra	0	8	12	0	0
C-II	IAI 1126 Galaxy	2	0	0	2	0
C-II	Falcon 900EX	0	0	2	0	0
C-II	Sabre 65 (NA 265)	0	0	0	2	0
C-II	Rockwell Sabre 80	0	0	0	0	2
Total C-I and C-II		**46**	**64**	**56**	**20**	**30**
D-I	Lear 60	2	2	4	4	2
D-II	Gulfstream II (G-1159)	2	0	0	0	0
D-II	Gulfstream IV (350/450)	4	12	10	0	0
Total DI and D-II		**8**	**14**	**14**	**4**	**2**
Total Business Jet Aircraft Activity		***266***	***300***	***266***	***188***	***146***
Source: Airport IQ IFR flight plan data						

It should be noted, however, that the Airport IQ count did not capture at least one operator. Discussions with the fixed base operator (FBO) indicated that Campbell's Soup will utilize PRX via its Gulfstream V (G-V) aircraft. Neither Campbell's Soup nor the G-V was captured in the data set provided by Airport IQ. As previously noted, the likely reason is that the flight plan was opened or closed in the air and thus not counted for Cox Field Airport. As a result, one should view the figures in **Table 3C** as absolutely minimums and not the sum total of all business jet operations over the period.

In the case at Cox Field Airport, it appears that a family of aircraft defines the existing critical design aircraft when combining a particular approach category and ADG. Based upon the most demanding approach category and design group to regularly utilize the airport, the current critical aircraft for Cox Field Airport is ARC B-II, similar to the Cessna Citation 525 models and Falcon 50 that are based at the airport.

FUTURE CRITICAL AIRCRAFT

The aviation demand forecasts indicate the potential for growth in business jet and turboprop aircraft activity at the airport. This includes the addition of three based jets and three based turboprops through the long term planning period. Itinerant business jet and turboprop activity is projected to follow strong growth, rebounding from current economic conditions. Therefore, business jet and turboprop aircraft will continue to define the critical aircraft parameters for Cox Field Airport through the planning period.

Cox Field Airport is capable of serving the full breadth of piston-powered and turboprop general aviation aircraft. The airport is also capable of serving the full array of business jet aircraft in the fleet today as evidenced by the G-V, which has historically operated at PRX in support of Campbell's Soup flight operations. Future business jet aircraft which will base and/or operate at PRX are projected to mirror current conditions, however, in higher volumes. Larger jet models could base at Cox Field Airport, however, in fewer numbers.

The G-V and Global Express represent the largest commonly used business jets in the fleet today. These aircraft are not projected to represent the airport's critical aircraft unless one or more were to be based at PRX. It is projected, however, that all business jets within ARC C-I through D-II combined could exceed the critical aircraft operational threshold of 250 annual operations at some point in the future. This would include a higher level of aircraft operations by the Learjet family, larger Cessna models such as the Citation X, as well as the Challenger and Gulfstream family of aircraft.

Future airport design will follow the requirements posed by the existing and ultimate design aircraft. FAA and Texas Department of Transportation – Aviation Division (TxDOT) standards for aircraft through ARC B-II are much less stringent than for those in approach categories C and D. With this in mind, it is important for airport planning to consider the potential need for Cox Field Airport to transition from ARC B-II to ARC C/D-II during the planning period of this study.

PRX is somewhat distant from the Dallas/Fort Worth Metroplex and serves as an important economic engine for both Lamar County and the City of Paris, which is the hub for regional commerce and business. Given the historic use of PRX by ARC C-I through D-III aircraft, coupled with the continued and potential increased use by these aircraft, future planning will consider ARC C/D-II as the ultimate critical aircraft. This transition is projected to occur beyond the short term period, and as such, long term planning will factor into the transition of the airport and its facilities to ARC C/D-II design standards.

While the airport in general will be planned to meet ARC C/D-II standards, each runway will be individually analyzed based on function. Primary Runway 17-35 is the longest runway at the airport and is served by the only straight-in instrument approach procedures. As such, Runway 17-35 will be planned to ultimately conform to all applicable ARC C/D-II standards. The crosswind runways will be considered to accommodate small aircraft, especially when crosswinds prohibit the use of Runway 17-35. Having a crosswind runway also provides the vital role of serving all aircraft operations when the primary runway is closed for maintenance or emergencies. As such, at least one crosswind runway will be designed to conform to full ARC B-II standards over the long term planning period.

AIRPORT ROLE

The *Texas Airport System Plan (*TASP*),* revised in June 2007*,* classifies airports in the state by service level and role. The five classifications are: Basic Service, Community Service, Business/Corporate, Reliever, and Commercial Service. PRX is currently classified as a Business/Corporate airport in the TASP and is designated as a general aviation airport in the FAA *National Plan of Integrated Airport Systems* (NPIAS).

According to TxDOT *Policies and Standards*, a Business/Corporate airport, such as PRX, should meet the applicable ARC standard which could range between ARC B-II up to and including ARC D-IV, depending upon actual activity. The existing and projected future ARC for the airport, as previously discussed, falls within TxDOT *Policies and Standards* range for designated Business/Corporate airports.

AIRPORT FUNCTION

In addition to the above defined roles for Texas airports, the TASP further sub-divides airports into functional categories specifically related to the type of use that the airport is expected to accommodate. These functional categories include: access, remote, agricultural, special use, industrial, multi-purpose, regional, reliever, and commercial. **Table 3D** presents the definition of the airport functional categories including the regional classification for Cox Field Airport.

TASP Airport Design Standards

The TASP presents the following minimum design criteria for each defined airport role. As already mentioned, the Cox Field Airport is currently a Business/Corporate airport. **Table 3E** presents the TASP design standards for each airport service role including the role of Business/Corporate airport.

TABLE 3D Texas Airports Functional Category Cox Field Airport		
Category	**Typical ARC**	**Function**
Access	A-I, B-I	Small airports with minimal service.
Remote	A-I, B-I	Very remote facilities supporting oil production, ranching, and medical access.
Agricultural	A-I, B-I	Located in areas of intense agricultural activity.
Special Use	A-I, B-I, B-II, C-II	Seasonal airports typically related to tourism or recreation.
Industrial	B-II Through D-IV	Airport supporting aviation-related business and/or adjacent industrial activity.
Multi-Purpose	A-I, B-I, B-II, C-II	Diversified airport activity.
Regional	***B-II, C-II, C-III***	***Support higher performance aircraft. Support air taxi, commuter and charter activity.***
Reliever	B-II, C-II, C-III, D-II	Designated by the FAA to relieve congestion at commercial airports.
Commercial	C-II Through D-VI	Scheduled passenger service with more than 2,500 annual enplanements.
Source: TxDOT-Division of Aviation: Policies and Standards		

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of different ways. The **hourly capacity** of a runway measures the maximum number of aircraft operations that can take place in an hour. The **annual service volume (ASV)** is an annual level of service that may be used to define airfield capacity needs. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given timeframe. FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, provides a methodology for examining the operational capacity of an airfield for planning purposes. This analysis takes into account specific factors about the airfield.

- **Runway Configuration** – The existing airfield configuration consists of a three-runway system oriented in a triangular fashion. Primary Runway 17-35 is served by a nearly full length parallel taxiway. The crosswind runways are served only by connecting and entrance/exit taxiways. Primary Runway 17-35 is 6,002 feet long by 150 feet wide. Both crosswind runways are 4,624 feet long by 150 feet wide.

- **Runway Use** – Runway use in capacity conditions will be controlled by wind and/or airspace conditions. For Cox Field Airport, the direction of takeoffs and landings are generally determined by the speed and direction of the wind. It is generally safest for aircraft to takeoff and land into the wind, avoiding a crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components during these operations.

  Based upon information received from wind data obtained for the airport, Runway 17-35 is favorably oriented for predominant winds. This is common in the plain states as north/south winds are predominant. Crosswind Runway 14-32 provides the next best runway orientation for winds. Both ends of primary Runway 17-35 are served by at least one published instrument approach procedure. The global positioning system (GPS) localizer performance with vertical guidance (LPV) approach serving Runway 35 provides the lowest minimums at three quarters of a mile visibility.

TABLE 3E
Texas Airport Design Standards
Cox Field Airport

Minimum Standard	Basic Service	Community Service I	Community Service II	Business/Corporate Reliever
Design Standard (ARC)	A-I/B-I	B-I/B-II	B-II	B-II through D-IV
Runway	Length: 95% of the small aircraft fleet	Length: 95% of the small aircraft fleet	Length: 100% of the small aircraft fleet	Length: 75% at 60% useful load
	Width: 60 feet	Width: 60 feet	Width: 75 feet	Width: 75 feet*
	Strength: 12,500 pounds	Strength: 12,500 pounds	Strength: 30,000 pounds	Strength: 30,000 pounds
Taxiway	Runway end turnarounds and access to apron	Runway end turnarounds and access to apron	Partial parallel taxiway	Full-length parallel
Apron	360 s.y. for itinerant and 300 s.y. for based	360 s.y. for itinerant and 300 s.y. for based	360 s.y. for itinerant and 300 s.y. for based	360 s.y. for itinerant and 300 s.y. for based
Approach	Visual	Non-precision, 1-mile visibility	Non-precision, 1-mile visibility	GPS LPV, 3/4-mile visibility
Lighting	MIRL and taxiway turnout lights	MIRL and taxiway turnout lights	MIRL, taxiway centerline or edge reflectors on taxiway to lighted runway	MIRL, taxiway centerline striping or reflectors and turnout lights from the active runway
Visual Aid	Wind indicator, segmented circle, beacon	Lighted wind indicator, segmented circle, rotating beacon, PAPI	Lighted wind indicator, segmented circle, rotating beacon, PAPI	Lighted wind indicator, segmented circle, rotating beacon, PAPI, REIL
Facilities/ Services	Location specific	AWOS, fuel, terminal building	AWOS, fuel, airfield signage, terminal building	AWOS, fuel, lighted airfield signage, terminal building
Typical Aircraft	Cessna 152, Cessna 414	Cessna 414, King Air 200	Cessna King Air 350, Cessna Citation 550	Cessna 750 Citation X, Challengers, Gulfstream

Notes:
MIRL: Medium Intensity Runway Lighting
PAPI: Precision Approach Path Indicator
REIL: Runway End Identification Lights
LPV: Localizer Performance with Vertical Guidance
AWOS: Airport Weather Observation System
ARC: Airport Reference Code
GPS: Global Positioning System
* FAA design standard is 100 feet wide

- **Exit Taxiways** – Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determines the occupancy time of an aircraft on the runway. For Cox Field Airport, those taxiway exits located between 2,000 and 4,000 feet from the runway threshold count in the capacity determination. Operations utilizing all runways at the airport are credited with one exit in both directions.

- **Weather Conditions** – The airport operates under visual flight rules (VFR) approximately 87 percent of the time. Instrument flight rules (IFR) apply when cloud ceilings are between 500 and 1,000 feet, approximately ten percent of the year. Poor visibility conditions (PVC) apply for minimums below 500 feet and one mile. PVC conditions occur three percent of the year.

- **Aircraft Mix** – Aircraft mix for the capacity analysis is defined in terms of four aircraft classes. 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 which would include all business jets (except the very light jets) and most turboprop aircraft. Class D aircraft consists of large aircraft weighing more than 300,000 pounds. The airport does not experience operations by Class D aircraft; however, Class C operations are estimated to be nearly two percent of total annual operations. The remaining operations are by Class A and Class B aircraft.

- **Percent Arrivals** – Percent arrivals generally follow the typical 50/50 percent split.

- **Touch-and-Go Activity** – Current local operations account for approximately 60 percent of total annual operations. This figure will likely remain relatively constant over the planning period.

- **Peak Period Operations** – For the airfield capacity analysis, average daily operations and average peak hour operations during the peak month, as calculated in the previous section, are utilized. Typical operations activity is important in the calculation of an airport's annual service volume 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.

CAPACITY ANALYSIS CONCLUSIONS

Given the factors outlined above, the airfield ASV will range between 150,000 and 200,000 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. The current operation level estimated for PRX represents 5.4 percent of the airfield's ASV, if the ASV is considered at the low end of the typical range (150,000 annual operations). By the end of the planning period, total annual operations (22,650) are expected to represent 15.1 percent of the airfield's ASV considering the lower end of the typical ASV range.

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS) and TxDOT's *Policies and Standards*, indicate 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. Based on current and projected operations developed for this study, improvements specifically designed to enhance capacity do not need to be considered.

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 Cox Field Airport has been analyzed from a number of perspectives, including:

- Runways
- Safety Area Design Standards
- Taxiways
- Airfield Lighting, Marking, and Signage
- Navigational Aids and Instrument Approach Procedures

RUNWAY ORIENTATION

The airport is served by Runway 17-35 oriented in a north-south manner. Crosswind Runway 14-32 is oriented in a northwest-southwest fashion, while crosswind Runway 3-21 is oriented northeast-southwest. For the operational safety and efficiency of an airport, it is desirable for the primary runway to be orientated as closely 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 16, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is computed on the basis of the crosswind 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 for Cox Field Airport was obtained from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Center and is depicted on **Exhibit 3B**.

Singularly, primary Runway 17-35 provides 93.84 percent wind coverage for 10.5 knot crosswinds, 97.03 percent wind coverage at 13 knots, and 99.95 percent coverage at 16 knots. As a result, Runway 17-35 meets the FAA stipulated crosswind component for all but 10.5 knots where it falls short by less than two percent. Runway 14-32 provides the next best singular crosswind coverage at 92.13 percent for 10.5 knots and above 95 percent for all other crosswind components. Runway 3-21 singularly provides only 87.87 percent crosswind coverage for 10.5 knot crosswind components. All three runways combined provide over 99 percent crosswind coverage for all components.

While the FAA expects a single runway to provide 95 percent coverage for all crosswind components, primary Runway 17-35 could offer sufficient coverage if the two crosswind runways were not available. If the airport was not currently served by two crosswind runways, the FAA would likely not participate in constructing a new crosswind runway given the primary runway's crosswind coverage of nearly 95 percent for 10.5 knots. As a result, at least one of the crosswind runways should be planned to remain for use by aircraft up to ARC B-II. Analysis later in this chapter will detail long term planning recommendations for the crosswind runways.

RUNWAY LENGTH

Runway length requirements are based upon five primary elements: airport elevation, the mean maximum daily temperature of the hottest month, runway gradient, critical aircraft type expected to use the runway, and aircraft loading (weight). Aircraft performance declines as elevation, temperature, and runway gradient factors increase. Therefore, these factors increase runway length requirements.

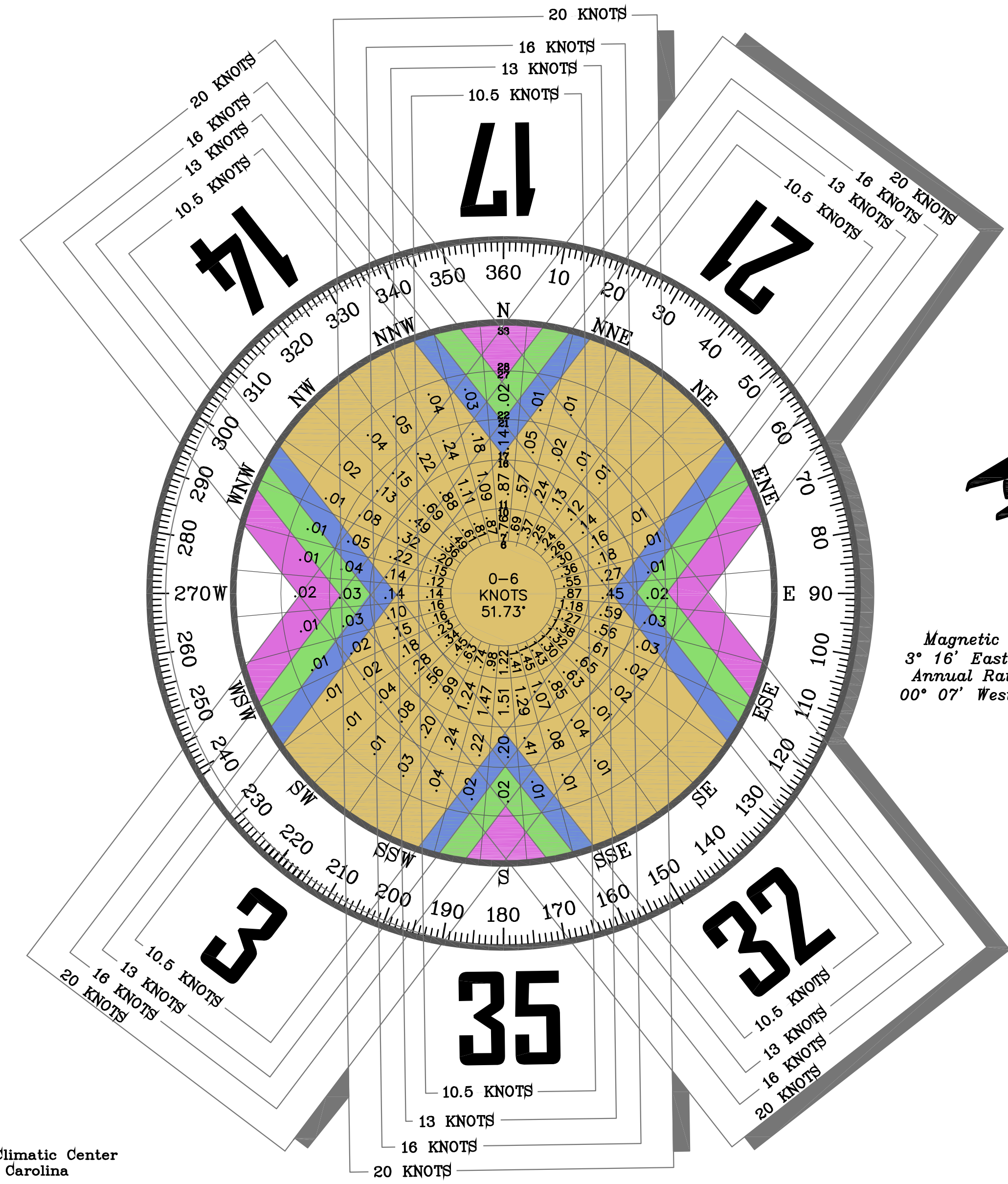
For calculating runway length requirements at Cox Field Airport, the elevation is 547 feet mean sea level (MSL) and the mean maximum daily temperature of the hottest month is 94 degrees Fahrenheit (F) (July/August). The maximum elevation difference in Runway 17-35 is 14.3 feet. The mean maximum temperature is 94 degrees Fahrenheit.

FAA Advisory Circular (AC) 150/5235-4B, *Runway Length Requirements for Airport Design*, provides guidelines to determine runway lengths for civil airports. In conjunction with this AC, the FAA provides a computer program that estimates runway length estimates for several categories of aircraft based on the input factors. **Table 3F** presents the runway length results from the computer program.

The Advisory Circular segregates business jets (large airplanes) into two categories: 1) aircraft that make up 75 percent of the national fleet; and 2) aircraft that make up 100 percent of the national fleet. Small- and medium-size business jets, such as Cessna Citation models 500-650, Dassault Falcon models 10-50, and Learjet models 20-45, make up the first 75 percent of the national fleet. The remaining 25 percent of the fleet includes large business jets, such as

ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 3–21	*87.87%*	*93.81%*	*98.46%*	*99.65%*
Runway 14–32	*92.13%*	*96.36%*	*99.07%*	*99.80%*
Runway 17–35	*93.84%*	*97.03%*	*99.35%*	*99.85%*
Combined All Runways	*99.23%*	*99.84%*	*99.95%*	*99.99%*
Runway 17–35 with 3–21	*95.78%*	*99.33%*	*99.66%*	*99.95%*
Runway 17–35 with 14–32	*97.97%*	*99.20%*	*99.83%*	*99.96%*
Runway 3–21 with 14–32	*98.81%*	*99.79%*	*99.95%*	*99.99%*



Magnetic Declination
3° 16' East (April 2010)
Annual Rate of Change
00° 07' West (April 2010)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Cox Field
Paris, Texas

OBSERVATIONS:
218,963 All Weather Observations
2000–2010

Coffman Associates R:\CAD\HopkinsD\MP\PARIS\Exhibits\Paris Wind\Paris Wind Rose.dwg Printed Date: 5-25-11 08:33:57 AM DHopkins

Exhibit 3B
COX FIELD AIRPORT WIND ROSE

Bombardier Challenger models 600-605, Cessna Citation models 650-750, Learjet models 35-60, and Dassault Falcon models 900-2000.

TABLE 3F
General Aviation Runway Length Analysis
Cox Field Airport

AIRPORT AND RUNWAY DATA	
Airport Elevation	547 feet
Mean daily maximum temperature	94º F
Maximum difference in runway centerline elevation	14.7 feet
Haul length for airplanes of more than 60,000 pounds	1,000 miles
Wet and slippery runways	
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	2,800
95 percent of these small airplanes	3,300
100 percent of these small airplanes	***3,900***
Small airplanes with 10 or more passenger seats	4,500
Business jets of 60,000 pounds or less	
75 percent at 60 percent useful load	***5,500***
100 percent at 60 percent useful load	7,200
75 percent at 90 percent useful load	***5,900***
100 percent at 90 percent useful load	9,200
Business jets of more than 60,000 pounds	***6,200***

Reference: AC 150/5325-4B, Runway Length Requirements for Airport Design

The FAA and TxDOT typically only accept planning for runway length requirements at 60 percent useful load unless specific justification can be made for a need to plan for 90 percent useful load. Planning for jet aircraft at 90 percent useful load is not practicable because many aircraft are weight-restricted during the climb after takeoff. In other words, due to the need to maintain a certain positive climb rate after departure, the aircraft can rarely be fully loaded.

As shown in **Table 3F**, the current length of Runway 17-35 at 6,002 feet meets the runway length requirements for both 75 percent of business jets at 60 percent useful load and 100 percent of business jets at 60 percent useful load. The runway length software program also generalizes the length required for aircraft weighing more than 60,000 pounds based on certain stage or trip lengths. As presented in the table, aircraft that weigh more than 60,000 pounds require 6,200 feet of runway length for 1,000-mile stage lengths. For shorter trip lengths, however, the runway length required is less than 6,000 feet. While some aircraft may be weight-restricted on very hot days, the current length of Runway 17-35 is adequate to serve the vast majority of current and projected operations. As a result, the current length of Runway 17-35 should be maintained at 6,002 feet through the planning period.

As noted in the previous section, only one crosswind runway is necessary to meet the FAA crosswind coverage criteria. The crosswind runway should be capable of meeting the runway length needs of aircraft up to and including ARC B-II. According to **Table 3F**, approximately 3,900 feet of runway length is required to meet the needs of 100 percent of all small aircraft (equivalent to ARC B-II). Both crosswind runways currently measure 4,654 feet. While the lengths of the crosswind runways exceed FAA criteria, the extra length would serve a valuable capacity during periods when primary Runway 17-35 is closed for maintenance, emergencies, etc. As a result, at least one crosswind runway should remain and be maintained at its current length.

CROSSWIND RUNWAYS

Due to the high operational and capital costs of maintaining airfield pavements, the FAA and TxDOT do not participate in grant funding assistance for improvements not deemed justified and/or necessary. Three runways at Cox Field Airport are not required to meet safety requirements outlined by the FAA as evidenced by the wind rose presented on **Exhibit 3B**. In fact, if a new airport were to be constructed on the existing Cox Field Airport site, only one runway would be constructed. Since crosswind runways currently exist at PRX, the FAA and TxDOT will likely only support continued funding assistance of two runways since Runway 17-35 does not fully meet the 95 percent threshold; however, the funding assistance for maintaining one crosswind runway may be very low priority. It should also be noted that the remaining crosswind runway could only be supported to meet the needs of ARC A-I through B-II based on FAA crosswind coverage criteria. Consideration should then be given to which of the two crosswind runways should be maintained through the planning period. Both crosswind runways could remain operational until their useful life expires and/or if the City of Paris elects to self-fund capital costs associated with the third runway. The primary consideration in choosing the runway to remain is analysis of the combined wind coverage provided by each crosswind runway with primary Runway 17-35. Secondary considerations include geometrical, environmental, and financial factors associated with the existing layout of each runway.

Exhibit 3B presents the wind coverage of each crosswind runway combined with primary Runway 17-35. As detailed, the combination of Runway 17-35 and Runway 14-32 provides the best dual crosswind component coverage, although the difference is relatively minor. The dual combination of the primary runway with each crosswind runway exceeds the FAA's 95 percent coverage criteria. As a result, either runway would be suitable to remain. Therefore, the choice of which runway should remain will require further analysis considering geometrical and economic factors. That analysis will be conducted in the following chapter.

RUNWAY WIDTH

The FAA design standard for runway width is dependent on the critical design aircraft and the approach visibility minimums. The existing critical design aircraft falls in ARC B-II with future planning proposed to conform to ARC C/D-II. The lowest visibility minimum provided is a GPS LPV instrument approach procedure to Runway 35. This approach provides visibility minimums not lower than ¾-mile. The minimum runway width standard for these conditions is 100 feet. Runway 17-35 is currently 150 feet wide and meets FAA and TxDOT standards. For runways served by ½-mile visibility approach minimums, a runway width of 100 feet is required. As a result, the width of Runway 17-35 should be maintained to at least 100 feet through the planning period.

Both of the crosswind runways are also 150 feet wide. As previously noted, one of the crosswind runways is not needed to meet FAA wind coverage criteria. The remaining crosswind runway should meet ARC B-II standards. The FAA calls for a runway width of 75 feet to meet ARC B-II standards for visual runways and runways served by instrument approach procedures with not lower than ¾-mile visibility minimums.

Future planning will consider a crosswind runway with minimums not lower than ¾-mile visibility. As a result, the FAA and TxDOT will likely only support a crosswind runway width of 75 feet. The current width of the crosswind runway is twice as large as FAA design standards require. Therefore, the FAA and TxDOT will likely only provide grant-in-aid funding assistance for a 75-foot wide crosswind runway. The City of Paris will likely have to self-fund pavement width improvements in excess of the 75-foot standard.

RUNWAY STRENGTH

The pavement strength of the airport surfaces should be planned to meet the needs of the critical design aircraft. As a Business/Corporate airport, the primary runway pavement strength should be at least 30,000 pounds single wheel loading (SWL), while 60,000 pounds would be preferable for large business jet aircraft. SWL refers to the type of landing gear an aircraft has; thus, the available area for that aircraft to disburse its weight on the pavement. SWL aircraft have a single wheel on each landing strut. Dual wheel loading (DWL) landing gear has two wheels on each strut. The existing pavement strength is 60,000 pounds SWL and 95,000 pounds DWL. The crosswind runway should provide a minimum pavement strength of 12,500 pounds SWL.

Primary Runway 17-35 currently provides a runway pavement strength of 30,000 pounds SWL. This strength will be adequate for the short term; however, consideration should be given to increasing the pavement strength to 60,000 pounds by the long term. The heavier weight bearing capacity will allow the runway to better serve large business jets that are projected to increasingly utilize the airport, such as the Gulfstream family of aircraft.

Future planning for the crosswind runway should consider providing a pavement strength capable of accommodating all small aircraft (those under 12,500 pounds) and small to medium sized business jets. As noted earlier, at some point during the planning period, primary Runway 17-35 will be closed for maintenance or other reasons. As a result, the crosswind runway should be planned to be at least 30,000 pounds SWL. Both crosswind runways currently provide 26,000 pounds SWL; however, both runway pavements are in poor condition. The crosswind runway that is selected to remain should be strengthened during maintenance to meet the 30,000 pound SWL capacity.

RUNWAY/TAXIWAY SEPARATION

FAA AC 150/5300-13, *Airport Design*, discusses required minimum separation distances between a runway centerline and various areas on the airport. The separation distances are a function of the approaches approved for the airport and the critical design aircraft.

The runway to parallel taxiway separation standard for a critical aircraft in ARC B-II is 240 feet. For ARC C/D-II and for runways served by an instrument approach with not lower than ¾-mile visibility, the separation standard is 300 feet. Runways served by approaches with lower than ¾-mile visibility requires a 400-foot runway/taxiway separation. The current separation between Runway 17-35 and parallel Taxiway A exceeds 500 feet and meets FAA standards.

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. Taxiways designed to support operations by aircraft in design group II should be 35 feet wide, while those supporting aircraft in design group III should be 50 feet wide.

An object free area applies to taxiways and taxilanes (TOFA). The width of the TOFA is dependent on the wingspan of critical aircraft. For ADG II aircraft, the TOFA is 131 feet wide, or 65.5 feet on either side of centerline. The taxiway shoulder width requirements are 10 feet for ADG II.

The current taxiway system meets FAA design criteria; however, portions of Taxiways A, B, and all of Taxiway C will require significant maintenance due to poor pavement conditions and drainage issues.

Planning analysis to be completed in the next chapter will also consider extending parallel Taxiway A to the south end of Runway 17-35. Currently, Taxiway A parallels Runway 17-35 up to a point approximately 1,400 feet north of the Runway 35 threshold. At this point, it travels at an acute angle to the runway. Aircraft utilizing Runway 35 must then "back taxi" to the runway end for departure. While this geometrical design is not uncommon, it will not allow for Runway 35 to be served by a precision instrument approach providing minimums below 3/4-mile.

INSTRUMENT NAVIGATIONAL AIDS

As a reliever airport, the Cox Field Airport should be equipped with near all-weather instrument approach capability. The airport is not currently served by a precision instrument approach providing Category I (CAT-I) minimums (1/2-mile visibility minimums and/or not lower than 200-foot cloud heights). Currently, nearly all CAT-I approaches require extensive on-airport facilities, such as localizer and glide-slope antennas, as well as a sophisticated approach lighting system (ALS). In the future, these approaches will be served via GPS technology.

The FAA is moving rapidly on implementing the Wide Area Augmentation System (WAAS) to enhance instrument approaches across the country. The WAAS uses a system of reference stations to correct signals from the GPS satellites to bring positional accuracy to within one to two feet. Where the non-WAAS-enabled GPS satellites provide for instrument approaches with lateral navigation capabilities, WAAS provides for approaches with both lateral and vertical navigation. WAAS-enabled approaches are called LPV approaches, which stands for Localizer Performance with Vertical guidance. As of September 2008, the FAA had approved 1,333 LPV approaches. This now exceeds the number of existing instrument landing system (ILS) approaches. The FAA is planning to also implement the Local Area Augmentation System (LAAS), which further refines and improves the local GPS signal. With LAAS, the GPS LPV approaches will be capable of meeting full CAT-I minimums.

LPV approaches have been approved with visibility minimums not lower than ¾-mile without any airport based equipment. This is the case for Runway 35, which is served by a GPS LPV approach providing not lower than ¾-mile visibility minimums. Long term planning should consider this approach being upgraded to full CAT-I once LAAS is in place and operational. The only improvement required would be the addition of an ALS on Runway 35. Runway 17 is currently served by a GPS LPV approach; however, the approach provides minimums of not lower than one mile. Predominant winds dictate the use of Runway 17 approximately 70 percent of the year. As a result, ultimate planning should also consider a CAT-I LPV approach to Runway 17.

Currently, an ALS is required to attain visibility minimums as low as ½-mile. A medium intensity approach lighting system (MALSR) is the preferred ALS utilized to provide full CAT-I visibility minimums. In order for Runway 17 and/or 35 to be upgraded to CAT-I minimums with LAAS GPS in the future, a MALSR would be required. Long term planning will consider the implementation of MALSR to serve both runway ends.

The crosswind runways are not currently served by a published instrument approach (straight-in approach). Ultimate planning should consider the implementation of a published instrument GPS approach to both ends of the crosswind runway. The approach should be planned to, at a minimum, provide not lower than one mile visibility minimums; however, ¾-mile visibility minimums could be achieved with GPS and without an ALS. As a result, analysis in the next chapter will analyze the ability of the crosswind runway to achieve not lower than ¾-mile visibility minimums.

VISUAL NAVIGATIONAL AIDS

Cox Field Airport will need a beacon to provide for rapid identification of the airport at night. The airport beacon is green on one side and white on the other. The beacon at the existing airport may be able to be relocated to the new site.

Runway end identification lights (REILs) are strobe lights set to either side of the runway ends. These lights provide rapid identification of the runway threshold. REILs should be installed at runway ends not currently providing an approach lighting system but supporting instrument operations. REILs should be planned for both ends of Runway 17-35 unless or until a MALSR in installed. The crosswind runway should also be served by REILs.

Precision approach path indicators (PAPIs) and visual approach slope indicator (VASIs) lights provide pilots with visual descent information to the runway touchdown zone. These systems are similar in that they provide the pilot with a visual representation of being above, on, or below the proper approach glide path. Runway 17 is currently served by a four-box PAPI, while Runway 35 is served by a four-box VASI. Four-box systems are generally preferred by corporate and air carrier aircraft. The crosswind runways are not served by a PAPI or VASI system. Ultimate planning will include planning for a two-box PAPI system to serve the crosswind runway.

WEATHER REPORTING AIDS

Cox Field Airport is currently served by three lighted wind cones. One is located near each runway end and one is located in the segmented circle. The segmented circle provides traffic pattern information. These facilities should be maintained for the planning period.

Two types of automated weather observing systems are currently deployed at airports around the country. An Automated Surface Observing System (ASOS) and Automated Weather Observing System (AWOS) both measure and process surface weather observations 24 hours per day, with reporting varying from one minute to hourly. These systems provide near real-time measurements of atmospheric conditions.

Cox Field Airport is currently served by an AWOS-III which should be maintained in the future. The airport is also served by a lighted windcone and tetrahedron which offer immediate visual information of local winds to pilots. These facilities should also be maintained in the future.

AIRFIELD LIGHTING AND MARKING

Runway markings are designed according to the type of instrument approach available on the runway. FAA AC 150/5340-1F, *Marking of Paved Areas on Airports*, provides guidance necessary to design airport markings. Runway 17-35 has non-precision markings. These markings are currently sufficient and should be maintained in the future. If Runway 17 and/or 35 is upgraded to CAT-I minimums, precision runway marking would be required. Precision markings include runway designation, centerline, edge line, threshold bar, touchdown zone, and aiming points.

The current hold positions associated with primary Runway 17-35 are marked 250 feet from the runway centerline on all taxiways to the west of the runway. The taxiways leading from Runway 17 to Runway 14 and Runway 35 to Runway 3 are set at 175 feet. While this has been approved for current conditions, the markings would need to be moved out to 250 feet from Runway 17-35 if it is to be served by a CAT-I approach to either end.

Currently, Runway 17-35 is served by medium intensity runway lights (MIRL) which are required to serve nighttime operations and approach procedures. MIRL is also stipulated for Business/Corporate airports in the TASP. The crosswind runway should also be planned for MIRL. As previously mentioned, the crosswind runway will need to serve as the airport's only runway during periods when Runway 17-35 is closed. Without MIRL on the crosswind runway, the airport would be closed for all nighttime operations.

A portion of Taxiway B, near the terminal ramp and intersection of Runway 17-35, is lighted with medium intensity taxiway lights (MITL) as well as lighted signs. TxDOT planning standards indicate that airports having more than 100 based aircraft should be served with these lights as well as taxiway guidance signs. The airport does not currently meet this standard and forecasts of based aircraft do not indicate that 100 aircraft will be based at the airport through the planning period. Therefore, the existing taxiway lights arrangement, as well as airfield signage, will be adequate and should be maintained in the future.

AIRPORT TRAFFIC CONTROL TOWER

The establishment of a new FAA-funded airport traffic control tower (ATCT) follows a two-phase process as detailed in FAA Handbook 7031.2C, *Airway Planning Standard Number One - Terminal Air Navigation Facili-*

ties and Air Traffic Control Services. The first phase involves identifying possible candidacy through an analysis of annual operation levels. The second phase involves a cost-benefit analysis of the tower location over a 15-year time frame. To be identified as a possible candidate for a new ATCT, the sum of the cost-benefit formula must be greater than or equal to one.

Airports don't typically qualify for ATCT consideration until they have exceeded a minimum of 100,000 annual operations. This is a generality, and lower operational levels can still justify the need for an ATCT, providing there is enough qualifying air carrier and/or air taxi operations. Only the FAA and TxDOT can make a determination of tower qualifications.

PRX does not currently exceed 100,000 annual operations. Aviation forecasts for the planning period presented in the previous chapter indicate that the airport will not near this level of operations through the planning period. As a result, an ATCT will not be planned for PRX.

AIRFIELD SAFETY AREAS

Cox Field Airport should be designed, at a minimum, as a Business/Corporate airport, according to TxDOT design standards, that meets the requirements of an ARC C/D-II airport. The functional category should also be for a regional airport intended to support diversified activity from recreational activity from smaller piston-powered aircraft, to agricultural services, to corporate and charter jet activity.

APPLICABLE ARC STANDARDS

The minimum standards for the various safety areas surrounding an airport are defined in FAA AC 150/5300-13, *Airport Design*. These imaginary surfaces are intended to protect area airspace and keep them free from obstructions or incompatible land uses that could affect an aircraft's safe operation. These include the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway protection zone (RPZ).

The entire RSA, OFA, and OFZ should be under the direct control of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. It is not required that the RPZ be under airport ownership, but it is strongly recommended. 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 ensures that the RPZ remains free of incompatible development.

Dimensional standards for the various safety areas associated with the runway is a function of the ARC as well as the planned approach visibility minimums. The planned critical aircraft for Runway 17-35 falls in ARC C/D-II. The crosswind runway will be planned to full ARC B-II design standards. The ultimate plan will continue to provide ½-mile visibility minimums on both ends of Runway 17-35 and for not lower than ¾-mile visibility minimums on the crosswind runway, if proven feasible in the next chapter.

Runway Safety Area (RSA)

The RSA is defined 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 and 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. The FAA has been visually inspecting the RSAs at each federally obligated airport for the last ten years with a goal to complete the program by 2015. In Texas, TxDOT has been given the responsibility to administer and inspect the RSAs at the state's general aviation airports.

As previously mentioned, the current critical aircraft is ARC-II for all runways due to existing aviation activity. Future planning calls for Runway 17-35 to meet ARC C/D-II standards, while the crosswind runway is planned for ARC B-II. For ARC C/D-II runways, the FAA calls for the RSA to be 500 feet wide and extend 1,000 feet beyond each runway end. The FAA has recently modified the RSA requirement, allowing for only 600 feet of RSA prior to landing. For ARC B-II, the RSA is 150 feet wide and extends 300 feet beyond each runway end.

As depicted on **Exhibit 3C**, the airport has sufficient area available to meet RSA standards for all runways for the current designation of ARC B-II. The south end of Runway 17-35 does not conform to ARC C/D-II standards as trees and the Little Sandy Creek are located in the RSA. These areas will need to be cleared, graded, and stabilized to meet standard. **Table 3G** presents the various safety area design standards applied to Cox Field Airport.

Object Free Area (OFA)

The runway object free area (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 does not have to be graded and level as does the RSA; instead, the primary requirement for the OFA is that no object in the OFA penetrates the lateral elevation of the RSA. The runway OFA is centered on the runway, extending out in accordance to the critical aircraft design category utilizing the runway.

TABLE 3G
Airfield Design Standards
Cox Field Airport

	Existing Runway 17-35		Ultimate Runway 17-35		Ultimate Crosswind Runway
Airport Reference Code (ARC)	B-II		C/D-II		B-II
Approach Visibility Minimums	1 Mile	¾ Mile	½ Mile	¾ Mile	consider ¾-mile
Runway Length Runway Width	6,002' 150'		Same Same (standard is 100')		4,624' 150' (standard is 75')
Runway Safety Area Width Length Beyond Runway End	 150' 300'		 500' 1,000'		 150' 300'
Object Free Area Width Length Beyond Runway End	 500' 300'		 800' 1,000'		 500' 300'
Obstacle Free Zone Width Length Beyond Runway End	 400' 200'		 Same Same		 400' 200'
Runway Protection Zone Inner Width Outer Width Length	Runway 17 500' 700' 1,000'	Runway 35 1,000' 1,510' 1,700'	Runway 17 1,000' 1,750' 2,500'	Runway 35 1,000' 1,750' 2,500'	 1,000' 1,510' 1,700'
Runway Centerline to: Holding Position Parallel Taxiway Centerline	 250' 400'		 Same Same		 200' 240'
Taxiway Width	35' to 40'		Same		35' to 40'
Taxiway Object Free Area Width	131'		Same		131'
Taxiway Centerline to: Fixed or Moveable Object	65.5'		Same		65.5'

Source: FAA AC 150/5300-13, Airport Design, Change 16

For ARC C/D-II aircraft design, the OFA must be 800 feet wide, centered on the runway, and extend 1,000 feet beyond the runway ends. For ARC B-II the OFA must be 500 feet wide and extend 300 feet beyond the runway ends. As depicted on **Exhibit 3C**, the OFA for all runways are clear of obstructions for ARC B-II design; however, the OFA at the south end of Runway 17-35 is obstructed for ARC C/D-II design criteria due to the location of trees and the Little Sandy Creek. These obstructions would need to be rectified to meet ARC C/D-II standards.

Obstacle Free Zone (OFZ)

The obstacle free zone (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. The OFZ is 400 feet wide, centered on the runway, and extends 200 feet beyond the runway ends.

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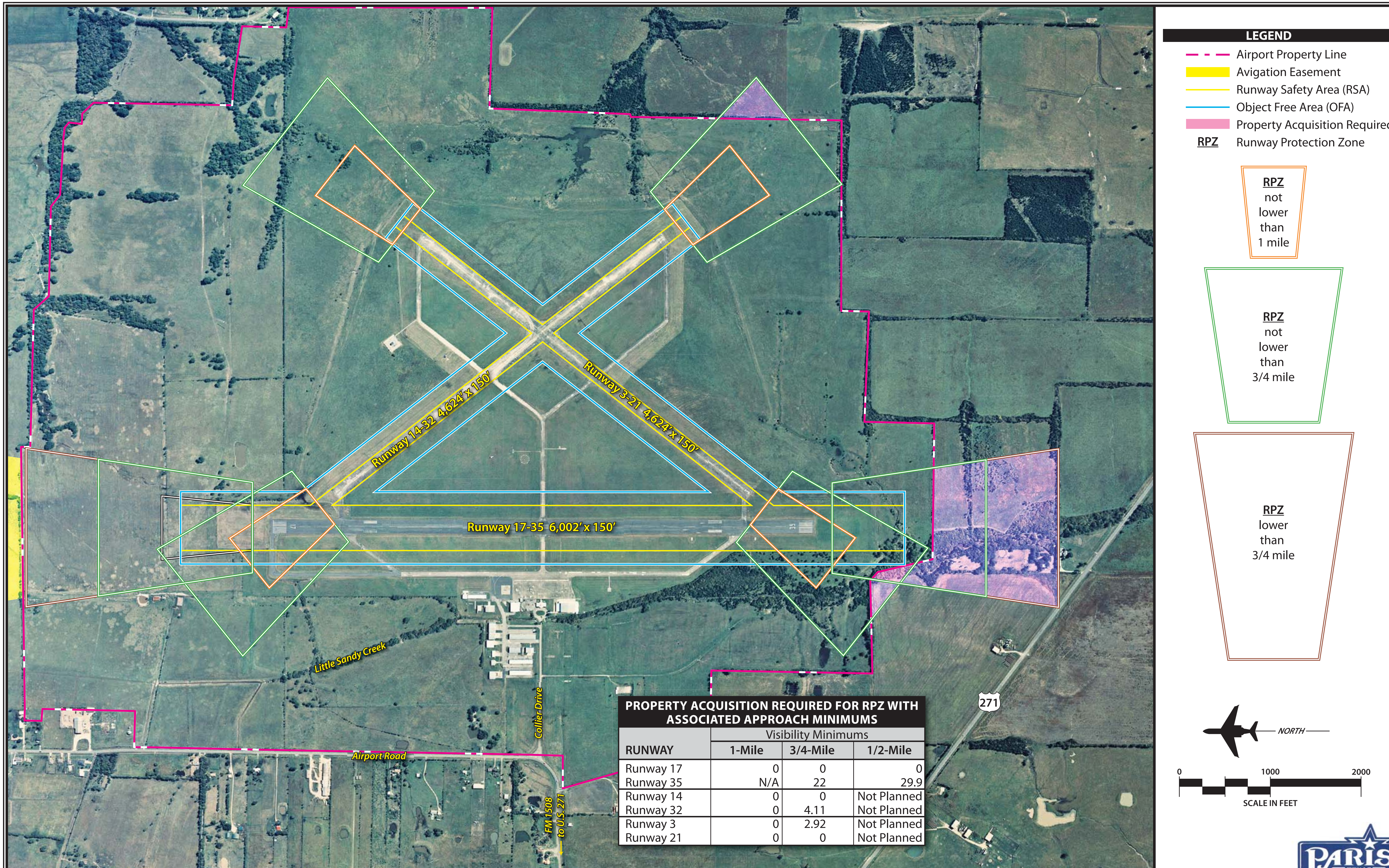

PROPERTY ACQUISITION REQUIRED FOR RPZ WITH ASSOCIATED APPROACH MINIMUMS

RUNWAY	Visibility Minimums 1-Mile	3/4-Mile	1/2-Mile
Runway 17	0	0	0
Runway 35	N/A	22	29.9
Runway 14	0	0	Not Planned
Runway 32	0	4.11	Not Planned
Runway 3	0	2.92	Not Planned
Runway 21	0	0	Not Planned

Exhibit 3C
AIRFIELD SAFETY STANDARDS

A precision obstacle free zone (POFZ) is further defined for runway ends with a precision approach. The proposed ½-mile LPV GPS approaches to Runways 17 and 35 would be considered precision approaches. As such, Runway 17-35 would be required to provide a POFZ that is 800 feet wide (centered on the runway) and extends 200 feet beyond the runway threshold. The POFZ is only in effect when the following conditions are met:

a) The runway supports a vertically guided approach.
b) Reported ceiling is below 250 feet and/or visibility is less than ¾-mile.
c) An aircraft is on final approach within two miles of the runway threshold.

Runway Protection Zone (RPZ)

The runway protection zone (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 RPZ is comprised of the Central Portion of the RPZ and the Controlled Activity Area. The dimensions of the RPZ vary according to the visibility minimums serving the runway and the type of aircraft operating on the runway.

The Central Portion of the RPZ extends from the beginning to the end of the RPZ, is centered on the runway centerline, and is the width of the OFA. Only objects necessary to aid air navigation, such as approach lights, are allowed in this portion of the RPZ. The remaining portion of the RPZ, the Controlled Activity Area, has strict land use limitations. Wildlife attractants, fuel farms, places of public assembly, and residences are prohibited. The AC specifically allows surface parking facilities, but they are discouraged.

Table 3G presents the dimensions of the existing RPZs for all runway ends. As noted, Runway 17 is currently served by a not lower than one-mile straight-in instrument approach. Future planning will consider minimums as low as ½-mile visibility. Runway 35 is currently served by a not lower than ¾-mile visibility approach with future planning considerations being given to not lower than ½-mile visibility. The crosswind runways are not currently served by an instrument approach; however, future planning will consider an approach to the crosswind runway providing minimums as low as ¾-mile visibility minimums.

Exhibit 3C depicts existing and planned RPZs for all runway ends. As previously discussed, the size of the RPZ is dependent on the runway's approach minimums and/or ARC (for not lower than one mile visibility conditions only). The existing and planned RPZs for Runways 17, 14, and 21 are all contained on existing airport property. This includes the RPZ associated with a CAT-I approach to Runway 17 as well as the potential to provide not lower than ¾-mile visibility minimums on Runways 14 and/or 21.

Runway 35 is currently served by an LPV approach providing not lower than ¾-mile visibility. As depicted on the exhibit, the RPZ for existing conditions extends south beyond current airport property. Approximately 22.0 acres should be acquired in fee or easement to properly manage the existing RPZ for Runway 35. If Runway 35 is to be served by a CAT-I GPS approach, an additional 29.90 acres would need to be acquired to properly control the RPZ.

Runways 3 and 32 are not currently served by an instrument approach. Their associated RPZs fall within existing airport bounds, which includes the ability to implement a GPS not lower than one mile visibility minimum approach. If the runway ends were to be served by a not lower than ¾-mile visibility approach, 2.92 acres would need to be acquired for the Runway 3 RPZ, and 4.11 acres would need to be acquired for the 32 RPZ.

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 general aviation needs such as:

- Aircraft Hangars
- Aircraft Parking Aprons
- General Aviation Terminal
- General Aviation Parking
- Fuel Storage Capacity

AIRCRAFT 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, future hangar development should be based on actual demand and economic conditions.

Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is toward more sophisticated aircraft (and consequently, more expensive aircraft); therefore, many aircraft owners prefer enclosed hangar space to outside tie-downs. At present, seven single engine piston-powered aircraft utilize outside tie-down space. This represents approximately 12.5 percent of the based total. Future planning will consider that only five of the based aircraft would be tie-down as opposed to being based in hangars if they were available.

Shade and T-hangars are typically used for smaller single and multi-engine aircraft storage. Cox Field Airport has one shade hangar facility which provides six individual covered storage positions and a total of 7,250 square feet of space. A total of 29 individual T-hangar positions are provided in three separate facilities and provide a total of 29,900 square feet of space. Shade hangars provide aircraft owners with a relatively inexpensive covered storage area. T-hangars are popular with aircraft owners having one aircraft as they are allowed privacy and individual access to their space. These hangars are individual spaces nested within a larger structure. All shade and T-hangars are owned by the City of Paris and are currently leased.

Executive box hangars are typically utilized by owners of larger aircraft or multiple aircraft. Executive hangars are usually smaller than 10,000 square feet and offer open-space storage. There are currently ten executive box hangars at Cox Field Airport, one of which is similar to a T-hangar. One facility provides seven individual box units. All executive box hangars, except the seven-unit facility, are privately owned. The City of Paris owns the seven-unit executive box hangar.

Conventional hangars are typically 10,000 square feet or larger and utilized for bulk aircraft storage and by airport businesses such as FBOs, maintenance providers, and flight schools. They are open-space facilities with no supporting structure interference, similar to executive/box hangars. At Cox Field Airport, there are two privately owned conventional hangar facilities, totaling approximately 29,000 square feet.

The aviation demand forecasts indicated that the airport is trending toward an increasing number of based aircraft. A planning standard of 1,500 square feet was used for single engine aircraft, and 2,500 square feet for multi-engine aircraft, jets, and helicopters. Since portions of executive and conventional hangars are also used for aircraft maintenance, servicing, and office space, a planning standard of 175 square feet per based aircraft is allocated for these requirements.

Table 3H shows the results of the analysis for hangar requirements to accommodate those aircraft that would normally be stored in a hangar if space were available. Within the short term, there is a forecast need for eight T-hangar positions and two box hangar positions. Space in the conventional hangars appears adequate through the short term planning period and will likely be privately constructed as needed.

The analysis shows that there is an immediate need for additional hangar space. While the overall square footage figures appear adequate for the short and intermediate terms, this does not necessarily indicate that a demand does not exist. This is because these hangars are often leased to a single entity for a specific purpose, such as an airport business. Cox Field Airport has a wait list for 33 aircraft. Experience indicates that not all of those on the list will accept new spaces, especially if rental fees are high. Typically, no more than 75 percent of those on the list will locate to the airport is space is provided.

TABLE 3H
Aircraft Storage Hangar Requirements
Cox Field Airport

		Future Requirements		
	Currently Available	Short Term	Intermediate Term	Long Term
Aircraft to be Hangared	49	57	63	78
Shade/T-hangar Positions	29	37	41	50
Executive Box Hangar Positions	16	18	19	23
Conventional Hangar Positions	4	2	3	5
Hangar Area Requirements (s.f.)				
Shade/T-hangar Area	37,150	46,300	51,300	62,500
Executive Box Hangar Area	51,100	45,000	47,500	57,500
Conventional Hangar Area	29,000	5,000	7,500	12,500
Maintenance/Office Area	N/A	10,850	11,900	14,525
Total Hangar Storage Area (s.f.)*	117,250	107,150	118,200	147,025

AIRCRAFT PARKING APRON

FAA AC 150/5300-13, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At Cox Field Airport, the number of itinerant spaces required was determined to be approximately 13 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 larger), a planning criterion of 1,600 square yards per aircraft position was used. For planning purposes, 80 percent of these spaces are assumed to be utilized by non-jet aircraft, which is in line with national trends.

The aircraft apron should also provide space for locally based aircraft that are tied-down and for maintenance activity. By maintenance activity, this simply means there should be adequate apron space to allow aircraft to be temporarily parked on the apron. Total apron parking requirements are presented in **Table 3J**. As indicated in the table, the existing apron area should be adequate to accommodate future aircraft parking requirements.

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. For Cox Field, the airport's only FBO is based in the airport terminal building. The existing terminal building provides approximately 5,330 square feet of space.

TABLE 3J Aircraft Parking Apron Requirements Cox Field Airport	Available	Short Term	Intermediate Term	Long Term
Single, Multi-engine Transient Aircraft Positions		2	3	4
Apron Area (s.y.)		1,600	2,400	3,200
Transient Business Jet Positions		1	2	3
Apron Area (s.y.)		1,600	3,200	4,800
Locally Based Aircraft Positions		7	7	7
Apron Area (s.y.)		4,600	4,600	4,600
Total Positions	±10	10	12	14
Total Apron Area (s.y.)	23,111	7,800	10,200	12,600

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. A design hour itinerant passenger is determined by multiplying design hour itinerant operations by the number of passengers on the aircraft (multiplier). An increasing passenger count (from 1.8 to 2.2) is used to account for the likely increase in larger, more sophisticated aircraft using the airport.

Table 3K outlines the general aviation terminal facility space requirements for Cox Field Airport. As evidenced in the table, the existing terminal building is properly sized to accommodate existing and future terminal space requirements.

TABLE 3K General Aviation Terminal Building Requirements Cox Field Airport	Available	Short Term	Intermediate Term	Long Term
Design Hour Operations	5	7	9	14
Design Hour Itinerant Operations	2	3	4	7
Multiplier	1.9	2	2.2	2.5
Total Design Hour Itinerant Passengers	3	6	9	17
General Aviation Building Spaces (s.f.)	±5,300	700	1,000	2,000

GENERAL AVIATION AUTOMOBILE PARKING

General aviation vehicular parking demands have also been determined for Cox Field Airport. Space determinations were based on an evaluation of existing airport use, as well as industry standards. Terminal automobile parking spaces required to meet general aviation itinerant demands were calculated by multiplying design hour itinerant passengers by a multiplier of 1.8 for each planning period. This multiplier represents the average number of passengers per general aviation flight.

The parking requirements of based aircraft owners are also considered. Although some owners prefer to park their vehicles near their hangars, safety can be compromised when automobile and aircraft movements are intermixed. For this reason, separate parking requirements, which consider 25 percent of based aircraft at the airport, were applied to general aviation automobile parking space requirements. Parking requirements for the airport are summarized in **Table 3L**.

TABLE 3L
General Aviation Vehicle Parking Requirements
Cox Field Airport

		Future Requirements		
	Available	Short Term	Intermediate Term	Long Term
Design Hour Itinerant Passengers		6	9	17
GA Itinerant Spaces		10	16	30
GA Based Spaces		16	17	21
Total GA Parking Spaces	49	26	33	51
Total GA Parking Area (s.f.)	15,500	8,140	10,290	16,060

Throughout the planning period, dedicated parking spaces may not be needed as the airport provides nearly the forecast number needed for the long term. Future planning should keep the goal in mind of limiting the potential interaction of aircraft and vehicles. Locating parking in useful areas is critical for a general aviation airport. If a parking area is not conveniently located, then airport users will continue to drive on aircraft surfaces.

FUEL STORAGE

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 requirements. Fuel tanks must 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.

As discussed in Chapter One – Inventory, The City of Paris owns the only fuel storage facilities on the airport and leases the facility to the FBO for resale of fuel. The fuel farm consists of two underground storage tanks, one dedicated for Avgas and one for Jet A fuel. Both storage tanks have a capacity of 10,000 gallons. The fuel farm is located approximately 200 feet north of the terminal building.

A review of historic fuel sales indicate that the Jet A fuel sales average between 7,500 and 10,000 gallons per month, with the higher average indicative of sales prior to the economic recession. For Avgas (100LL), monthly sales range between 1,800 and 8,400 gallons. Fuel purchases will increase as annual operations increase. When maintaining a 14-day fuel supply, the current capacity is adequate through the long term planning period.

Given the existing operational level estimates, the current fuel storage capacity may be adequate to meet demand for the long term. Future operational levels could tax the existing storage capacity during peak periods, especially for Jet A fuel. As a result, ultimate planning will consider the expansion of the fuel farm to include another Jet A storage facility. It is projected that additional Jet A storage could be required by the long term as aircraft utilizing Jet A fuel take on more fuel, thereby depleting resources more quickly. The plan will consider the addition of 10,000 gallons of additional capacity for Jet A storage.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for Cox Field Airport for the planning horizon. A summary of the airfield and general aviation facility requirements is presented on **Exhibits 3D** and **3E**.

Following the facility requirements determination, the next step is to determine a direction of development which best meets these projected needs. The remainder of the master plan will be devoted to outlining this direction, its schedule, and its costs.

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		AVAILABLE	SHORT TERM	LONG TERM
RUNWAYS		**Runway 17-35** 6,002' x 150' 30,000# SWL 1-Mile Visibility (17) 3/4-Mile Visibility (35) ARC B-II **Crosswind Runways** 4,624' x 150 26,000# SWL Visual (no approaches) ARC B-II	**Runway 17-35** Improve pavement to 30,000# SWL Improve to ARC C/D-II **Crosswind Runways** Same	**Runway 17-35** Maintain **Crosswind Runway** Close One Crosswind Runway Improve Pavement to 30,000# SWL Consider: 3/4 Mile Approaches
TAXIWAYS		**Runway 17-35** Partial Parallel Taxiway 500+' Separation 4 Entrance/Exits All Taxiways 35'-40' wide **Crosswind Runways** Connecting Taxiways 3 Entrance/Exits All Taxiways 35'-40' wide	**Runway 17-35** Same **Crosswind Runways** Same	**Runway 17-35** Extend Parallel Taxiway A Full Length **Crosswind Runway** Close taxiways associated with closed runway
NAVIGATIONAL AIDS		**Runway 17-35** RNAV/GPS/LPV VOR AWOS-III **Crosswind Runways** AWOS-III	**Runway 17-35** Add GPS CAT-I (17) **Crosswind Runways** Same	**Runway 17-35** Consider: GPS CAT-I (35) **Crosswind Runway** Consider: GPS 3/4-mile
LIGHTING & MARKING		Airport Beacon Segmented Circle Lighted Windcone Partial MITL Tetrahedron **Runway 17-35** MIRL PAPI-4 (17) VASI-4 (35) Hold Positions - 250' Nonprecision Marking **Crosswind Runways** Hold Positions - 175" Basic Marking	**Runway 17-35** Add: MALSR(17) Precision Marking (17) REIL (35) **Crosswind Runways** Same	**Runway 17-35** Consider: MALSR(35) Precision Marking (35) **Crosswind Runway** Add: MIRL Nonprecision Marking Holdlines - 250'

KEY

SWL: Single Wheel Loading
ARC: Airport Reference Code
RNAV: Area Navigation
GPS: Global Positioning System
LPV: Localizer Performance with Vertical Guidance
AWOS: Automated Weather Observation System
MIRL: Medium Intensity Runway Lighting
PAPI: Precision Approach Path Indicator
VASI: Visual Approach Slope Indicator
MALSR: Medium Intensity Approach Lighting System with Runway Alignment Indicators
REIL: Runway End Identifier Lights

Exhibit 3D
AIRSIDE FACILITY REQUIREMENTS

09MP11-3E-04/14/10

	Available	Short Term Need	Intermediate Term Need	Long Term Need

AIRCRAFT STORAGE

	Available	Short Term Need	Intermediate Term Need	Long Term Need
T-hangar Positions	29	37	41	50
Box Hangar Positions	16	18	19	23
Conventional Hangar Positions	4	2	3	5
T-hangar Area (s.f)	37,150	46,300	51,300	62,500
Box Hangar Area (s.f)	51,100	45,000	47,500	57,500
Conventional Hangar Area (s.f.)	29,000	5,000	7,500	12,500
Maintenance Area (s.f.)	N/A	10,850	11,900	14,525
Total Hangar Area (s.f.)	***117,250***	***107,150***	***118,200***	***147,025***

AIRCRAFT APRON

	Available	Short Term Need	Intermediate Term Need	Long Term Need
Single, Multi-engine Transient Aircraft Positions		2	3	4
Apron Area (s.y.)		1,600	2,400	3,200
Transient Business Jet Positions		1	2	3
Apron Area (s.y.)		1,600	3,200	4,800
Locally-Based Aircraft Positions		7	7	7
Apron Area (s.y.)		4,600	4,600	4,600
Total Positions	***±10***	***10***	***12***	***14***
Total Apron Area (s.y.)	***23,111***	***7,800***	***10,200***	***12,600***

GA SERVICES

	Available	Short Term Need	Intermediate Term Need	Long Term Need
GA Building Space (s.f.)	±5,300	700	1,000	2,000
GA Terminal Parking Spaces	49	26	33	51
GA Terminal Parking Area (s.f.)	15,500	8,140	10,290	16,060
Fuel Storage				
AvGas Storage Capacity (gallons)	10,000	10,000	10,000	10,000
Jet A Storage Capacity (gallons)	10,000	10,000	10,000	20,000

Exhibit 3E
LANDSIDE FACILITY REQUIREMENTS