3

Airfield Design

OVERVIEW

The operational role of Jacqueline Cochran Regional Airport as a general aviation airport requires it to serve aircraft of a wide variety of types and sizes. This role is well established and is expected to remain essentially the same throughout the 20-year planning period of this master plan. The purpose of the proposed airfield improvements recommended in this chapter is to augment this role.

Basic Design Considerations

An airport's airfield system includes the runways and taxiways, related approach and landing aids, and required clear areas beyond the runway ends and elsewhere adjoining these facilities.

The basic airfield design considerations related to the airport's role are (1) the ultimate length of the main runway (Runway 17-35), (2) the critical aircraft to be used for airfield design, (3) the design criteria to be applied to aircraft basing and other facilities, and (4) how to best use the airport's available land without foreclosing on future airport development needs.

The main runway was recently resurfaced and extended to 8,500 feet in length and the Boeing Business Jet (BBJ) and Boeing Business Jet 2 (BBJ2) are typical of the largest class of airplanes that will use the airport on a regular basis. This chapter answers the question of whether or not Runway 17-35 is long enough to accommodate these aircraft under all circumstances.

For the purpose of establishing airfield dimensional standards, the FAA defines the critical airplane as the type or types that "will make substantial use of the airport in the foreseeable future. Substantial use means 500 or more annual itinerant operations or scheduled commercial service. (FAA Order 5090.3B)

Numerous single-engine and light twin-engine aircraft will also continue to use the airport. These aircraft are subject to less stringent criteria for the design of their facilities than are required for the BBJ. Since these aircraft will operate out of different areas on the airport, the master plan applies design criteria to their facilities accordingly. Contrary to the situation that exists at many other airports, existing

facilities and site constraints do not unduly limit airport development options at this airport. Aside from the existing Terminal Area, which recently underwent major infrastructure enhancements, the airport is largely undeveloped.

Demand Determinants

In general terms, airfield operational demand characteristics are defined by the airport role and projected activity levels as addressed in the preceding chapter. In the more specific context of airfield facility design issues, these demand factors can be summarized as follows:

Critical Aircraft


Boeing Business Jet (BBJ)


King Air B-200

The majority of current operations at Jacqueline Cochran Regional Airport are by single-engine and twin-engine piston aircraft. But the airport also sees frequent use by larger, high-performance aircraft such as twin-engine turboprops and medium-large size business jets. The airport is also seeing increased use by larger business aircraft including the Gulfstream Aerospace IV (G-IV) and Gulfstream Aerospace V (G-V), as well as the Boeing Business Jet (BBJ) and BBJ2. Some of these larger passenger-type aircraft have operated as casino charters, and they are the largest aircraft that regularly operate from Jacqueline Cochran Regional Airport. The critical aircraft for determining runway length, pavement strength, airfield geometry and aircraft basing facilities may be different, dependent upon the design criteria to be used.

For airfield design purposes, the Boeing Business Jet 2 covers the design criteria needed to plan the airfield properly. Because these heavier and faster aircraft will use only the main runway and taxiway system, and be based on the eastern edge of the Terminal Area, a design aircraft for the remainder of the airfield and aircraft basing areas also needs to be designated. This master plan uses the Raytheon Beechcraft King Air 200 (B-200) as the design aircraft for these areas.

Runway Instrument Approach Types

- **GPS** - Global Positioning System
- **RNAV -** Area Navigation
- **VOR -**Very High Frequency Omnirange
- **DME -**Distance Measuring Equipment

Jacqueline Cochran Regional Airport is presently served by four non-precision instrument approach procedures, including both straight-in and circle-to-land approaches: (1) a straight-in GPS approach to Runway 35 with circle-to-land capability for all other runways; (2) a straight-in GPS (RNAV) approach to Runway 30 with circle-to-land capability for all other runways; (3) a VOR/DME straight-in approach to Runway 30 with circle-to-land capability for all other runways; and (4) a VOR-A circle-to-land approach for all runways. There is no precision instrument approach at this time. The lowest approach minimums for the airport are 361 feet above the airport

elevation and 1-statute mile visibility. This master plan considers the need for, and usefulness of, a precision instrument approach to Runway 35 for high performance aircraft.

Aircraft Activity Volume

The *Master Plan* activity forecasts indicate that Jacqueline Cochran Regional Airport has a potential to reach a total activity level of 110,000 operations over the next 20 years (compared to approximately 65,000 current annual operations).

Needs Assessment

Runway Capacity Factors

- Runway configuration.
- Location of runway exits.
- Existence of air traffic control facilities and navigational aids.
- Mix of aircraft types (including helicopters) using the airport.
- The amount of touch-and-go training activity.
- The extent of instrument versus visual weather conditions.
- Peaking conditions (i.e., the hourly, daily, and seasonal variations in traffic demands.
- The proximity of nearby airports and other factors affecting airspace use.

For the purposes of airfield design, the above operational demands must be translated into facility requirements. In basic terms, these needs can be assessed with respect to the following four factors:

Operational Capacity

An airport's airfield capacity is generally measured in terms of the number of aircraft operations the runway and taxiway system can accommodate in an hour or over a year. Calculation of airfield capacity, particularly annual capacity, is dependent upon various physical and operational factors as listed to the left.

At very busy airports, airfield capacity can be the major determinant of future runway/taxiway system improvement requirements. However, it is not a significant factor at Jacqueline Cochran Regional Airport. Based on information contained in FAA Advisory Circular (AC) 150/5060-5 "Airport Capacity and Delay" (Chg. 2), the airfield capacity (expressed as "Annual Service Volume") is rated at 225,000 annual operations. This level is more than twice the projected demand for 2022. The FAA recommends consideration of capacity enhancements when annual operations reach 60 percent of ASV.

Peak-period capacity is not likely to be a limitation either, although there may be occasional brief delays during common arrival-departure times. With a mixture of mostly takeoffs and full-stop landings, the runway system has a theoretical capacity of 108 VFR operations per hour and 57 IFR operations per hour. However, due to the lack of an air traffic control tower, the airport has a practical limit of about 20 IFR operations per hour.

The 1990 airport master plan recommended construction of a new utility runway parallel to Runway 17-35. By definition, the principal role of a parallel runway is to increase the ability of an airport to accommodate peak demand by providing an additional runway with the same orientation as an existing runway. This additional capacity was anticipated to be needed by 2010. The need for this parallel runway

was reconsidered as part of this master plan study and, as noted above, the forecast level of operations is well below the airfield's rated capacity. Since the runway capacity of Jacqueline Cochran Regional Airport is not forecast to be exceeded over the next twenty years, there is no need for a parallel runway. Therefore, a parallel runway is no longer shown on the Airport Layout Plan (ALP). It should be recognized, however, that adding a parallel runway at a later date may be difficult because without the runway shown on the ALP, measures to ensure land use compatibility in the area will not be in place.

Airport Reference Code: A Federal Aviation Administration classification system that links aircraft characteristics (i.e., approach speed, weight, and wingspan) and approach type (i.e., visual, nonprecision, or precision) to airfield design criteria. The ARC classification system replaced the former FAA classification hierarchy of Basic Utility, General Utility, Basic Transport, etc.

Runway Length

The length of runway required to accommodate the most demanding airplanes anticipated to use an airport is a fundamental airfield design factor. Runway length requirements for specific aircraft are dependent upon airfield elevation and design temperature (the average high temperature for the hottest month). For several categories of typical small general aviation aircraft, the FAA has established formulas indicating the desirable runway length. For large aircraft, these data are available in performance charts provided by aircraft manufacturers. Specific length requirements for Jacqueline Cochran Regional Airport's runway are analyzed in subsequent sections of this chapter.

Aircraft Approach Category (speed)
- A: less than 91 knots
- B: 91 knots or more, but less than 121 knots
- C: 121 knots or more, but less than 141 knots
- D: 141 knots or more, but less than 166 knots

Airplane Design Group (wingspan)
- I: Up to but not including 49 feet
- II: 49 feet up to but not including 79 feet
- III: 79 feet up to but not including 118 feet
- IV: 118 feet up to but not including 171
- V: 171 feet up to but not including 214 feet

Airport Classification/Design Standards

Another basic airfield design requirement that must be assessed is the capability of the facilities to safely accommodate the types of aircraft that operate at the airport. Runway length is a key component of this assessment, but other facility dimensions — such as pavement widths and the lateral clearances from the runway to adjacent taxiways and structures — also are important.

FAA design standards for these features are set in accordance with the *Airport Reference Code* (ARC) applicable to the airport as a whole or, in many cases, to individual runways or taxiways. The primary determinants of ARC classifications are:

- The approach speed, wingspan, and weight of the most demanding types of aircraft a runway or taxiway is intended to serve; and
- The existing or planned runway approach type and visibility minimums.

Table 3A summarizes the FAA design standards associated with several ARC classifications potentially applicable to Jacqueline Cochran Regional Airport. The significance of these standards with respect to individual components of the airfield design is discussed in subsequent sections of this chapter.

Item	FAA Airport Design Standards[1]					
Airport Reference Code	B-I (small)	B-II	C-II	C-II	C-III	D-III
Aircraft Approach Speed	<121 kts	<121 kts	<141 kts	<141 kts	<141 kts	<166 kts
Aircraft Wingspan	<49 ft.	<79 ft.	<79 ft.	<79 ft.	<118 ft.	<118 ft.
Aircraft Weight Group (lbs)	≤12,500	>12,500	>12,500	>12,500	>12,500	>12,500
Approach Visibility Minimums	Visual or ≥¾ mile	Visual or ≥¾ mile	Visual or ≥¾ mile	<¾ mile	<¾ mile	<¾ mile
Runway Design						
Width	60 ft.	75 ft.	100 ft.	100 ft.	100 ft.	100 ft.
Blast Pad						
Width	80 ft.	95 ft.	120 ft.	120 ft.	140 ft.	140 ft.
Length beyond Runway End	60 ft.	150 ft.	150 ft.	150 ft.	200 ft.	200 ft.
Safety Area						
Width	120 ft.	150 ft.	400 ft.	400 ft.	500 ft.	500 ft.
Length beyond Runway End	240 ft.	300 ft.	1,000 ft.	1,000 ft.	1,000 ft.	1,000 ft.
Obstacle Free Zone[2]						
Shape[3]	A	A	C	C	C	
Width (W)	250 ft.	400 ft.	400 ft.	400 ft.	400 ft.	400 ft.
Vertical Height (H) [4,5]	NA	NA	NA	53 ft.	49 ft.	49 ft.
Slope (S) [6]	NA	NA	NA	6:1	6:1	6:1
Object Free Area						
Width	250 ft.	500 ft.	800 ft.	800 ft.	800 ft.	800 ft.
Length beyond Runway End	240 ft.	300 ft.	1,000 ft.	1,000 ft.	1,000 ft.	1,000 ft.
Gradient (maximum)	2.0%	2.0%	2.0%	1.5%[6]	1.5%[6]	1.5%[6]
Runway Setbacks						
From Runway Centerline to:						
Parallel Runway Centerline[7]	700 ft.	700 ft.	700 ft.	700 ft	700 ft	700 ft
Hold Line	125 ft.	200 ft.	250 ft.	250 ft.	250 ft.	250 ft.
Parallel Taxiway	150 ft.	240 ft.	300 ft.	400 ft.	400 ft.	400 ft.
Aircraft Parking Line	125 ft.	250 ft.	400 ft.	500 ft.	500 ft.	500 ft.
Building Restriction Line[8]	370 ft.	495 ft.	495 ft.	745 ft.	745 ft.	745 ft.
Helipad for:						
Small Helicopters (≤6,000 lbs.)	300 ft.	500 ft.	500 ft.	500 ft.	500 ft.	500 ft.
Medium Helicopters (≤12,000 lbs.)	500 ft.	500 ft.	500 ft.	500 ft.	500 ft.	500 ft.
Heavy Helicopters (>12,000 lbs.)	700 ft.	700 ft.	700 ft.	700 ft.	700 ft.	700 ft.
Taxiway Design						
Width	25 ft.	35 ft.	35 ft.	35 ft.	50 ft.	50 ft.
Safety Area Width	49 ft.	79 ft.	79 ft.	79 ft.	118 ft.	118 ft.
Taxiway and Taxilane Setbacks						
From Taxiway Centerline to:						
Parallel Taxiway/Taxilane [9]	69 ft.	105 ft.	105 ft.	105 ft.	152 ft.	152 ft.
Fixed or Movable Object	45 ft.	66 ft.	66 ft.	66 ft.	93 ft.	93 ft.
From Taxilane Centerline to:						
Fixed or Movable Object	40 ft.	58 ft.	58 ft.	58 ft.	81 ft.	81 ft.
Runway Protection Zone[10]						
Width at Inner End	250 ft[10]	500 ft.[10]	500 ft.	1,000 ft	1,000 ft.	1,000 ft.
Width at Outer End	450 ft.	700 ft.	1,010 ft.	1,750 ft	1,750 ft	1,750 ft
Length	1,000 ft.	1,000 ft.	1,700 ft.	2,500 ft.	2,500 ft.	2,500 ft.

Table 3A

Airport Design Standards

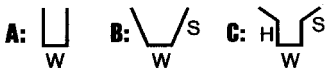
Jacqueline Cochran Regional Airport

Notes:

[1] Source: FAA Advisory Circular 150/5300-13, Change 7, *Airport Design* (October 2002).

[2] Object Free Zone normally extends 200 feet beyond end of runway; additional length required for runways with approach systems.

[3] Runway Obstacle Free Zone cross-section shapes:



[4] Height increases 3 feet per 1,000 feet of airport elevation.

[5] Indicated dimensions for runways with approach visibility minimums <¾ mile are for Category I instrument runways. Criteria for Category II and Category III runways are more restrictive.

[6] Maximum of 0.8% in first and last quarters of runway.

[7] Indicated runway separation is for planning purposes. FAA air traffic control criteria permit simultaneous operations by light, single-engine propeller airplanes with runways as close as 300 feet apart and by twin-engine propeller airplanes with runway separation of 500 feet. [FAA Order 7110.656].

[8] The FAA no longer has fixed-distance standards for the Building Restriction Line location. The indicated setback distances are based on providing 7:1 transitional slope clearance over a 35-foot building situated at the same base elevation as the adjacent runway and can be adjusted in accordance with local conditions.

[9] Assumes same size airplane uses both taxiway and adjacent taxiway/taxilane. Distance can be reduced if secondary taxiway/taxilane is limited to use only by smaller airplanes.

[10] For runways with approach visibility minimums of ¾ mile or more, but less than 1 mile, runway protection zone dimensions are 1,000 feet width at inner end, 1,510 feet width at outer end, and a length of 1,700 feet.

Table 3A, continued

Wind Coverage

Strong winds at an airport can represent additional airfield design concerns. FAA guidelines establish that the orientation of an airport's runway or runways should enable the airport to be usable, with crosswinds of an acceptable velocity, during at least 95% of the year. Airports with lower annual wind coverage qualify for FAA funding for a crosswind runway. The criteria for an acceptable crosswind velocity are tied to the runway's airport reference code and thus to the type of aircraft using the runway. Analyses of wind data for the Desert Resorts area indicate that the airport's existing runway system provides over 99.9 percent wind coverage. This means that no additional crosswind runways need be considered.

RUNWAY 17-35

Classification

Boeing (BBJ2)

The most demanding class of aircraft anticipated to regularly use Jacqueline Cochran Regional Airport are those in Airport Reference Code (ARC) D-III. This ARC classification includes the Boeing Business Jet 2 (BBJ2) and the Gulfstream G-V. These aircraft have approach speeds of 142 to 149 knots, wingspans of 93.5 to 117.5 feet, and maximum certificated gross takeoff weights (MGTOW) of from 90,500 to 174,200 pounds. Jacqueline Cochran Regional Airport is seeing more and more use by these types of airplanes, principally as corporate charters and for casino charter operations. It is estimated that the airport has over 500 annual operations by ARC D-III aircraft.

The airport continues to receive frequent use by corporate jets in ARC C-I and C-II, with some C-III operations (including the BBJ) as well. It is estimated that over 1,000 operations by Category C aircraft are currently occurring on an annual basis. The FAA Airport Design Standards for ARC C-III and D-III are identical. However, by designing to the ARC D-III standard such aircraft as the BBJ2 will be assured adequately designed facilities (see Table 3B below). Therefore, design standards for Category D-III aircraft should be applied to Runway 17-35, its associated taxiways and aircraft basing area(s).

AIRCRAFT TYPE	MGTOW	WINGSPAN	APPROACH	LENGTH	ARC
Boeing Business Jet (BBJ2)	**174,200**	**117.5 ft.**	**142 kts.**	**129.5 ft.**	**DIII**
Gulfstream Aerospace GV	**90,500**	**93.5 ft.**	**—**	**96.5 ft.**	**DIII**
Gulfstream Aerospace GIV	74,600	78 ft.	149 kts.	79 ft.	DII
Boeing Business Jet (BBJ)	171,000	117.5 ft.	133 kts.	110.5 ft.	CIII
Boeing (B717)	114,000	93.5 ft.	134 kts.	124 ft.	CIII
Bombardier CRJ 200	53,000	69.6 ft.	135 kts.	87.9 ft.	CII
Bombardier CRJ 700	75,000	76.25 ft.	—	106.75 ft.	CII
Bombardier C-601/ 604	48,200	64.5 ft.	136 kts.	68.5 ft.	CII
Bombardier Global Express	95,000	94.0 ft.	—	99.5 ft.	CIII
Dassault Falcon 50 EX	40,780	61.9 ft.	107 kts.	60.8 ft.	BII
Dassault Falcon 900 EX	49,000	63.5 ft.	109 kts.	66.3 ft.	BII
Dassault Falcon 2000	36,500	63.5 ft.	109 kts.	66.5 ft.	BII

Gulfstream (GV)

Boeing (BBJ2)

Source: Data compiled by Mead & Hunt, Inc. (March 2003)

Table 3B

Design Aircraft Factors

Jacqueline Cochran Regional Airport

Runway Length

Existing

Runway 17-35 is currently 8,500 feet long. There are no displaced landing thresholds. The FAA's computer program derived from Advisory Circular 150/5325-4A, *Runway Length Requirements*, was utilized to aid in defining the appropriate future runway length at Jacqueline Cochran Regional Airport. This program calculates runway length for various classes of aircraft using as inputs: airport elevation, mean maximum temperature, and flight stage length. Runway lengths are categorized by the percentage of the aircraft fleet that can utilize the runway at a given percentage of their maximum load. An aircraft's load includes passengers, baggage/cargo, and fuel.

The FAA's runway length program was used to calculate runway length requirements for large airplanes weighing 60,000 pounds or less under several scenarios. This class would include all but the largest business jets and represents a group of aircraft that the airport should be able to serve effectively. The FAA's program indicates that a runway length of 8,510 feet would be required to accommodate 75% of these large airplanes with 90% of their useful load at a temperature of 108 degrees F. What this means is that 75% of these aircraft could use the existing runway while carrying 90% of their maximum load. A runway length of 11,200 feet would be required to accommodate 100% of these airplanes at 90% useful load.

In considering the data generated by the FAA's program, it is important to understand that all of the aircraft weighing less than 60,000 pounds can use Jacqueline Cochran Regional Airport with its current runway length, under most circumstances. However, some aircraft may face operational constraints when they use the airport. For example, some aircraft may be limited to taking off with reduced loads during hot days. During the hottest summer months, these aircraft must either reduce their takeoff fuel load and make a fuel stop en route, or wait until the temperature has dropped before taking off. Most often, the fuel load is reduced, as it is not uncommon for temperatures to still be in the 80's at midnight. A runway extension would reduce the operational constraints for these aircraft. However, it is seldom cost effective to provide sufficient runway to accommodate all of these aircraft at their maximum weight. Rather, the intent is to accommodate the majority of these aircraft under most circumstances.

Future

The critical aircraft for Jacqueline Cochran Regional Airport design criteria is the BBJ2. Runway 17-35, at 8,500 feet in length is adequate

for these operations. However, for other potential users of the airport, the current runway length can impose limitations. The future runway length requirements for corporate jets at Jacqueline Cochran Regional Airport are driven by long stage lengths (in excess of 2,500 nautical miles with IFR reserves). As noted above, to accommodate 100 percent of aircraft weighing less than 60,000 pounds at 90 percent of their useful load would require an 11, 200-foot long runway.

For airplanes weighing more than 60,000 pounds, the FAA recommends a runway length of 8,950 feet (or 9,000 feet rounded to the nearest 100 feet). This is 1,000 feet fewer than was recommended in the 1990 master plan. However, the 1990 master plan anticipated air carrier and air cargo operations by aircraft as large as the Boeing B-757-200 (240,000 pounds MGTOW) and the McDonnell Douglas DC-10-30 (570,000 pounds MGTOW). While such expectations may have seemed reasonable thirteen years ago, the fact now is that to expect a significant number of regular operations by these aircraft is not realistic. Moreover, the design aircraft for calculating future runway length requirements was the Boeing B-727-200. This aircraft is no longer in commercial service in this country, except for the re-engined or "hush-kitted" models used By Federal Express, DHL, and UPS. These carriers will be phasing these aircraft out of their fleet mixes over the next 10-15 years.

If air carrier or air cargo service becomes a reality at some point in the future, the aircraft types will be radically different from those suggested by the 1990 master plan. The emerging class of passenger aircraft known as "regional jets" are the most likely aircraft expected to be used for scheduled passenger service at Jacqueline Cochran Regional Airport in the future. Likewise, future air cargo aircraft are likely to be different from those suggested by the 1990 Master Plan. The existing 8,500-foot runway length is adequate for the majority, if not all of these types of aircraft.

Based upon the preceding factors, a future runway length of only 9,000 feet would be required. This length was chosen in consideration of the volume of aircraft that would need the additional length and the fact that the extra 500 feet would only be required in the summertime, i.e., the airport's low activity season. While some aircraft under some circumstances would benefit from a longer runway, the frequency would be low. Therefore, to extend the existing 8,500-foot runway to 9,000 feet, with the attendant closure or relocation of Avenue 60 was judged not to be cost-effective at this time. However, the airport should preserve the option for a 10,000-foot long runway in the event that additional length may be required to support commercial air carrier or air cargo operations. In any event, the extension should take place to the south because of existing development to the

north and the fact that Airport Boulevard is the primary airport access road.

Runway Width

Runway 17-35 is currently 150 feet wide. The FAA standard width for a runway accommodating aircraft in ARC D-III over 150,000 pounds maximum gross takeoff weight is 150 feet.

Runway Approaches

Traffic Patterns and Approach Patterns

The established traffic pattern for Runway 17-35 is a standard left-hand pattern to both runway ends. The pattern altitude is established at 1,000 feet above ground level (AGL) or 886 feet above mean sea level (MSL). As noted above, the airport is presently served by four non-precision instrument approach procedures. Two of these procedures apply to Runway 17-35: (1) a straight-in/circle-to-land GPS approach to Runway 35; and (2) a VOR-A circle-to-land approach for all runways.

Other Runway Design Considerations

Runway Safety Areas

The Runway Safety Area is an integral part of the runway environment. Its stated purpose is "to provide a measure of safety in the event of an aircraft's excursion from the runway by significantly reducing the extent of personal injury and aircraft damage during overruns, undershoots, and veer-offs." On October 1, 1999, FAA Order 5200.8 established the FAA's Runway Safety Area (RSA) Program. The purpose of the RSA Program is to ensure that all federally obligated airports and those certificated under 14 CFR Part 139 conform to the standards contained in AC 150/5300-13 to the extent practical. The program has three segments: inventory, determination, and implementation. For federally obligated airports such as Jacqueline Cochran Regional Airport, the inventory and determination segments will normally be undertaken during the master planning process. Implementation of RSA improvements will occur, if federal funds are used for the project, during the next scheduled runway project involving construction, reconstruction (including overlays), or significant expansion.

FAA airport design standards for ARC D-III facilities (with 1/2 mile visibility minimums), such as proposed for Jacqueline Cochran Regional Airport's Runway 17-35, specify that the Runway Safety Area

(RSA) be 500 feet wide the full length of the runway, extending 1,000 feet beyond each end of the runway. This is consistent with the dimensions for the RSA on the previously approved Airport Layout Plan (ALP).

Runway 17

The existing RSA at the approach end of Jacqueline Cochran Regional Airport's Runway 17 extends 1,000 feet beyond the runway end and is contained within the airport property. This is consistent with FAA design criteria and no changes are recommended. However, the RSA must be maintained as follows:

- Be cleared and graded, and have no potentially hazardous ruts, humps, depressions, or other surface variations;
- Be drained by grading or storm sewers to prevent water accumulation;
- Be capable, under dry conditions, of supporting…aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft; and
- Be free of objects, except for objects that need to be located in the runway safety area because of their function. Objects higher than 3 inches above grade are not permitted, unless required by function.

Runway 35

The existing RSA at the approach end of Runway 35 extends 1,000 feet beyond the runway end with a width of 500 feet. It is also contained on airport property and meets FAA standards for ARC D-III facilities. As with Runway 17, the RSA for Runway 35 must be maintained as above.

Object Free Areas

FAA design standards for ARC D-III facilities, such as Runway 17-35, specify that the Object Free Area (OFA) be 800 feet wide the full length of the runway and extend 1,000 feet beyond each runway end. The OFA for Runway 17-35 is in conformity with this standard. In addition, it is acceptable to place objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the OFA. Taxiway F is located within the OFA for Runway 17-35. Taxiway B is located outside the OFA for Runway 17-35.

Obstacle Free Zones

The dimensions of obstacle free zones (OFZs) vary depending upon the size of aircraft served and the visibility minimums of any associated instrument approach. The design aircraft for Jacqueline Cochran Regional Airport's Runway 17-35 is the Boeing Business Jet 2 and this master plan anticipates a precision instrument approach to Runway 35 with minimums below 3/4-mile. An OFZ for a runway with these characteristics is 400 feet wide and extends 200 feet beyond each runway end. An inner-approach OFZ is also required on the approach to Runway 35 and an inner-transitional OFZ lateral to the runway is also required. Runway 17-35 is capable of meeting these criteria.

Runway Protection Zones

Because it can accommodate aircraft in approach categories C and D (approach speeds of from 121 knots up to, but not including 166 knots) the runway protection zone (RPZ) for Runway 17 is 500 feet wide at its inner edge, 1,700 feet long, and 1,010 feet wide at its outer end. Airport Boulevard cuts across the middle of the RPZ and, with exception of a small triangular section, the remainder of the RPZ is contained within airport property. In the future, this RPZ should be upgraded to coincide with the proposed non-precision instrument approach for Runway 17. The dimensions of the future RPZ would be 1,000 feet wide at its inner edge, 1,700 feet long, and 1,510 wide at its outer end (see Figure 3-1).

Because of its straight-in non-precision instrument approach and ability to accommodate approach category C and D aircraft, Runway 35 has an RPZ that is 500 feet wide at its inner end, 1,700 feet long, and 1,010 feet wide at its outer end. Avenue 60 cuts across the midpoint of the RPZ, leaving approximately half of the RPZ on airport property, with the remainder on the south side of Avenue 60 located on privately owned property. In the future, this RPZ should upgraded to coincide with the precision instrument approach proposed for this runway. The dimensions of the future RPZ would be 1,000 feet wide at its inner edge, 2,500 feet long, and 1,750 wide at its outer end. The future RPZ will require the acquisition of the underlying land south of Avenue 60. When acquiring this land for approach protection purposes, the County should acquire enough land for extending the runway to 10,000 feet plus the area needed for the ultimate RPZ location (see Figure 3-2).

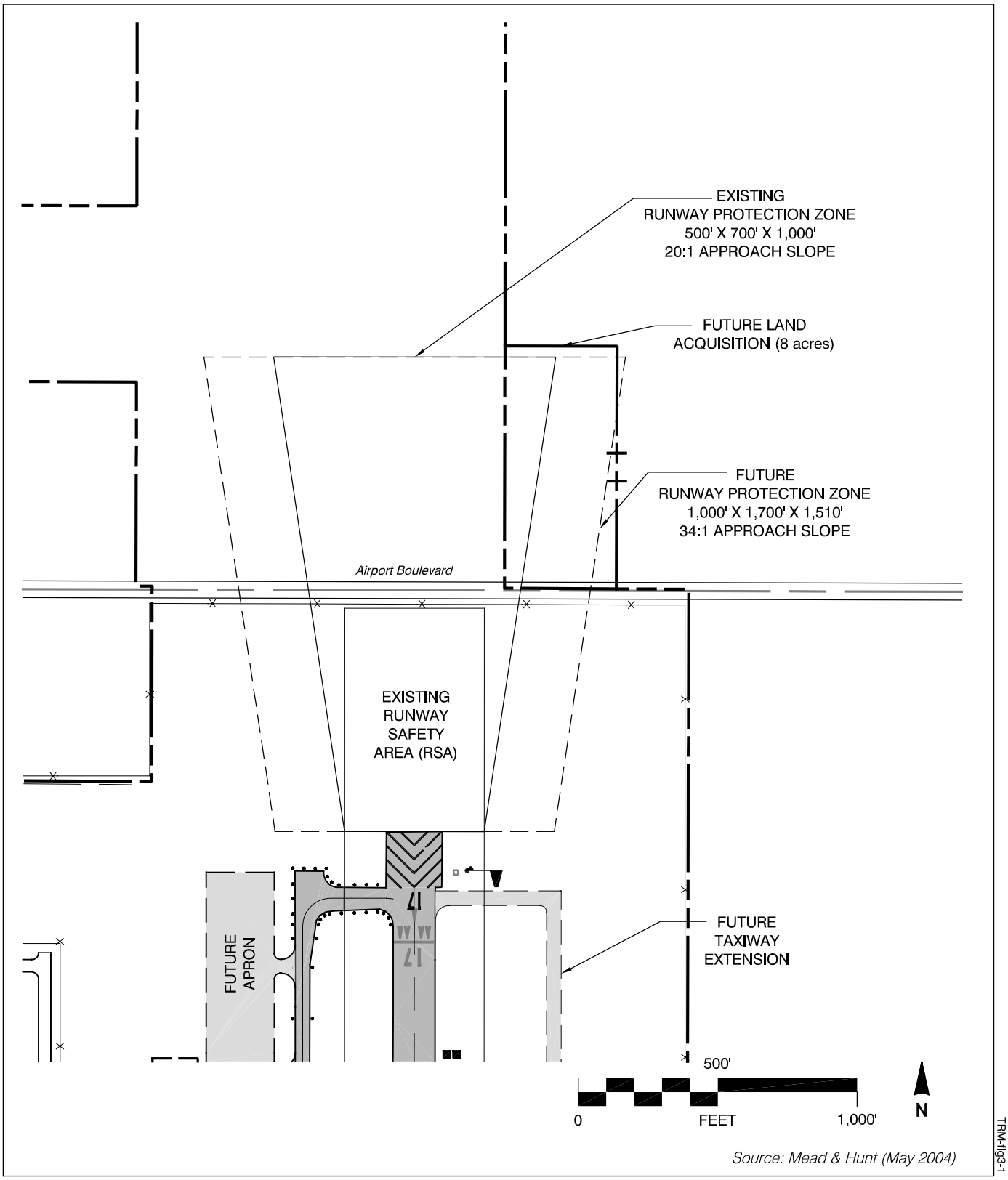
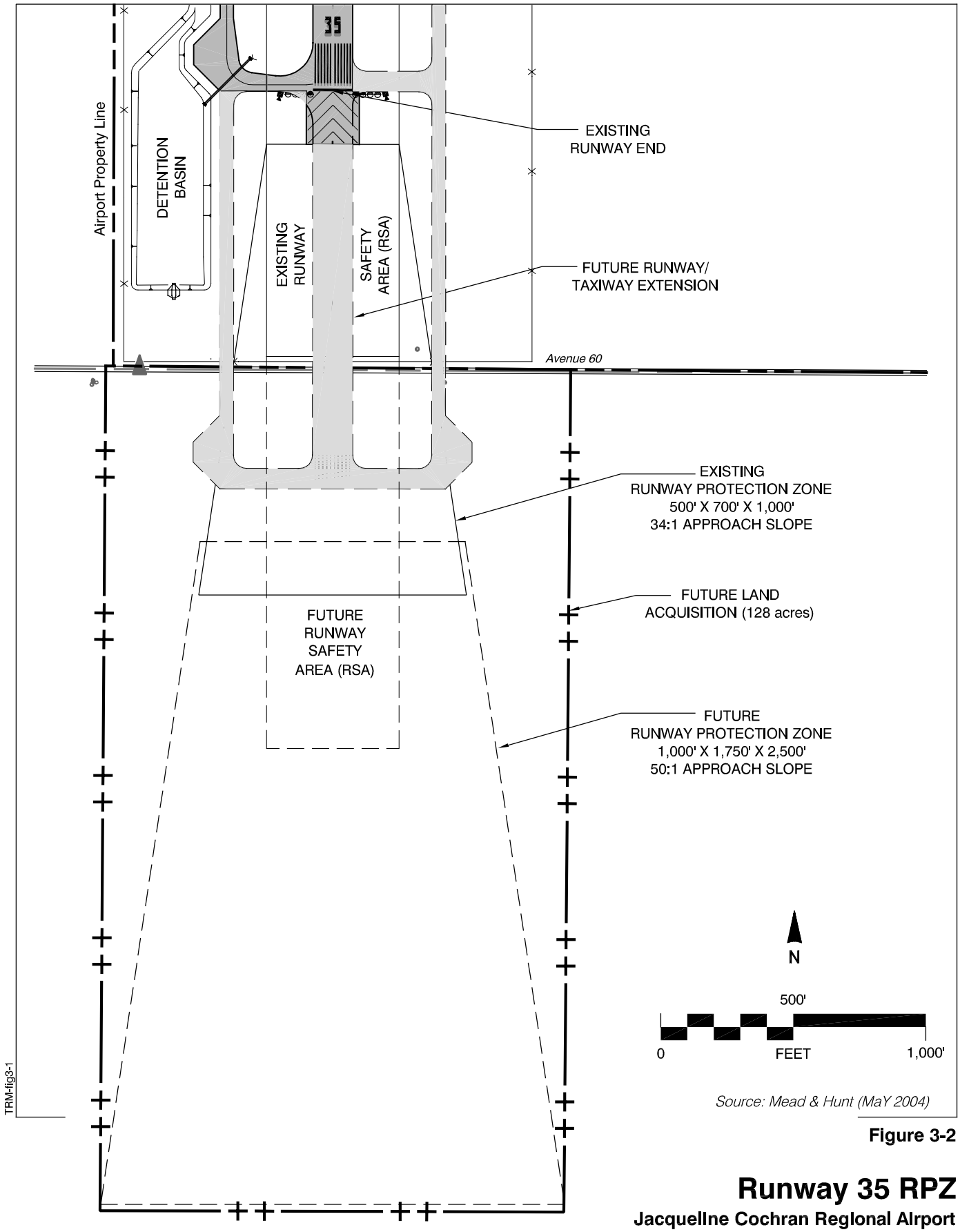


Figure 3-1

Runway 17 RPZ

Jacquelline Cochran Regional Airport



Source: Mead & Hunt (MaY 2004)

Figure 3-2

Runway 35 RPZ

Jacquelline Cochran Regional Airport

FAR Part 77 Imaginary Surfaces

Federal Aviation Regulations (FAR) Part 77, "*Objects Affecting Navigable Airspace*, identifies the airspace necessary to ensure the safe operation of aircraft to, from, and around airports. This airspace is defined for each airport by a series of imaginary surfaces. The dimensions and slopes of these surfaces depend on the configuration and approach categories of each airport's runway system. Generally, most critical among the FAR Part 77 surfaces are the approach surfaces.

Jacqueline Cochran Regional Airport enjoys published non-precision instrument approaches straight-in to both Runways 30 and 35. A precision instrument approach is anticipated for Runway 35 and a non-precision approach for Runway 17. It is not anticipated that Runway 12 will have a non-precision approach in the future. Therefore, the airport's airspace plan should reflect the ultimate extension (to 10,000 feet) of Runway 35 to the south and the installation of a precision instrument approach to this runway and a non-precision instrument approach to Runway 17. The ultimate extension of the runway to 10,000 feet will require relocation of Avenue 60. The relocation is required to provide necessary airspace clearance over vehicles using the road and room for an adequate runway safety area. No other effects on airspace are anticipated to result from the planned runway extension.

Building Restriction Line

The building restriction line (BRL) defines the limits of development of all on-airport structures, except facilities required by their function to be located near runways and taxiways. Although FAA offers only limited guidance on defining the appropriate location for building restriction lines, most airports use Part 77 surfaces. This is the case at Jacqueline Cochran Regional Airport where the building restriction line has been set to provide FAR Part 77 clearance over a structure up to 35 feet in height. In order to provide this clearance, the building restriction lines have been set at a minimum of 750 feet on each side of the centerline of Runway 17-35. There are no structures located within the BRL for Runway 17-35.

Although the current building restriction line is established on the basis of the distance a 35-foot high structure would have to be from the runway centerline to avoid penetration of the Part 77 surfaces, buildings of lesser height could be built within the BRL. If a 20-foot tall structure is assumed, the building restriction line can be set 640 feet from the runway centerline. Flexibility in the location of the BRL is allowable, as long as a structure does not penetrate the FAR Part 77 surfaces. However, consideration also needs to be given to

the tail heights of aircraft parked in front such a building to see that the aircraft's tail does not penetrate the FAR Part 77 surfaces.

Other Airfield Design Elements

Runway Lighting, Marking, and Visual Approach Aids — Runway 17-35 is equipped with medium-intensity runway edge lighting (MIRL). This lighting is in good condition, but should be upgraded to a high-intensity system when the approach to Runway 35 is upgraded from non-precision to a precision instrument approach. The lighting is pilot-controlled. Runway 35 currently has non-precision markings and Runway 17 is marked as a visual runway. Runway 17 should be upgraded to a non-precision instrument runway at the same time Runway 35 is upgraded to a precision instrument runway.

The approach end of Runway 17 is equipped with a Visual Approach Slope Indicator (VASI-V2L) with an approach slope angle of 3.0 degrees and a threshold crossing height of 50 feet. A Precision Approach Path Indicator (PAPI-P4L) with an approach slope of 3.0 degrees and a threshold crossing height of 50 feet serves the approach end of Runway 35.

The approach ends of Runways 17 and 35 are equipped with Runway End Identification Lights (REILs). These lights are useful in locating the runway threshold during hours of darkness and periods of low visibility.

Hold Lines — The FAA requires hold lines on all taxiways intersecting with runways. The hold lines painted on the exit taxiways for Runway 17-35 are set 250 feet from the runway's centerline. This conforms to the FAA standards for a non-precision instrument runway with Airport Reference Code D-III. It is also the same criterion for a precision instrument runway.

RUNWAY 12-30

Classification

The most demanding class of aircraft anticipated to regularly use Runway 12-30 at Jacqueline Cochran Regional Airport are those in Airport Reference Code (ARC) B-II. The specific design aircraft is the Raytheon Beechcraft King Air 200 (B-200). Aircraft in ARC B-II have approach speeds of 91 knots or more but less than 121 knots, wingspans of 49 feet up to but not including 79 feet. Airplanes in this class do not always require the runway length available for takeoffs and landings on Runway 17-35, and there is 99.5% wind coverage to 15 knots on Runway 12-30. Therefore, design standards for

Category B-II aircraft are appropriate to Runway 12-30, its associated taxiways and aircraft basing areas.

Runway Length

Existing

Runway 12-30 is currently 4,995 feet long. There are no displaced landing thresholds. The FAA's runway length program was used to calculate runway length requirements for small airplanes (MGTOW <12,500 pounds) with more than 10 passenger seats. The program calculated that a runway length of 4,570 feet was adequate for these aircraft at a temperature of 108-degrees F.

Future

The critical design aircraft for Runway 12-30 is the B-200 King Air, with a MGTOW of 12,500 pounds. However, larger and faster aircraft, including jets can and do use this runway. There is nothing in the B-II design criteria that would preclude the use of this runway by the majority of business jets, except for the biggest and fastest (i.e., over 30,000 pounds MGTOW and with approach speeds in excess of 120 knots). Hence, it is proposed that Runway 12-30 remain at its current length.

Runway Width

Runway 12-30 is currently 100 feet wide. The FAA standard width for a runway accommodating aircraft in ARC B-II is 75 feet. However, due to the potential for upgrading the non-precision instrument approach to Runway 30 to lower than ¾ mile visibility minimums, the runway width should be retained at 100 feet.

Runway Approaches

Traffic Patterns and Approach Patterns

The established traffic pattern for Runway 12-30 is a standard left-hand pattern to both runway ends. The pattern altitude is established at 1,000 feet above ground level (AGL) or 886 feet above mean sea level (MSL). As noted above, the airport is presently served by four non-precision instrument approach procedures. Three of these procedures apply to Runway 12-30: (1) a straight-in RNAV (GPS) approach to Runway 30 with circle-to-land capability to the other runways; (2) a VOR/DME straight-in approach to Runway 30 with circle-to-land capability for the other runways; and (3) a VOR-A circle-to-land approach for all runways.

Other Runway Design Considerations

Runway Safety Areas

FAA airport design standards for ARC B-II facilities (with less than ¾ statute mile visibility minimums), such as proposed for Runway 12-30, specify that the Runway Safety Area (RSA) be 300 feet wide the full length of the runway, extending 600 feet beyond each end of the runway. This is different from the dimensions for the RSA as depicted on the previously approved Airport Layout Plan (ALP). The previous RSA dimensions were based on the assumption that either Runway 12-30 would accommodate Airport Design Group IV aircraft (wingspans of 118 feet to 171 feet) or it would accommodate Aircraft Approach Group category C and D aircraft (121 to 166 knots). This master plan incorporates the modified dimensional criteria.

Runway 12

The existing RSA at the approach end of Jacqueline Cochran Regional Airport's Runway 12 extends 600 feet beyond the runway end and is contained within the airport property. This is consistent with FAA design criteria and no changes are recommended. However, as noted above, the RSA must be maintained in a particular manner.

Runway 30

The existing RSA at the approach end of Runway 30 extends 600 feet beyond the runway end with a width of 300 feet. It is also contained on airport property and meets FAA standards for ARC B-II facilities. As with Runway 12, the RSA for Runway 30 must be maintained as above.

Object Free Areas

FAA design standards for ARC B-II facilities, such as Runway 12-30, specify that the Object Free Area (OFA) be 300 feet wide the full length of the runway and extend 500 feet beyond each runway end. However, given the potential for upgrading the non-precision instrument approach to Runway 30 to lower than ¾ statute mile visibility minimums, this master plan uses an OFA width of 800 feet and 600 feet beyond the runway end. It is acceptable to place objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the OFA. Taxiway C is located outside the OFA for Runway 12-30. Proposed Taxiway G would be located within the OFA for Runway 12-30.

Obstacle Free Zones

As was discussed previously, the dimensions of obstacle free zones (OFZs) vary depending upon the size of aircraft served and the visibility minimums of any associated instrument approach. The design aircraft for Runway 12-30 is in ADG B-II and the master plan proposes an upgraded non-precision instrument approach to Runway 30 with minimums below 3/4-mile. An OFZ for a runway with these characteristics is 400 feet wide and extends 200 feet beyond each runway end. An inner-transitional OFZ lateral to the runway is also required. Runway 30 is capable of meeting these criteria.

Runway Protection Zones

The runway protection zone (RPZ) for Runway 12 is 500 feet wide at its inner edge, 1,000 feet long, and 700 feet wide at its outer end. The RPZ is located entirely on airport property.

Runway 30 also has an RPZ that is 500 feet wide at its inner end, 1,000 feet long and 700 feet wide at its outer end. The RPZ is contained entirely on airport property. In the future, if the non-precision instrument approach to Runway 30 is upgraded to not lower than ¾ statute mile minimums, the RPZ should be expanded to 1,700 feet long, 1,000 feet wide at its inner end and 1,510 feet wide at its outer end.

FAR Part 77 Imaginary Surfaces

Runway 30 has a published straight-in instrument approach. It is not anticipated that Runway 12 will need a non-precision approach in the future. Therefore, the only anticipated change to the current airspace for Runway 12-30 will occur when the non-precision approach to Runway 30 is upgraded to ¾ mile visibility minimums.

Building Restriction Line

As discussed above, the building restriction line (BRL) defines the limits of development of all on-airport structures, except facilities required by their function to be located near runways and taxiways. For Runway 12-30, the building restriction line is set at 650 feet from the runway centerline. This would allow for the construction of a 21-foot high building at this distance from the runway. South of the runway, this area would be located in the County's Redevelopment project area. This standard is different than that recommended for Runway 17-35, because aircraft using facilities associated with this runway would be smaller and have lesser tail heights.

Other Airfield Design Elements

Runway Lighting, Marking, and Visual Approach Aids — Runway 12-30 is equipped with medium-intensity runway lighting (MIRL). This lighting is in good condition and is suitable for the runway's existing and future use. The runway currently has non-precision markings for Runway 30 and visual markings for Runway 12. Runway lighting should be upgraded to high intensity lights when the non-precision instrument approach minimums are upgraded. There are no visual approach aids on Runway 12-30. The approach ends of Runways 12 and 30 should have Precision Approach Path Indicator (PAPI-P4L) with an approach slope of 3 degrees with a threshold crossing height of 50 feet installed in the future. There are no Runway End Identification Lights (REILs) on either runway end. These lights are useful in locating the runway threshold during hours of darkness and periods of low visibility, and should be installed in the future.

Hold Lines — The FAA requires hold lines on all taxiways intersecting with runways. There are hold lines painted on the exit taxiways for Runway 12-30.

Wind Indicators and Segmented Circle — The wind cone and segmented circle are located on the south side of Taxiway A across from the Million Air ramp.

Helipad

Jacqueline Cochran Regional Airport has no designated helipad, even though there are several helicopter operators who use the airfield, including the California Highway Patrol and military. By 2022, an estimated six helicopters will be based at the airport. Therefore, this master plan proposes the development of a designated helicopter operations area and helipad immediately to the south of Taxiway A, across from the Million Air-La Quinta FBO. At a minimum, this facility should provide parking for at least four transient helicopters and an area for basing up to six helicopter business operations.

Sikorsky UH-60

Not knowing what the future may bring, and the fact that some military helicopter operations already occur on a periodic basis, it would seem prudent to design the helicopter facility to accommodate the largest military helicopter expected to use the heliport. Although not the largest of all the military helicopters, the Sikorsky UH-60 (Blackhawk) is in widespread use by the U.S. Army, including the National Guard. The civilian version of the UH-60 is the S-70. The UH-60/S-70 is 65 feet in length, has a rotor diameter of 54 feet and weighs from 16,500 pounds to 24,500 (MGTOW) depending on its configuration. By adopting the UH-60 as the design helicopter for the Jacqueline Cochran Regional Airport helipad, the airport will be

able to ensure that all but the largest of civilian and military helicopters can be accommodated without having to risk the mixing of fixed-wing and rotary wing aircraft on areas designated for fixed-wing aircraft parking (e.g., the Million Air ramp).

Runway 17-35 Parallel Taxiway System

Existing

The centerline of the full-length parallel taxiway (Taxiway F) serving the west side of Runway 17-35 is located 400 feet from the runway centerline. The runway centerline-to-parallel taxiway centerline dimension recommended by the FAA for an ARC D-III facility is 400 feet. The runway centerline to taxiway centerline distance for the east side parallel taxiway (Taxiway B) is 500 feet. Therefore, the two parallel taxiways are consistent with FAA design guidelines for ARC D-III. While taxiing on the parallel taxiways, no part of the design aircraft (Boeing BBJ 2) will penetrate the OFZ defined above.

Future

Taxiway F was recently extended to coincide with both ends of Runway 17-35 and provides access to the new apron being constructed at the northwest end of Runway 35. No additional improvements to Taxiway F are anticipated. Taxiway B needs to be extended to both the north and south to coincide with the runway ends. Taxiway B provides access to the airport's eastside. Parts of this area have been reserved for a future air passenger terminal, air cargo facility and ARFF facility. Other potential developments include FBOs and other aviation related activities.

Holding Bays

The approach ends of Runways 17 and 35 are served by holding bays (runup aprons) on Taxiway F. These holding bays are adequate for current operations, but with any future development of the airport's east side, similar holding bays should be developed on Taxiway B.

Aircraft Parking Limits

Aircraft parking limit (APL) lines are established to define where it is appropriate to park aircraft. Depending upon the configuration of an airfield, aircraft parking limit lines are set with respect to a runway or a parallel taxiway. As Jacqueline Cochran Regional Airport has a full-length parallel taxiway on the west side of Runway 17-35 (Taxiway F), and since no development is currently planned for the east side of the runway, aircraft parking limits are established with respect to Taxiway F only.

The appropriate setback distance from a taxiway centerline to a parked aircraft is based upon the taxiway's object free area (OFA). Similar in concept to the runway OFA, the taxiway OFA defines an area that should be clear of objects that rise above the level of the runway. The size of the taxiway OFA is related to the wingspan of the critical aircraft. For Taxiway F, the APL is set 93 feet from the taxiway centerline. This will provide standard wingtip clearance for the design aircraft, the Boeing BBJ 2.

Taxiway Marking and Lighting

Taxiways B, F, and the runway exit taxiways are appropriately marked with centerline stripes, edge stripes, and appropriate hold lines. Taxiway F is lighted with medium-intensity taxiway lights (MITL). Taxiway B is lighted only at the runway exits.

Hold Lines

The FAA requires hold lines on all taxiways intersecting with runways. The hold lines at the access/exit taxiways serving Runway 17-35 are located 250 feet from the runway centerline. These hold lines are located and marked in accordance with FAA standards.

Signing

Lighted exit taxiway and hold line signs have been placed adjacent to the runway and exit taxiways. No deficiencies in signage have been identified.

Runway 12-30 Parallel Taxiway System

Existing

Runway 12-30 is served by Taxiways A, C and D. Taxiway A connects the northwest end of Runway 12-30 with the building area on the airport's north side. The taxiway continues on to the east to connect with Runway 17-35 and Taxiways B and F. Taxiway A is lighted for its entire length. Taxiway C is seldom used due to its poor condition. It is not lighted. Taxiway D connects the east end of Runway 12-30 with Runway 17-35 and Taxiways B and F. Taxiway D is lighted. Taxiways A, C and D are all 50 feet wide.

Future

This master plan recommends that Taxiway C be closed and that a new parallel taxiway (Taxiway G) be constructed inboard(northeast) of Runway 12-30. The new Taxiway G centerline would be 240 feet from the centerline of Runway 12-30. The taxiway width would be 35 feet.

Holding Bays

There are no holding bays for the taxiways serving Runway 12-30. Since Taxiways A and D do not serve the ends of Runway 17-35, none are required on these taxiways.

Aircraft Parking Limits

As discussed above, aircraft parking limit (APL) lines are established to define where it is appropriate to park aircraft. For Runway 12-30 the APL is set at 250 feet from the runway centerline on the south and 66 feet from the centerline of proposed Taxiway G on the north.

Taxiway Marking and Lighting

Taxiways A and D are equipped with pilot-controlled medium intensity taxiway lights (MITL). Taxiways A and D are appropriately marked with centerline stripes, and edge stripes. Centerline stripes also exist on taxilanes throughout the building area.

Hold Lines

The FAA requires hold lines on all taxiways intersecting with runways. The hold lines on Taxiways A and D serving Runway 17-35 are located 250 feet from the runway centerline. These hold lines are located and marked in accordance with FAA standards.

Signing

Lighted exit taxiway and hold line signs have been placed adjacent to the runway and exit taxiways. No deficiencies in signage have been identified.