# Chapter Five – Facility Requirements

## INTRODUCTION

To ensure that the Space Coast Regional Airport (TIX) will adequately accommodate demand expected during the twenty-year planning period, this chapter is intended to establish facility requirements for the future development of the airport. The principal challenge facing any growing airport is that of meeting future development requirements. Airport development is costly, and since each project is typically planned to last many years, care must be taken to ensure that each development project will help satisfy the projected level of airport needs. Increasingly, the nation's airports are facing serious deficiencies in their ability to provide the requisite facilities necessary to meet the public's demand for aviation services, both general aviation and commercial.

It is important that airport owners and managers make sure they do not overlook valuable opportunities to develop facilities and resources. When these opportunities are missed, the airport loses potential revenues, tenants do not receive maximum benefit from their leases, and the users experience a lower level of service than might otherwise be obtainable. Conversely, it is equally important when planning development that owners continue to consider the quality of life for local residents around the airport. Meeting the growth demands of an airport in today's world is routinely balanced with the community's desire for aesthetics and environmental conservation. The planning process for TIX is no exception.

This facility requirements analysis evaluates existing airport facilities (airfield and landside) against the projected level of demand to determine the ability of the airport to meet the forecast of future activity. The primary output of this analysis is the identification of excess or deficient capacity for the array of individual facilities comprising the airport. Before facilities at TIX are evaluated, it is important to review criteria that are employed by the Federal Aviation Administration (FAA) for the planning and design of airports. These criteria establish certain benchmarks that are used in the definition of adequacy or inadequacy for specified airport areas and facilities.

### FAR Part 139 Certification

The FAA recently made significant changes to 14 CFR Parts 121 and 139 pertaining to the certification of airports who conduct both scheduled and unscheduled air carrier operations. The new rule published in the Federal Register on February 10, 2004 and effective June 9, 2004 revised the certification process to incorporate all airports covered by the authorizing statute, including those serving scheduled, small air carrier aircraft (10 to 30 seats). Under this legislation, the FAA dropped the term "Limited Part 139" and reclassified airports into four classes, based on the type of air carrier operations served.

> **Class I** airport means an airport certificated to serve scheduled operations of large air carrier aircraft and can serve unscheduled passenger operations of large air carrier aircraft and/or scheduled operations of small air carrier aircraft.
>
> **Class II** airport means an airport certificated to serve scheduled operations of small air carrier aircraft and the unscheduled passenger operations of large air carrier aircraft. A Class II airport cannot serve scheduled large air carrier aircraft.
>
> **Class III** airport means an airport certificated to serve scheduled operations of small air carrier aircraft. A Class III airport cannot serve scheduled or unscheduled large air carrier aircraft.

**Class IV** airport means an airport certificated to serve unscheduled passenger operations of large air carrier aircraft. A Class IV airport cannot serve scheduled large or small air carrier aircraft.

TIX currently maintains a FAR Part 139, Class IV Certificate, which allows the airport to serve unscheduled carriers with aircraft seating capacity of more than 30 passengers. Although there are a limited number of unscheduled charter flights that occur at the airport each year, such service could increase at any time. Therefore, it is recommended that the Airport Authority maintain its current Class IV, Part 139 Certificate.

**Airport Reference Code and Critical Aircraft**

A key element in defining airport development needs is establishing development guidelines that are directly associated with the size and type of aircraft activity the airport will be expected to serve. By determining the aircraft types expected to use the airport, it is possible to establish a critical design aircraft that is then used for facility planning and design purposes. This critical aircraft is usually the most demanding aircraft using the airport. There may be different critical aircraft for different airport components identified, if necessary, by approach category, by wingspan, and/or by weight. To be considered a critical aircraft, there must be a minimum of 500 operations conducted at the airport each year by the aircraft.

Once the critical aircraft has been determined, an Airport Reference Code (ARC) is established based on specific characteristics of that aircraft. The two characteristics defining the ARC are the approach speed and wingspan. Because some aircraft may have large wingspans and relatively slow approach speeds, while others have high approach speeds and short wingspans, it is sometimes necessary to establish a critical aircraft for specific airport design parameters. Likewise, the aircraft defining the critical wingspan for design purposes may not be the critical aircraft defining the runway pavement strength requirement.

The ARC is identified using an alphanumeric designation, a letter designation followed by a Roman numeral. The letter designator is used to identify the Approach Category and the Roman numeral designates the Design Group in terms of wingspan. **Table 5-1** and **Table 5-2** delineate the criteria used in defining Aircraft Approach Categories and Aircraft Design Groups according to FAA Advisory Circular (AC) 150/5300-13 Change 8.

**TABLE 5-1**
**AIRCRAFT APPROACH CATEGORIES**

| Category | Approach Speed (knots) |
|---|---|
| A | < 91 |
| B | 91 – 121 |
| C | 121 – 141 |
| D | 141 – 166 |
| E | > 166 |

Source: FAA AC 150/5300-13 Change 8.

| TABLE 5-2<br>AIRCRAFT DESIGN GROUPS | |
|---|---|
| **Design Group** | **Wingspan (feet)** |
| I | < 49 |
| II | 49 – 78 |
| III | 79 – 117 |
| IV | 118 – 170 |
| V | 171 – 213 |
| VI | 214 – 262 |

Source: FAA AC 150/5300-13 Change 8.

Facilities at TIX have generally been designed to accommodate aircraft operations by aircraft with an ARC of C-III. In fact, the 1996 Master Plan Update shows both Runway 18-36 and Runway 9-27 as having an existing and future ARC of C-III. Today the critical aircraft for Runway 18-36 still warrant an ARC of C-III; however, the current critical aircraft for Runway 9-27 only require an ARC of C-II. Due to its length and instrument capability, Runway 18-36 supports a majority of the large jet operations conducted at TIX. This category of aircraft would also include many of the narrow-body jet aircraft that are used by charter operators such as the Boeing 727, Boeing 737, and McDonnell Douglas DC-9 series aircraft, including the McDonnell Douglas MD-80 through MD-90 models. Of these, the Boeing 727-200 was selected as the critical aircraft to represent the C-III operations conducted on Runway 18-36. This aircraft continues to be a popular and demanding aircraft for the type of charter and cargo carriers currently conducting operations at TIX. Because of the length available, Runway 9-27 cannot accommodate the larger charter and cargo aircraft without severe operational restrictions. Nonetheless, the runway does frequently accommodate aircraft within the larger business/corporate fleet. While the Gulfstream III was selected as the current critical aircraft for Runway 9-27, other business jets in the C-II category, such as the Citation X, Lockheed JetStar, and Rockwell Sabreliner 80, also utilize Runway 9-27 on a regular basis.

As reflected in the Forecast of Aviation Activity – Chapter 3, additional jet aircraft operations are expected to occur at TIX in the future. While a majority of these jet aircraft are anticipated to fall within the smaller B-II category, a number of larger jet aircraft operations are also anticipated. As such, operations conducted by the larger business/corporate users, ad hoc charters, and specialized cargo operators will continue throughout the planning period. It is predicted that these will include the newer and larger business jets gaining popularity today, such as the Airbus Corporate Jetliner, Boeing Business Jet, Bombardier Global Express, or Grumman Gulfstream V, as well as the current fleet of narrow-body commercial aircraft. Over the next 20 years, the ad hoc charter and specialized cargo carriers operating into TIX will slowly change their fleet to have less Boeing 727 and DC-9 series aircraft, and an increasing number of Boeing 737 and MD80 series aircraft. For illustrative purposes the MD-87 model with an ARC of C-III has been selected as the representative future critical aircraft for Runway 18-36 and the airport overall. For Runway 9-27 the size of aircraft is not expected to increase so much as the approach speed. Based on information from airport management and the air traffic control tower, it is not uncommon for aircraft as fast as the Grumman Gulfstream IV to utilize Runway 9-27. Therefore, once aircraft like the Grumman Gulfstream IV conduct more than 500 annual itinerant operations on Runway 9-27, the ARC will change to D-II. This is expected to occur during the latter half of the planning period.

## RUNWAY REQUIREMENTS

As the primary airfield component at any airport, a runway must have the proper length, width, and strength to safely accommodate the critical aircraft are expected to use the airfield. FAA AC 150/5325-4A, "Runway Length Requirements for Airport Design" and the FAA Airport Design software, Version 4.2D, provide guidelines to determine the ultimate runway length required at an airport facility. Runway width requirements for airport design are delineated in FAA AC 150/5300 Change 8. The design standards are based on the critical aircraft's Approach Category, Design Group, and the airport's approach visibility minimums.

Pavement strength is predicated upon the critical aircraft's weight and how that weight is distributed through the landing gear configuration. Pavement evaluations establish load bearing capacity for expected operations, assess the ability of pavements to support significant changes from expected volumes or types of traffic, and determine the condition of existing pavements for use in the planning or design of improvements. Projects to rehabilitate runway pavements are routinely conducted every 15 to 20 years after the previous major rehabilitation, strengthening, or new construction. These projects, which repair damage to the runway pavements resulting from normal wear, need to be conducted even at airports with regular pavement maintenance programs, including crack sealing and surface seal coats.

In addition to issues associated with the physical characteristics of the runway are other safety-related criteria tied to the requirement for a Runway Safety Area, Runway Object Free Area, and Runway Protection Zone. The FAA definitions for these surfaces are defined as:

> **Runway Safety Area (RSA) -** A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershot, overshoot, or excursion from the runway. The RSA needs to be: (1) cleared and graded with no potentially hazardous ruts, humps, depressions, or other surface variations; (2) drained by grading or storm sewers to prevent water accumulation; and (3) capable, under dry conditions of supporting the occasional passage of aircraft without causing structural damage to the aircraft. Finally, the RSA must be free of objects, except for those that need to be located in the safety area because of their function.
>
> **Runway Object Free Area (ROFA) -** The ROFA is centered on the runway centerline. Standards for the ROFA require clearing the area of all ground objects protruding above the RSA edge elevation. Except where precluded by other clearing standards, it is acceptable to place objects that need to be located in the ROFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the ROFA. Objects non-essential for air navigation or aircraft ground maneuvering purposes are not to be placed in the ROFA. This includes parked airplanes and agricultural operations.
>
> **Runway Protection Zone (RPZ) -** A RPZ, or clear zone as it was formerly named, is a two-dimensional trapezoidal shaped area beginning 200 feet from the usable pavement end of a runway. The primary function of this area is to preserve and enhance the protection of people and property on the ground. The size or dimension of the runway protection zone is dictated by guidelines set forth in FAA AC 150/5300-13, Change 8. Airports are required to maintain control of each runway's RPZ. Such control includes keeping the area clear of incompatible objects and activities. While not required, this control is much easier to achieve and maintain through the acquisition of sufficient property interests in the RPZs.

**Runway 18-36**

As reflected in the Inventory – Chapter 2, Runway 18-36 is the primary runway with an overall length of 7,320 feet and width of 150 feet. The landing threshold at the Runway 18 end is displaced 319 feet and both runway ends have a 200 foot long and 150 feet wide, paved blast pad. Currently Runway 36 has precision instrument approach capability, while Runway 18 is limited to a straight-in non-precision instrument approach with not lower than one statute mile approach visibility minimums. The following sections detail the improvements necessary for this runway over the course of the planning period.

***Runway 18-36 Length Analysis***

The current runway lengths at TIX were analyzed to determine if the existing and future aircraft operations could be sufficiently served. The size and type of aircraft that currently utilize the airfield, as well as those forecasted to frequent the airport during the planning period, provide the basis for this analysis, as it is their operating characteristics that determine runway length requirements. Other major determinants in establishing required runway lengths have been factored into the analysis for TIX including: local temperatures, elevation, and weather conditions; FAA guidance; the proximity of the airport in the Central Florida region; and future development plans for the airfield. The basis of the analysis was to decide whether existing or future demand warrants a runway extension.

Currently, TIX primarily serves single-engine, multi-engine, and rotorcraft operations. This is not to say that the airport does not support a significant number of jet aircraft operations. In fact, because of the airfield's close proximity to the many industries and corporations supporting the operations at both the Kennedy Space Center Complex and Canaveral Air Force Station, the airport supports a multitude of jet aircraft operations. These jet operations provide direct assistance to space related activities, such as receiving and expediting cargo deliveries, as well as serving as a primary location for use by major space related corporate traffic. Likewise, the airport also serves a considerable number of the larger general aviation jet activity for tourism (such as the beaches, cruise ships, or Space Shuttle launches) and some jet charter aircraft, which are conducted for a variety of purposes.

Up to 1999, the length of Runway 18-36 was limited to 6,001 feet. In June 1998, a detailed Runway Length Analysis Report was prepared by Transportation Solutions Incorporated. Shortly afterwards, an Environmental Assessment was completed, which resulted in the approval of a 1,320 foot extension to the north to obtain the current Runway 18-36 length of 7,320 feet. The 1998 Runway Length Analysis documented that TIX supported over 500 annual itinerant operations by aircraft requiring a runway length greater than 6,001 feet. The 1998 report utilized the characteristics of aircraft operating at TIX along with local conditions to determine the runway length necessary to safely support the operations conducted at TIX. The conclusion of the report was that an extension of Runway 18-36 to a minimum length of 7,000 feet and potentially 7,500 feet was not only warranted, but also completely justified by the level of demand and operational activity occurring at the airport at that time. The ultimate extension to 7,320 feet in 1999 provided the runway length necessary to safely accommodate a majority of the business/corporate jet aircraft fleet flown in the U.S. at the stage lengths typically flown from TIX. This is not to say, however, that the extension fully met all demands.

By providing the proper runway length to safely accommodate the larger business jet activity at TIX not only supported the existing operations, but also provided a strategic move to spur additional economic development in the local community as well. Currently, TIX has much undeveloped land on the airfield, including the West Side of the airport, with significant potential for the continued development of an industrial park type complex. For purposes of discussion, the West Side refers to the areas described in the Inventory – Chapter 2 as the Southwest Side and Northwest Side of the airfield. The presence of an industrial center with airfield access opens the door to even greater opportunities for business jet activity, which the forecasts show occurring over the planning period. In addition to the airport's proximity to space operations and industrial/business markets, the airport also anticipates increases in jet activity because of the boost in sales and use of business jets over the past decade. Major local corporations including Boeing, Lockheed Martin, Sea Ray Boats, and United Space Alliance, to name a few, will continue to operate their existing corporate jet fleets and likely even larger aircraft that are currently in their fleets over the course of the planning period. The forecast operational fleet mix shows that the airport should expect the current level of jet operations to more than double by the end of the planning period.

It is anticipated that as these jet operations at TIX increase, so will the size of the aircraft operating at the airport. As described in the discussion on critical aircraft, the airport should plan to accommodate more of the newer and larger business jets such as the Airbus Corporate Jetliner, Boeing Business Jet, Bombardier Global Express, and Grumman Gulfstream V. While these aircraft can certainly operate at the airport today under restricted loads, the entire purpose for companies acquiring the variants is to operate with high loads on very long stage lengths. Nonetheless, while there will be times when more than 7,320 feet of runway length is needed, the airport is not presently anticipated to meet the minimum level of operations to justify a greater length until later in the planning horizon. The same is true for the various mix of narrow-body aircraft identified as the critical aircraft. While their operations warrant the appropriate airfield design standards to be met, the frequency at which they depart under their maximum allowable takeoff weight does not currently justify additional runway length. As stated previously, the FAA mandates that a minimum of 500 annual operations be conducted by the aircraft requiring the increase in runway length. Nonetheless, TIX should still anticipate this larger business jet activity to occur at some point in the future and address contingencies to meet this demand in its current planning process. As such, the study needs to consider the long-term runway length expected in order to properly plan the development of the airfield. Once the justification is documented, the airport will be in a position to move forward with the necessary environmental and design elements.

The FAA, when reviewing need for runway lengthening, generally relies on its own runway length software program that is part of the Airport Design package. This program provides an assessment of runway length needs for generalized groupings of aircraft and factors in several key airport and runway elements, which include: airport elevation, mean daily maximum temperature (of the hottest month), maximum difference in runway centerline elevation, average length of haul (for aircraft over 60,000 pounds), and typical weather conditions. Airfield elevation and the temperature of the hottest month determine the density altitude, which is pressure altitude adjusted for temperature. Density altitude adversely impacts runway length. As the airfield elevation and/or average temperature increases, the minimum required runway length must increase due to the increased density altitude. The difference in runway centerline elevation can impact runway length depending on whether the aircraft is going up or downhill during the takeoff roll. For Runway 18-36, this difference is four feet. Length of haul is considered to provide an indication of how heavy the larger aircraft are operating out of the airfield. As documented in the 1998 runway study, stage lengths of 2,000 miles, 2,500 miles, or even longer are not uncommon. Therefore, an average stage length of 2,250 miles was utilized for the analysis. Finally, weather conditions must be factored into the equation, as takeoffs made from runways under slippery and wet conditions must consider the accumulative effects of reduced acceleration. As noted in the Inventory – Chapter 2, rainfall in this area occurs during all seasons, however is more abundant during the summer when heavy daily showers are common. Therefore, in the FAA model, the runway conditions were labeled as wet and slippery versus dry. The following provides a summary of the airport and runway data utilized.

| | |
|---|---|
| Airport Elevation: | 34 feet |
| Mean Daily Maximum Temperature of the Hottest Month: | 91°F |
| Maximum Difference in Runway Centerline Elevation: | 4 feet |
| Average Length of Haul (Airplanes more than 60,000 pounds): | 2,250 miles |
| Runway Conditions: | Wet and Slippery |

**Table 5-3** reflects the recommended runway lengths computed using the FAA's software program with the information described above for TIX.

**TABLE 5-3**
**FAA RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN**

| | | |
|---|---|---|
| Small airplanes with approach speeds of less than 30 knots | | 300 feet |
| Small airplanes with approach speeds of less than 50 knots | | 810 feet |
| Small airplanes with less than 10 passenger seats | | |
| 75 percent of these small airplanes | | 2,520 feet |
| 95 percent of these small airplanes | | 3,090 feet |
| 100 percent of these small airplanes | | 3,660 feet |
| Small airplanes with 10 or more passenger seats | | 4,280 feet |
| Large airplanes of 60,000 pounds or less | | |
| 75 percent of these large airplanes at 60 percent useful load | | 5,370 feet |
| 75 percent of these large airplanes at 90 percent useful load | | 7,000 feet |
| 100 percent of these large airplanes at 60 percent useful load | | 5,510 feet |
| 100 percent of these large airplanes at 90 percent useful load | | 8,490 feet |
| Airplanes of more than 60,000 pounds | Approximately | 7,980 feet |

Source: Chapter 2 of AC 150/5325-4A, Runway Length Requirements for Airport Design.

According to the FAA calculations, the current length of Runway 18-36 (7,320 feet) satisfies the recommended runway lengths for all small airplanes (less than 12,500 pounds). However, the categories of particular relevance for this analysis are the 'Large airplanes of 60,000 pounds or less' and 'Airplanes of more than 60,000 pounds.' These two categories encompass nearly every one of the nation's active business jets, with the newer and larger aircraft falling in the over 60,000 pound category. The over 60,000 pounds also encompasses the aircraft typically used by the occasional charter operators at TIX.

As shown, Runway 18-36 satisfies all but one of the four sub-categories under 'Large airplanes of 60,000 pounds or less.' In order to accommodate 100 percent of these large airplanes at a 90 percent useful load, the FAA recommends a runway length of 8,490 feet. Therefore, to accommodate 100 percent of the large airplanes at a 90 percent useful load, an additional 1,170 feet would be necessary. However, it is not anticipated that every jet would require a 90 percent useful load, under the conditions shown, 500 times each year. For the over 60,000 pound category, the FAA methodology indicates a runway length of 7,980 feet will be needed. It should be stated that when the maximum gross weight of the critical aircraft is over 60,000 pounds, the runway length is normally designed for a specific aircraft. However, for the purposes of this study, this category provides a general length that the airport should consider to preserve for the future capability of the airport. It is also important to note that FAA criteria, as well as various airplane characteristics, tend to understate the runway length needs when compared against the actual operators' flight performance manuals and engine-out obstacle clearance requirements.

In addition to the FAA calculations, another more detailed runway length analysis was also conducted. This analysis calculated runway length figures using airfield conditions for TIX and data from the specific aircraft performance manuals. The resulting lengths, shown in **Table 5-4**, list a number of the popular large jet aircraft by type (over 12,500 pounds), ARC, maximum takeoff weight, and the corresponding required runway lengths. Although this is not a complete list of the aircraft expected to utilize the airfield, it does provide greater detail than the more general figures calculated by the FAA software. The aircraft have been listed based on their maximum takeoff weight.

**TABLE 5-4**
**RUNWAY LENGTHS REQUIRED FOR LARGE JETS AT TIX**

| Aircraft | Airport Reference Code (ARC) | Maximum Takeoff Weight (pounds) | Required Runway Takeoff Length (feet) |
|---|---:|---:|---:|
| Citation II | B-II | 13,300 | 4,054 |
| Learjet 24 | C-I | 13,500 | 3,763 |
| Learjet 25 | C-I | 15,000 | 4,693 |
| Learjet 28/29 | B-I | 15,000 | 3,588 |
| Beechjet 400 | B-I | 16,100 | 4,463 |
| Citation V | B-II | 16,100 | 3,716 |
| Citation Ultra | B-II | 16,300 | 3,740 |
| Learjet 31A | C-I | 17,000 | 4,100 |
| Learjet 35A/36A | C-I | 18,500 | 5,824 |
| Sabreliner 40 | B-I | 18,650 | 5,741 |
| Citation Excel | B-II | 18,700 | 4,013 |
| Falcon 10 | B-I | 18,740 | 5,275 |
| Sabreliner 60 | B-I | 20,000 | 5,973 |
| Learjet 45 | C-I | 20,500 | 5,101 |
| Learjet 55C | C-I | 21,500 | 6,553 |
| Citation III | B-II | 22,200 | 6,031 |
| Citation VII | B-II | 22,450 | 5,496 |
| IAI Westwind 1124A | C-I | 23,500 | 6,148 |
| Learjet 60 | C-I | 23,500 | 6,380 |
| Sabreliner 65 | B-II | 24,000 | 8,116 |
| Sabreliner 80 | C-II | 24,500 | 6,989 |
| Hawker 800XP | B-II | 28,000 | 6,380 |
| Falcon 20 | B-II | 28,660 | 5,799 |
| Falcon 20-5 | B-II | 29,100 | 6,811 |
| Falcon 200 | B-II | 30,650 | 6,090 |
| Citation X | C-II | 35,700 | 6,683 |
| Falcon 2000 | B-II | 35,800 | 6,369 |
| Hawker Horizon | B-II | 36,000 | 6,148 |
| Falcon 50 | B-II | 37,480 | 5,508 |
| Falcon 50EX | B-II | 39,700 | 5,729 |
| Falcon 2000EX | B-II | 40,700 | 6,741 |
| Lockheed Jetstar | C-II | 42,000 | 7,527 |
| Challenger 601 | B-II | 43,250 | 6,322 |
| Falcon 900C | B-II | 45,500 | 5,781 |

| TABLE 5-4<br>RUNWAY LENGTHS REQUIRED FOR LARGE JETS AT TIX | | | |
|---|---|---|---|
| **Aircraft** | **Airport Reference Code (ARC)** | **Maximum Takeoff Weight (pounds)** | **Required Runway Takeoff Length (feet)** |
| Falcon 900EX | B-II | 47,185 | 6,107 |
| Challenger 604 | B-II | 47,600 | 6,670 |
| Falcon 7X | B-III | 63,700 | 6,090 |
| Gulfstream II | D-II | 64,800 | 6,584 |
| Gulfstream III | C-II | 69,700 | 5,991 |
| Gulfstream IV | D-II | 74,600 | 7,122 |
| Gulfstream V | D-III | 90,500 | 7,009 |
| Global Express | C-III | 93,500 | 6,578 |
| Boeing Business Jet | C-III | 171,000 | 7,137 |
| Boeing Business Jet 2 | C-III | 174,200 | 8,184 |

Source: Runway Length Analysis Software and Aircraft Performance Manuals.

Based on the calculations above, the current 7,320 foot runway would adequately serve all of the large business jet aircraft analyzed with only a few requiring restrictions on the useful load. While this table is not intended to imply that each specific aircraft listed will frequent the airport, it does serve to illustrate that the current runway length is adequate for a majority of the business jet fleet operating at TIX. Likewise, the length of the two existing blast pads located off each runway end meets Design Group II standards. Nonetheless, it is recommended that the ultimate ability to provide 8,000 feet of runway should be preserved for Runway 18-36. While this length may not be needed for some time, it is recommended that the Airport Authority properly plan to ultimately have the ability to provide such a length in the future. This includes protecting the land and airspace associated with the ultimate length. An overall length of 8,000 feet would enhance the ability to serve the entire business/corporate fleet of jet aircraft.

In addition, an ultimate length of 8,000 feet would enhance the ability to provide additional landing length for occasional larger and heavier aircraft that have expressed an interest in operating intermittently in and out of the facility carrying equipment to support space-bound payloads. Occasionally, some of the corporations in the area will require a wide-body cargo aircraft such as the Lockheed L1011, McDonnell Douglas DC-10, McDonnell Douglas MD-11, or Airbus A300-600. A key activity of the business base in the area is the preparation of payloads for space launch. One of the leading firms in the world in this industry is located immediately northwest of the airport, and they have expressed their desire to land components at TIX. The firm recently completed a $30 million expansion of its facilities to accommodate the new generation of launch vehicles. Based on existing contracts, this facility alone will bring over $85 million in business through its Titusville facility with a direct and corresponding benefit to the entire business and overall community economic base. Utilizing the Shuttle Landing Facility or the Skid Strip at Cape Canaveral is adversely impacted by NASA launches, which often result in both landing facilities being closed for extended periods. Further, the use of these two facilities doubles the complicated movement of highly sensitive payloads with corresponding impacts to traffic flows in the area. The ability to access TIX as one element of their operation would significantly enhance the efficiency of these operations. While none of the wide-body cargo aircraft are expected to conduct enough flights to be considered the critical aircraft for the airport, they would operate into and out of the facility a few times each year. Typically, these aircraft will arrive with a payload and leave empty, which depending on their origin, makes the landing more critical than the takeoff. These wide-body freighters can require anywhere from 6,000 feet to more than 8,000 feet of landing length. This of course varies based on whether or not the aircraft is landing at the maximum allowable landing weight, weather conditions (primarily temperature, humidity, and precipitation, even with a grooved runway), wing configuration on landing, and/or pilot technique. Basically, an overall runway length of 8,000 would enhance the operation and safety of the occasional heavy jet cargo operations at the airport.

Finally, with any major runway extension, the FAA will require that an Environmental Assessment (EA) be undertaken. While it is ultimately up to the FAA to determine whether an extension to Runway 18-36 constitutes a major runway extension, the airport should coordinate with the FAA Orlando Airport District Office (ADO) environmental representative to determine the viability of obtaining Categorical Exclusion for the project. If Categorical Exclusion is not granted, the EA process will be necessary, whether or not federal funds are anticipated in the project. For planning purposes, an EA for the extension of Runway 18-36 should be programmed in the long-term portion of the Capital Improvement Program.

***Runway 18 Displaced Threshold***

It is believed that through the appropriate management of both man-made and vegetative obstructions, the current displacement of Runway 18 may not be necessary in the future. The Alternatives Analysis, Chapter 6 of this study, will apply and evaluate the FAA's threshold siting criteria to this runway end. This analysis will incorporate the data obtained from the June 2002 aerial photogrammetry to make a decision as to whether or not the Airport Authority should request a formal review by the FAA to remove the existing 319 foot displaced threshold. Should the threshold be removed in the future, some costs will be required to make the appropriate modifications to the runway markings, edge lighting, inboard threshold lighting, the Precision Approach Path Indicator (PAPI) system, signage, and distance remaining signs. These costs as well as the potential impact to the existing and any future instrument approach procedures will be considered in the Alternatives Analysis – Chapter 6.

***Runway 18-36 Width Requirements***

Runway 18-36 currently has, and will continue to have an ARC of C-III. Criteria contained in FAA AC 150/5300-13, Change 8 states that runways with an ARC of C-III require a minimum width of 100 feet. However, for Design Group III runways serving aircraft with a maximum certificated takeoff weight greater than 150,000 pounds, AC 150/5300-13, Change 8 states that the standard runway width should be 150 feet. It also states that the runway should have 25-foot wide paved shoulders and a 200-foot wide blast pad. Since the airport supports a number of operations by aircraft over 150,000 pounds and is fully expected to continue in the future, the current 150-foot width of Runway 18-36 is adequate for the planning period and any future extension should be planned to match the existing pavement width configuration. However, the runway will require 25-foot wide paved shoulders and for both blast pads to be increased to a width of 200 feet in order to safely accommodate Design Group III aircraft over 150,000 pounds.

***Runway 18-36 Pavement Strength***

When the runway was extended in 1999, the older 6,001-foot portion was not changed. However, an overlay of the original length was conducted as part of a 2002 project. Currently the published pavement strength for Runway 18-36 shows that it is capable of accommodating a maximum gross weight of 80,000 pounds for single wheel landing gear aircraft, 110,000 pounds for dual wheel aircraft, and 190,000 pounds for dual tandem gear aircraft. Since nearly all of the large business/corporate jet aircraft have a dual landing wheel configuration and are less than 110,000 pounds, the current runway will provide the proper strength to support the existing critical aircraft. However, a runway-strengthening project may be required as the existing Boeing 727-200 and future MD-87 critical aircraft have gross maximum takeoff weights in excess of 110,000 pounds and only a dual landing gear configuration. This is also true for most of the popular charter and cargo aircraft that frequent TIX, including the Boeing 737 and DC-9 series aircraft. As state previously, these aircraft currently do not conduct 500 annual operations under their respective maximum allowable takeoff weight configuration. However, should this occur in the future, Runway 18-36 would require additional strengthening to accommodate heavier aircraft with dual-wheel configurations.

Although the Runway 18-36 pavement will be in excellent condition during the short term planning period, routine maintenance is recommended to address normal wear. This routine maintenance should include regular pavement rehabilitations. Depending on whether or not a runway strengthening project is actually needed, it may be necessary to rehabilitate the pavement one or two other times during the planning period of this study.

***Runway 18-36 Safety Criteria***

The size of the RSA, ROFA, and RPZ are a function of the Approach Category and Design Group as well as the minimums associated with the most critical approach to the runway. Under ARC C-III, Runway 18-36 requires a 500 foot wide RSA (250 feet either side of the runway centerline) that extends 1,000 feet beyond each runway end. The ROFA for Runway 18-36 needs to be 800 feet wide (400 feet either side of the runway centerline) and extend 1,000 feet beyond each runway end. Because Runway 18-36 is in Approach Category C, this RSA and ROFA criteria is required regardless of the type of approach minimums established for the runway. However, the criteria for the RPZ may vary for each end. Beginning 200 feet beyond the end of the area usable for takeoff or landing, the RPZ for Runway 36 needs to have an inner width of 1,000 feet, an outer width of 1,750 feet, at an overall length of 2,500 feet, to support the precision instrument approach. For Runway 18 the current non-precision instrument approach, with not lower than one statute mile visibility minimums, requires an RPZ to have an inner width of 500 feet, an outer width of 1,010 feet, at an overall length of 1,700 feet. Currently, Runway 18-36 meets the FAA RSA and ROFA width and length requirements, as well as the criteria required for the RPZs.

Should Runway 18-36 be extended in the future, all of the safety criteria described above will need to be incorporated into the new runway length. If a better non-precision instrument approach is established for Runway 18, the dimensions of the RPZ will increase. For example, if a non-precision approach with not lower than ¾ statute mile visibility minimums is established, the required RPZ dimensions would increase to an inner width of 1,000 feet, an outer width of 1,510 feet, and an overall length of 1,700 feet. Should a precision instrument approach (lower than ¾ mile visibility) be established to Runway 18, the RPZ dimensions increase to an inner width of 1,000 feet, an outer width of 1,750 feet, and an overall length of 2,500 feet. The requirement for any future or improved instrument approaches to Runway 18 will be discussed in a later section.

**Runway 9-27**

Runway 9-27 is the secondary or crosswind runway with an overall length of 5,000 feet and width of 100 feet. This runway also has 25 foot wide paved shoulders. As mentioned previously, the ARC for Runway 9-27 will remain C-II throughout most of the planning period, but is ultimately expected to change to D-II. Currently only

Runway 9 has a straight-in non-precision instrument approach, with not lower than one statute mile approach visibility minimums. The following sections detail the future requirements for Runway 9-27 over the twenty-year planning period.

***Runway 9-27 Length Analysis***

The runway length analysis conducted for Runway 18-36 indicated that eventually an overall length of 8,000 feet may be required at TIX. Whether or not the demand justifies extending Runway 18-36, the current length of Runway 9-27 (5,000 feet) is considered sufficient. The reason for this is based on the wind coverage provided by the two runways at TIX. According to FAA AC 150/5325-4A, "Runway Length Requirements for Airport Design," a crosswind runway should provide 80 percent of the length of the primary runway. Currently this would equate to 5,856 feet; however, based on the wind rose analysis, Runway 9-27 is only required to provide 95 percent coverage in the 10.5-knot category. This was reflected in **Table 2-14** of the Inventory – Chapter 2. The 10.5-knot category is for aircraft with an ARC of A-I or B-I, while the 13-knot category is for aircraft with an ARC of A-II or B-II, and the 16-knot category is for aircraft with an ARC .

It has been suggested by some large jet operators that additional length on Runway 9-27 would enhance the safety of operations when conditions dictate the use of the crosswind runway. While this is true, not enough critical operations under such conditions occur to justify such an extension. Essentially, when Runway 9-27 is utilized by the larger business/corporate jet aircraft, it is at the pilots' own discretion. When aircraft configuration and/or weather conditions dictate a requirement greater than 5,000 feet, pilots of the larger jet aircraft should not use Runway 9-27. In other words, while operations by the larger business/corporate jets do occur on Runway 9-27, they are only conducted when it is within the operating parameters of the aircraft. Discussions with air traffic control indicated that most large jet operations are conducted on Runway 9-27 to make the flight more convenient. Therefore, the length of Runway 9-27 will sufficiently serve the aircraft anticipated during the planning period.

***Runway 9-27 Width Requirements***

Ultimately, Runway 9-27 should be planned to have improved approach visibility minimums, possibly lower than ¾ of a statute mile on one end or the other. The possibility for better instrument approaches is discussed in a later section. Criteria contained in FAA AC 150/5300-13, Change 8, states that runways with an ARC of C-II or D-II are required to have a width of 100 feet, for any type of instrument approach. Therefore, the current width of Runway 9-27 will be adequate for the planning period.

***Runway 9-27 Pavement Strength***

As documented in the Inventory – Chapter 2, the pavement for Runway 9-27 is rated for aircraft with a maximum gross weight of 50,000 pounds under the single wheel landing gear configuration and 80,000 pounds under the dual wheel configuration. Since nearly all of the large business/corporate jet aircraft operating on Runway 9-27 have a dual landing wheel configuration and are less than 80,000 pounds, the pavement strength of Runway 9-27 should provide the proper strength to support the current critical aircraft. Likewise, the Grumman Gulfstream IV is a dual wheel aircraft with a maximum allowable takeoff weight of 74,600 pounds. Therefore, the current strength of Runway 9-27 is also adequate to accommodate the future critical aircraft. Nonetheless, it is expected that most of the heavier aircraft in either the ARC C-II or D-II groups, would utilize Runway 18-36 as it offers an additional 2,320 feet for the takeoff run.

Although the Runway 9-27 pavement was only partially rehabilitated in 1997, a full rehabilitation was completed in 2002. Therefore, the pavement is considered to be in excellent condition. Nonetheless, routine maintenance is recommended to address normal wear. Rehabilitation of the Runway 9-27 pavement surface is anticipated to be necessary towards the middle of the planning period.

***Runway 9-27 Safety Criteria***

For an ARC of C-II with not lower than one statute mile approach visibility minimums, Runway 9-27 currently requires a 500 foot wide RSA (250 feet either side of the runway centerline) that extends 1,000 feet beyond each runway end. The current ROFA for Runway 9-27 needs to be 800 feet wide (400 feet either side of the runway centerline) and extend 1,000 feet beyond each runway end. Beginning 200 feet beyond the end of the area usable for takeoff or landing, the current RPZs for Runway 9-27 both need to have an inner width of 500 feet, an outer width of 1,010 feet, at an overall length of 1,700 feet. The RPZ criterion is for both visual and not lower than one statute mile visibility for Approach Category C aircraft. At the time of this writing, Runway 9-27 did not provide the entire 1,000 feet beyond each runway end required for the RSA and ROFA. However, a project with the FAA to clear and grade the appropriate areas off each end was also underway at the time of this writing.

Better approach minimums to Runway 9-27 should be provided in the future and are discussed in a later section. Should an approach to either end of Runway 9-27 be established with not lower than ¾ statute mile visibility minimums, the RSA and ROFA dimensions will not change. ARC D-II runways with approach minimums not lower than ¾ statute mile requires the same size RSA and ROFA as the current C-II, not lower than one mile criteria. However, if one of the ends receives lower approach minimums, the size of the corresponding RPZ will change. For non-precision approaches with not lower than ¾ mile visibility minimums, the RPZ inner width increases to 1,000 feet, the outer width to 1,510 feet, and the overall length to 1,700 feet. For precision instrument approaches (lower than ¾ mile visibility) the RPZ dimensions increase to an inner width of 1,000 feet, an outer width of 1,750 feet, and an overall length of

2,500 feet. Because these areas are so important to the safety of operations on Runway 9-27, the largest surfaces required for the various safety criteria, should be accommodated as soon as possible.

## TAXIWAY SYSTEM REQUIREMENTS

The airfield demand/capacity assessment noted that enhancements to the airfield taxiway system should be given consideration to address operational activity and enhance the safety of ground movements by aircraft operating to and from the runways. These taxiway enhancements would also act to enhance the capacity of the existing runway system by allowing aircraft to move on and off the active runway system in a more efficient and safer fashion. A good taxiway system is designed to provide freedom of movement to and from the runways and between aviation facilities at an airport. This taxiway system includes entrance and exit taxiways, by-pass taxiways, taxiway run-up areas, apron taxiways, and taxilanes. Some of the basic design principles for a taxiway system as delineated in FAA guidance include the following:

- Provide each active runway with a full-length parallel taxiway.
- Construct as many by-pass, multiple access, or connector taxiways as possible to each runway and runway end.
- Provide taxiway run-up areas for each runway end.
- Build all taxiway routes as direct as possible.
- Provide adequate curve and fillet radii.
- Avoid developing areas, which might create ground traffic congestion.

Because Runway 18-36 and Runway 9-27 have different existing and future ARCs, the required width for taxiways serving the two runways is not the same. Based on the minimum standards, the future ARC for Runway 18-36 requires each associated taxiway to have a 60-foot wide pavement while the future ARC for Runway 9-27 requires taxiways to have a 35-foot wide pavement. The 60 foot taxiway width for Runway 18-36 is required for Design Group III aircraft with a wheelbase equal to or greater than 60 feet. Both the existing B727-200 and future MD-87 critical aircraft have wheelbases greater than 60 feet. However, all other Design Group III aircraft only require a taxiway width of 50 feet.

In the future, a significant portion of the airfield development will occur on the West Side of the airport, as will be evident in later sections of this study, since this side of the airport offers the best opportunities for the expansion of facilities and improvements to access. As such, a number of the taxiways serving this side of the airport should be planned and designed to accommodate the base Design Group III standard width of 50 feet. As the airport continues to serve some of the larger corporate jet aircraft, this taxiway standard will be required to facilitate access between the primary runway and facilities on the West Side of the airport. However, not all of the taxiways on the West Side will require a width of 50 feet. Some, as described in the individual sections, will only require Design Group II standards (35 feet wide). It is assumed that nearly all of the Design Group III aircraft with wheelbases greater than 60 feet will primarily conduct all of their operations on the east side of Runway 18-36, to and from the future general aviation terminal facilities.

Each taxiway is also required to have a Taxiway Safety Area (TSA) and Taxiway Object Free Area (TOFA). For taxiways serving Design Group III aircraft, the TSA, which is centered on the taxiway centerline, is required to be 118 feet wide and the TOFA 186 feet wide. In addition, Design Group II taxilanes would require an object free area of 162 feet wide. For those taxiways serving Design Group III aircraft, the TSA is required to be 79 feet wide and the TOFA 131 feet wide. Any taxilanes for Design Group II aircraft would require an object free area of 115 feet wide. These dimensional requirements need to be kept in mind when reviewing the existing and proposed taxiway system that is delineated in the following sections.

As with runway pavements, the rehabilitation of taxiway pavements is anticipated to be necessary over the course of the planning period. It is anticipated that most of the existing taxiways will require rehabilitation or reconstruction during the short and intermediate term planning periods. Routine maintenance, such as crack sealing and surface seal coats, will continue to be necessary on an annual basis to ensure the protection of and to enhance the life of the taxiway pavements.

**Taxiway A**

Taxiway A at TIX is a partial parallel taxiway located on the east side of Runway 18-36. This taxiway runs from the approach end of Runway 36 to the previous Runway 18 threshold prior to the runway extension to the north. Because this is the primary taxiway serving Design Group III aircraft with a wheelbase equal to or greater than 60 feet, FAA standards specify a taxiway width of 60 feet and a 400-foot runway centerline to taxiway centerline separation. However, this taxiway also serves a number of other special operations that individually would not justify changing the critical aircraft for the runway, but collectively require a taxiway width of 75 feet. These special operations include the occasional heavy, military, and regional jet aircraft.

The heavy jet operations include wide-body cargo aircraft such as the L1011, DC-10, MD-11 and A300-600, as well as charter or private aircraft up to the Boeing 747, including Air Force One on occasion. Many of these aircraft have a significant turning radius and require wider pavement surfaces due to the distance of their outermost engines from the aircraft centerline. As mentioned in the Forecast – Chapter 3, military operations are few at TIX due to a number of reasons including the number of training operations conducted, but also due to the limited taxiway widths. While the military jets still fly in for events such as the annual Warbird Airshow, Space Shuttle launches, and others, these operations have been limited due to most branches of the military requiring a taxiway width of 75 feet for jet operations. Finally, operators of regional jet aircraft also fly into TIX for various reasons. Many of these users have insurance requirements dictating a 75 foot wide taxiway for ground operations.

All of the jet operations described above fly into and out of Runway 18-36 and only utilize the facilities on the east side of the airfield. As such, Taxiway A is the only taxiway required to support these operations. In the past the FAA has recognized this need for a 75 foot wide taxiway. In fact, the FAA sponsored a project that provided the existing Medium Intensity Taxiway Lights for Taxiway A and approved the provision to ultimately go to a 75 foot wide pavement. Under the project, a portion of the light cans and conduit for Taxiway A were installed far enough out to ultimately support a 75 foot wide taxiway. Today this portion of the lighting has direct buried cable between the cans and fixtures, with the idea that ultimately the taxiway would be widened. Similarly, many of the existing fillets associated with Taxiway A, especially those coming off of Runway 18-36, have been constructed to coincide with a future expansion of the taxiway width to 75 feet.

Today, Taxiway A is 50 feet wide and maintains a taxiway centerline to runway centerline spacing of 500 feet. In 2002, all of Taxiway A was repaved, which included all of the connectors between Runway 18-36 and Taxiway A. As a result, this entire pavement section is in excellent condition. However, based on the dimensions indicated above, Taxiway A will require an additional 25 feet in width to adequately support operations. In addition, Taxiway A needs to be extended north so that it ties into the takeoff end of Runway 18. This extension will also need to be to a width of 75 feet.

**Taxiway B**

Oriented in an east and west direction, Taxiway B is the full-length parallel taxiway that serves the crosswind runway. This taxiway is located on the south side of the runway, and is marked to a width of 50 feet. Taxiway B has a taxiway centerline to runway centerline separation of 500 feet, which more than meets the current requirement of 300 feet. In the future, a 400 foot runway centerline to taxiway centerline separation will be required, if a precision instrument approach is established to Runway 9-27. In the mid 1990s, pavement maintenance was conducted for Taxiway B with a slurry seal. Currently this pavement is considered to range from fair to poor and should be rehabilitated in the short-term planning period. For any future Taxiway B rehabilitation or reconstruction projects, the current width of 50 feet should be maintained, as the taxiway will continue to serve Design Group III aircraft movements between the West Side of airport and Runway 18-36.

**Taxiways C**

The 50 foot wide, Taxiway C is situated to the southwest of Runway 9-27 and has a northwest/southeast alignment. The northwest end of Taxiway C connects to the midpoint of Runway 9-27 while the southeast end connects into Taxiway A. Most of Taxiway C is in good condition except for the portion that lies between Runway 9-27 and Taxiway B, which is noted to be in fair to poor condition. The portion between Runway 18-36 and Taxiway A is in excellent condition as it was just repaved in 2002. A rehabilitation of this taxiway should be considered during the short to intermediate term planning period. The width of 50 feet should be maintained, as the taxiway will serve Design Group III aircraft movements between the West Side of airport and Runway 18-36 throughout the planning period.

**Taxiway D**

Taxiway D provides immediate access to hangar facilities and aircraft parking aprons located along the northwest side of Challenger Avenue. Taxiway D begins at the intersection of the closed northeast/southwest runway and Taxiway C. Currently, Taxiway D is marked to a width of 50 feet, which should be maintained throughout the planning period to support Design Group III ground movements on this side of the airport. The pavement of Taxiway D is in excellent condition; however, along the flightline northwest of Challenger Avenue there are sporadic problems with small depressions in the pavement surface. These depressions are usually repaired by Airport maintenance as soon as they are detected. If this taxiway remains, a reconstruction of this pavement surface will be needed toward the end of the short term or beginning of the intermediate term planning period. This reconstruction would eliminate the sporadic depressions caused by the presence of decaying orange grove stumps below the pavement surface.

**Taxiway E**

As mentioned in the Inventory – Chapter 2, Taxiway E is aligned parallel to Taxiway D, runs across Runway 18-36, and intersects with Taxiway A. Taxiway E extends all the way down the southeast side of Challenger Avenue, and ends at the last parcel on the corner by Perimeter Road. Taxiway E also provides access to Discovery Aviation’s facilities and aircraft parking ramp. The portion of Taxiway E from Discovery Aviation’s aircraft parking ramp to the southwest is marked to 35 feet wide, but has an additional 15 feet of pavement which may be used to tie into future apron areas. Between Runway 18-36 and Discovery’s ramp, the taxiway pavement is 50 feet wide. Both of these portions of the taxiway are in excellent condition due to a recent repaving project. In addition, the 50 foot wide portion of Taxiway E between Runway 18-36 and Taxiway A is in excellent condition. Should this taxiway be utilized throughout the planning period, it is recommended that the pavement be overlaid some time during the long term planning period.

**Taxiway F**

Taxiway F, which parallels Taxiway C to the southwest, ties Discovery Aviation’s ramp and Taxiway E to the south end of Runway 18-36. While this taxiway is 50 feet wide but in poor condition, future improvements will depend on the future configuration of this area. In the short term, periodic maintenance to ensure maximum utilization and to minimize aircraft wear and tear needs to be conducted.

**New Taxiways and Taxilanes**

Typically, airports with the level and type of operations similar to those at TIX are sufficiently served by one parallel taxiway for each active runway. Currently, only Runway 9-27 is served by a full-length parallel taxiway system. However, the FAA recommends that an airport provide each active runway with a full parallel taxiway. Given that Runway 18-36 is the primary runway serving TIX and will remain in the future, it was recommended that Taxiway A be extended to tie into the existing north end of Runway 18-36. The proposed taxiway extension will improve an aircraft's ability to stay clear of the active runway during takeoff and landing, thereby increasing the operational capacity and efficiency of the airfield. As mentioned previously, this portion of the taxiway should be constructed to a width of 75 feet.

In the future, a parallel taxiway on the west side of 18-36 and north side of 9-27 should be planned. No matter what the rate of development is on the West Side of the airport, these two taxiways need to be a part of the airfield layout to ensure the ability to construct them when needed. In addition, the construction of one or both of these new parallel taxiways would provide additional exit points off Runway 9-27. As indicated in the Airfield Demand/Capacity – Chapter 4, while Runway 9-27 has a full-length parallel taxiway, is not optimized with respect to the number connector taxiways. Additional exits would enhance the flow of traffic on the ground, resulting in less runway occupancy time.

Additional taxilanes will be required to access future airfield facilities as they are developed. This will include apron taxilanes to provide access to areas of the airfield developed during the planning period. The primary location for these will be on the West Side of the airport. The final configuration will be dependent upon the ultimate hangar and ramp development in these areas. While most of the future taxilanes will only need to be constructed to a width of 25 feet, certain areas may require larger widths depending on their ultimate use. The layouts of these additional taxiways and taxilanes will be depicted on the final Airport Layout Plan (ALP).

**Bypass Taxiways and Run-Up Areas**

The FAA recommends that each taxiway serving a busy runway end provide a bypass taxiway or run-up area. Such features provide space for holding airplanes, for whatever reason, to delay their entrance onto the runway, while allowing other aircraft to bypass. None of the runway ends at TIX have such bypass capability and due to the level of operations, this deficiency needs to be addressed. Bypass taxiways should be constructed from Taxiway A to serve both ends of Runway 18-36. Likewise, bypass capability should be planned and designed for both ends of Taxiway B. However, a bypass taxiway is not possible at the Runway 27 end due to the proximity of Runway 18-36. Therefore, while the Runway 9 end requires a bypass taxiway, the Runway 27 end should have at least one designated run-up area constructed from Taxiway A. Whether the run-up area is constructed to the north, south, or both sides of Runway 27, it (they) need to be constructed to a size capable of accommodating multiple Design Group I or a few Design Group II aircraft. These improvements will significantly decrease any delays resulting from aircraft queuing for departure. Bypass taxiways and/or run-up areas should also be considered for the future parallel taxiways to the west of Runway 18-36 and to the north of Runway 9-27.

## AIRFIELD FACILITIES

The following sections address other airfield facility requirements necessary to support the various types and level of aircraft operations expected over the course of the 20-year planning period.

### Instrument Approaches

The ability of the airport to accommodate aircraft traffic, especially corporate and business jet aircraft, is greatly enhanced if the airfield has one or more instrument approaches. There are two types of instrument approach systems that are viable for installation at airports: an Instrument Landing System (ILS), which is the conventional system used at airports around the world today, and operational capabilities can also be achieved through the use of the Global Positioning Satellites (GPS). The installation of a precision approach helps alleviate delays experienced at an airport during instrument meteorological conditions, thus increasing the airfield's overall annual service volume or throughput capacity. In addition, many of the larger aircraft and corporate operators require a precision approach when operating into and out of an airport facility.

As mentioned in the Inventory – Chapter 2, the only precision instrument approach at TIX is the ILS for Runway 36, which provides Category I landing minimums. This equipment is maintained by the FAA. Depending on how the overall length of 8,000 feet for Runway 18-36 is achieved, all or part of the equipment associated with this ILS system may need to be relocated. The alternatives to extend Runway 18-36 will be addressed in the Alternatives Analysis – Chapter 6 of this report.

In the future, the ability to provide a precision instrument approach to the crosswind runway should be preserved. While it is not certain that a benefit cost analysis would support a second ILS at TIX, upcoming GPS technologies might make it possible for a second precision approach or multiple precision approaches to be established into TIX. GPS is a satellite based navigation system that consists of a network of satellites known as a constellation. This constellation provides a celestial reference for determining the position of any point on or above the Earth's surface. By analyzing the time delays of signals received from some of these satellites, a ground or air based receiver is able to determine latitude, longitude, and altitude. The basic GPS service provides users with 100-meter accuracy 95 percent of the time. This level of service is appropriate for en route navigation and non-precision instrument approaches. However, in order to meet international standards with regard to such factors as accuracy, availability, and integrity of the GPS signals, augmentations to the basic GPS service are necessary. Two augmentations have been defined: wide area augmentation system (WAAS) and local area augmentation system (LAAS).

WAAS provides the required accuracy, availability, and integrity to support GPS use as a primary means of navigation during all phases of flight through Category I precision approaches. Minimums for Category I approaches enable the properly equipped aircraft and trained pilots with the ability to descend as low as 200 feet, above airfield elevation, before having the runway environment in sight. The WAAS will improve the basic GPS service to approximately seven meters vertically and horizontally. On-airport systems are not required to achieve a WAAS supported Category I precision approach. LAAS is intended to support approaches to Category I minimums in those instances where WAAS cannot provide the necessary satellite coverage to achieve Category II and Category III precision capabilities. LAAS accomplishes this by using ground stations at the airport to transmit corrected signals to the aircraft in less time. LAAS is expected to have aircraft positioning capability to within one meter or less. Full operational capability of WAAS is expected during the first half of the planning period and the LAAS capability will follow. Certain airports in the U.S. have or are in the process of establishing Special Category I (SCAT-I) approaches based on the LAAS architecture. These are private use approaches designed for a specific runway end, aircraft type, and crew and are established without Federal funding assistance. The results of these SCAT-I procedures will serve as input to the final determination of the LAAS standards.

Current FAA standards require a 50:1 approach slope surface to any runway that has a precision instrument approach. The airport also needs to consider the space required in order to obtain the proper clearance and safety criteria associated with such an approach. Additionally, the airport needs to program an Environmental Assessment for any precision approach planned, as well as any land acquisition that may be necessary for its implementation. The Alternatives Analysis – Chapter 6 will evaluate the option to establish a second precision approach at TIX during the planning period.

### Airfield Lighting

Airfield lighting requirements are necessary at all airports intended to be utilized for nighttime operations as well as for operations during less than visual meteorological conditions. The following sections address the airfield lighting requirements at TIX over the planning period.

#### *Identification Lighting*

As noted in the Inventory – Chapter 2, the existing rotating beacon tower is located on the southeast side of the airfield, east of Runway 18-36. This beacon is elevated approximately 60 feet above ground level, is equipped with an optical rotating beacon system, and is in poor condition. A new beacon should be programmed for the short term planning period.

#### *Runway Lighting*

Both of the active runways at TIX have pavement edge lighting systems for night operations and restricted visibility. Runway 18-36 has High Intensity Runway Lights (HIRL) while Runway 9-27 has Medium Intensity Runway Lights (MIRL). The lighting systems are operated through the Common Traffic Advisory frequency (CTAF) when the ATCT is closed. The selection of a particular edge lighting system should be based on the operational need. According to FAA AC 150/5340-24, "Runway and Taxiway Edge Lighting Systems," MIRLs are required on all runways with non-precision instrument approaches while HIRLs are required for those runways with precision instrument approaches.

If a precision instrument approach is established to Runway 9-27 in the future, the MIRLs will need to be upgraded to HIRLs. Should the Runway 18 displaced threshold be removed, both the edge and inboard threshold lights will need to be modified. All of the runway lighting systems have been constructed with light cans and conduit, and are considered to be in excellent condition.

#### *Taxiway, Taxilane, and Apron Lighting*

All of the major taxiways and associated connectors at TIX are equipped with Medium Intensity Taxiway Lights (MITLs). The taxiway lighting systems have been constructed with light cans and conduit, and are considered to be in excellent condition. The taxiway lighting systems are also controlled by pilots when the ATCT is closed. Because of the current and proposed instrument capability, it will be necessary for MITLs to be installed along the entire lengths and on all associated connectors of any future parallel taxiway improvements.

The existing taxilanes associated with the t-hangar areas and the private taxilane off Taxiway E have overhead lighting fixtures for nighttime activities. All aircraft parking aprons, with the exception of Discovery Aviation, have floodlighting for nighttime operations. Discovery Aviation only has limited lighting, which are located on the sides of buildings. It is recommended that any proposed development at the airport for taxilanes and aprons include the installation of the appropriate lighting system.

**Pavement Markings**

Airport pavements are marked with painted lines and numbers in order to aid in the identification of the runways from the air and to provide information to the pilot during the approach phase of flight. There are three standard sets of markings used depending on the type of runway:

Basic - For runways with only visual or circle to land procedures. These markings consist of runway designation markers and a centerline stripe.

Non-precision - For runways to which a straight-in, non-precision instrument approach has been approved. These markings consist of runway designation markers, a centerline stripe, and threshold markings.

Precision - For runways with a precision instrument approach. These markings consist of the non-precision markings plus aiming point markings, touchdown zone stripes, and side stripes indicating the extent of the full strength pavement.

Depending on the type of aircraft activity and physical characteristics of the pavement, additional markings may be required for any of the three categories above. The FAA also allows markings on a runway to be upgraded at any time to include elements that are not required, but may be deemed to enhance safety. Runway pavement and displaced threshold markings are painted white, while taxiway pavement markings are painted yellow. Taxiways generally have a centerline and pavement edge stripes, plus holding line markings at the entrance to a runway. FAA AC 150/5340-1H, “Standards for Airport Markings,” contains the precise details of these markings. All runway and taxiway markings periodically need to be remarked so that they remain visible to the users of the airport.

The runways at TIX currently have the proper pavement markings for the existing approaches. Both runways have designation numbers, centerline striping, threshold markings, aiming point markers, and side stripes. Only Runway 36 has touchdown zone markings to support the ILS approach. As mentioned previously, Runway 18 has a displaced threshold, and as such, it is properly marked. However, in the future, if the displaced threshold is removed, all of the markings on the Runway 18 end will have to be re-configured. Both blast pads associated with Runway 18-36 are properly marked with yellow chevrons; however, these markings need to be remarked once the blast pads are expanded to 200 feet wide. As with the displaced threshold, during the extension of Runway 18-36, the required markings should also be remarked at the same time. If a precision instrument approach is established to Runway 9-27, the markings on this runway will need to be upgraded to include touchdown zone markings. All of the runway markings at TIX will need to be repainted on a periodic basis.

FAA guidelines state that all taxiways should have centerline markings and runway hold position markings whenever they intersect with a runway. As mentioned previously, all of the taxiways at TIX have visible taxiway centerline stripes with hold short lines located at all of the required locations. Taxiways D, E, and F also have edge markings to indicate the area designated for taxiing. As with the runways, all of the taxiway markings at TIX will need to be repainted on a periodic basis. Similarly, all new taxiways, taxilanes, and aprons should have the appropriate centerline, sideline, and hold position markings required by the FAA.

As mentioned in the Inventory, – Chapter 2, there are seven locations on the airfield from which rotorcraft operations are conducted. Using these locations, it is possible under certain traffic flows for up to five helispots to be used at one time. This occurs on a frequent basis due to the high level of rotorcraft training conducted at TIX. It was noted during interviews with the air traffic controllers, airport management, and the primary rotorcraft operators that on several occasions, the current helispots do not allow for optimum use of the surrounding airspace during peak training hours. As such, additional locations should be considered to provide more helispots for training activities. If possible, five additional helispots should be considered. The location of these helispots will depend on a number of considerations, which will be addressed in the following chapter.

**Takeoff and Landing Aids**

TIX also has a series of runway end, threshold, and approach lighting systems to aid in the identification of the runway end during takeoff or landing. A project in 2003 provided the installation of Runway End Identification Lights (REIL) systems to the four ends of Runway 18-36 and Runway 9-27. However, in the future, if the current 319 foot displaced threshold is removed from Runway 18, that REIL system will have to be relocated. Similarly, the existing Precision Approach Path Indicator (PAPI) system installed for Runway 18 would also have to be relocated if the Runway 18 displaced threshold is removed. Should a precision instrument approach be established to either end of Runway 9-27, the appropriate approach lighting system will need to be installed. It is recommended that a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) be considered to provide Category I approach minimums.

Currently there are four internally illuminated windsocks located on the airfield. Three of the windsocks directly serve specific runway ends. There is one located on the left side, on the approach end of Runway 18, another is located on the right side of the approach end of Runway 36, and one located on the right side of the approach end of Runway 9. The fourth windsock is located in the triangle created by Runway 18-36, Taxiway C, and Taxiway E. Ultimately, a lighted windsock for the Runway 27 end would provide aircraft taking off or landing with visual wind information and should be programmed during the short-term planning period.

**Airfield Signage**

Currently, TIX has a number of illuminated airfield signs. The signs are placed to provide instruction and guidance information to the users of the airport. These signs include instruction signs (holding position or no entry into an area), location signs (indicate which runway/taxiway the user is on or crossing), directional signs, and destination signs. Both runways are also equipped with distance remaining signs. Changes and additions to the signs associated with Runway 18-36 will be necessary if either the displaced threshold to Runway 18 is removed or the runway extended.

As additional facilities are constructed on the airport, lighted airfield signage will be imperative to ensure the efficient and safe movement of aircraft to and from the runway environment. The signage will also be required as the overall level of operations increase. An increase in operations at the airport will include an increase in itinerant traffic, which in turn indicates that the number of pilots not familiar with TIX will also increase. Airfield signage should be added with each runway and taxiway lighting project and at a minimum, should reflect the formal designations assigned to each runway, taxiway, and hold short location.

**Air Traffic Control**

TIX does have an air traffic control tower (ATCT), which operates between the hours of 7:00 a.m. and 9:00 p.m. eastern standard time. As previously mentioned in the Forecast – Chapter 3, there is an issue pertaining to the ATCT hours of the operations. Recently, there has been a significant number of operations occurring after the ATCT closes and before the facility opens. From the interviews conducted at TIX with ATCT staff, airport managers, and several on-site tenants, it is recommended that the ATCT hours of operations be extended.

In addition, as the airfield develops over time, improvements to the existing ATCT will be necessary. Currently the ATCT at TIX has a floor height of approximately 50 feet above ground level. As projects such as the potential extension of Runway 18-36 and the development of facilities on the Southwest Side occur, the existing tower will begin to loose the necessary line of sight it has with these facilities. Thus a taller tower in the same location or a tower in a new location of the airport will be necessary during the long term planning period. Added height would allow ensure that controllers can monitor the expanding airfield operations, including being able to see more of the ground movements between the hangars of the various taxiways and taxilanes on the Southwest Side.

**Aircraft Rescue and Fire Fighting**

Aircraft Rescue and Fire Fighting (ARFF) services are dictated by the type and level of operations conducted. An index is based on the longest commercial service aircraft conducting five or more daily departures. Because TIX does not have any airline, regional/commuter, or charter aircraft that conduct five or more daily departures, the airport is not required to have on-site ARFF facilities. Currently the City of Titusville provides fire and rescue services for the airport through an agreement with Brevard County Fire Rescue. Brevard County Fire Rescue responds to most calls using equipment from their station located on Columbia Boulevard. Whether going to the East or West Side of the airport, this station is approximately three miles away and has a response time of eight minutes or more. If possible, the presence of an on-airport ARFF facility should be considered. Unfortunately, the cost and potential liability involved makes the establishment of such a facility difficult for the Airport Authority. In addition to the capital costs associated with the facility construction; the continual maintenance, equipment, staff requirements, and annual recurring training requirement also add to the expense.

**Electrical Vault**

As the airport adds additional airfield lighting and electronic aids, the need for a newer and larger facility dedicated to housing the airfield electrical equipment will exist. The timeframe for a new vault will depend on the rate of airfield improvements, but should be constructed with a significant airfield electrical improvement projects.

**Airport Security Fencing**

A key requirement of the FAR Part 139 Certificate for TIX is to have the appropriate airport security fencing required under federal regulation. Even if the airport does not maintain the current certificate, the existing airport fencing should be maintained to preserve airfield security throughout the planning period. Likewise, as additional facilities and features are added or enhanced at the airport, each project must provide the proper measures necessary to ensure that the integrity of the current fencing is not compromised. Each future facility development and enhancement will also require a determination to be made as to whether or not the facility requires the inclusion of secured access points, such as vehicle gates.

**Fuel Storage Requirements**

As outlined in the Inventory – Chapter 2, there are a number of above ground fuel storage tanks at TIX which contain both Avgas and Jet fuel. While a number of tanks could be considered in analyzing the fuel storage requirements for the airport, only the fuel supplies of Gateway Aviation and Discovery Aviation were evaluated. The other tanks at TIX, which are for private use, were not considered.

Overall, the fuel supplies available to the public at TIX are regarded as adequate in terms of capacity. Between the two FBOs, a total storage capacity of 42,000 gallons of 100LL Avgas and 42,000 gallons of Jet A are currently available. Discussions with the various operators revealed that the supplies were sufficient for the typical operations and did not require either of the tank systems to have an excessive amount of fuel delivered each month. Although no additional fuel storage has been identified at this point, additional tanks may be needed during the planning period, as the various tenants on the airport may want to improve or expand their current facilities. Future capacity expansions can be accommodated by additional trucks, installation of larger tanks at the existing facilities, or development of additional fueling facilities by other FBOs.

## GENERAL AVIATION FACILITIES

General aviation facilities address the aircraft parking and storage requirements for the airport as well as the pilot/passenger space required. For planning purposes, based and itinerant aircraft requirements are usually considered separately since they serve different functions. At TIX, some aircraft parking areas accommodate both itinerant and based aircraft. However, for this study, the two will be analyzed separately and then the total requirements for each will be combined as a summary of the total required.

In general, the aircraft parking and storage requirements at an airport are typically provided through the combination of some or all of the following facilities:

### Apron Area

Small aircraft - an outdoor parking space with tie-down capability, sized to accommodate single-engine or light multi-engine aircraft.

Large aircraft - spaces on a paved apron suitable for parking the larger business type aircraft, such as the Citation, Falcon, Gulfstream, and Learjet business jet aircraft fleets.

### Hangars

T-hangars units - a fully enclosed building housing individual stalls, each capable of storing one aircraft, typically a single-engine or a light multi-engine aircraft.

Clearspan hangars - a fully enclosed building typically capable of holding multiple aircraft (five to seven each); these are often referred to as storage hangars.

Corporate hangars - similar to clearspan hangars, but typically have an attached office. These hangars are assumed to hold one to three business jet or turboprop aircraft each.

Shade hangars - a structure with a protective roof but no walls, typically capable of holding numerous aircraft each; these are often referred to as aircraft shelters or shade ports.

TIX currently utilizes all of the types of facilities described above to accommodate aircraft parking and storage.

### Itinerant Aircraft Parking Apron Area Requirements

The requirement for itinerant aircraft parking can be derived by using the guidelines provided in FAA AC 150/5300-13 Change 8. Based on these FAA guidelines, the itinerant parking demands for TIX were computed using the following steps:

1. Find the peak month average day itinerant operations. This figure is obtained by multiplying the forecast activity of the average day during the peak month (**Table 3-13**) with the corresponding local/itinerant split.
2. Add 10 percent to the above value to find peak day itinerant operations.
3. Find the total number of peak day itinerant aircraft. This is half of the peak day itinerant operations since it is assumed that each aircraft will make two operations.
4. Assume that 50 percent of the total number of peak day itinerant aircraft will need to be accommodated at one time.
5. Increase the final calculated amount by 10 percent. The FAA suggests that the value should be increased by 10 percent to accommodate expansion for at least the next two-year period.

The final value is the total calculated demand for itinerant aircraft parking spaces. In order to determine the requirement for large aircraft parking (business jets) as opposed to small aircraft parking (single-engine, multi-engine, and rotor), the national growth rates for aircraft mix from Chapter 3 (**Table 3-11**) were applied. **Table 5-5** reflects the results of these calculations.

**TABLE 5-5**
**ITINERANT AIRCRAFT PARKING SPACE DEMAND**

| Year | Single Engine | Multi Engine | Jet | Rotor | Total Itinerant Parking Spaces |
|---|---|---|---|---|---|
| ***Base Year*** | | | | | |
| 2001 | 32 | 9 | 7 | 27 | 75 |
| ***Forecast*** | | | | | |
| 2007 | 40 | 10 | 10 | 35 | 95 |
| 2012 | 45 | 12 | 11 | 36 | 104 |
| 2022 | 55 | 15 | 16 | 38 | 124 |

Source: THE LPA GROUP INCORPORATED, 2003.

Itinerant aprons are intended for relatively short-term parking periods, usually less than 24 hours (could be overnight), and are primarily for transient aircraft. Such aprons should be located as to provide easy access to terminal, fueling, and ground transportation facilities. FAA AC 150/5300-13 Change 8 suggests that for planning purposes, the size of an itinerant apron should be based upon a minimum area of 360 square yards (SY) per itinerant aircraft. This includes a reasonable amount of room for the maneuvering and taxiing of aircraft. This value of 360 square yards was applied for each single-engine aircraft, multi-engine aircraft, and rotor aircraft; however, 1,000 square yards was applied for each itinerant jet expected. **Table 5-6** reflects the itinerant aircraft apron area demand expected at TIX.

| TABLE 5-6<br>ITINERANT AIRCRAFT APRON AREA REQUIREMENTS | | | |
|---|---|---|---|
| **Year** | **Single / Multi / Rotor (SY)** | **Jet (SY)** | **Total Itinerant Aircraft Apron Area (SY)** |
| ***Base Year*** | | | |
| 2001 | 24,480 | 7,000 | 31,480 |
| ***Forecast*** | | | |
| 2007 | 30,600 | 10,000 | 40,600 |
| 2012 | 33,480 | 11,000 | 44,480 |
| 2022 | 38,880 | 16,000 | 54,880 |

Source: THE LPA GROUP INCORPORATED, 2003.

**Based Aircraft Parking Apron Area Requirements**

Planning for the necessary facilities for based aircraft parking in the future at TIX requires identifying the current needs at the airport and applying the existing data to the projected scenario set forth in the Forecast – Chapter 3 of this document. Currently, there are approximately 61 of the 190 based aircraft at TIX that are stored using apron tiedown, thus requiring ramp space. This represents roughly 32 percent of the total based aircraft at TIX. Under the unconstrained scenario, it is anticipated that a similar share (30 percent) of the projected based aircraft will require ramp space throughout the planning period. **Table 5-7** shows the forecast based aircraft parking demands and their related mix.

| TABLE 5-7<br>BASED AIRCRAFT PARKING DEMAND | | | | | |
|---|---|---|---|---|---|
| **Year** | **Single Engine** | **Multi Engine** | **Jet** | **Rotor** | **Total** |
| ***Base Year*** | | | | | |
| 2001 | 32 | 7 | 2 | 20 | 61 |
| ***Forecast*** | | | | | |
| 2007 | 38 | 8 | 2 | 24 | 72 |
| 2012 | 42 | 8 | 3 | 26 | 79 |
| 2022 | 49 | 10 | 4 | 31 | 94 |

Source: THE LPA GROUP INCORPORATED, 2003.

For based aircraft, FAA AC 150/5300-13 Change 8 suggests that a minimum area of 300 square yards be used for planning purposes. This figure is lower than that used for the itinerant aircraft because it is assumed that a tighter spacing between based aircraft can be achieved. The actual area per aircraft on the apron will most likely vary, depending on the configuration and layout of the parking positions. As with the itinerant aircraft calculations, the 300 square yards per based aircraft allows for sufficient clearance of wing tips and maneuvering. **Table 5-8** shows the amount of apron area that will be needed to accommodate the remaining based aircraft.

| TABLE 5-8<br>BASED AIRCRAFT APRON REQUIREMENTS | | | |
|---|---|---|---|
| **Year** | **Based Aircraft** | **Number Stored on Ramp** | **Total Based Aircraft Apron (square yards)** |
| ***Base Year*** | | | |
| 2001 | 190 | 61 | 18,300 |
| ***Forecast*** | | | |
| 2007 | 240 | 72 | 21,600 |
| 2012 | 262 | 79 | 23,700 |
| 2022 | 312 | 94 | 28,200 |

Source: THE LPA GROUP INCORPORATED, 2003.

**Table 5-9** provides a summary of the total apron area requirements for itinerant and based aircraft at TIX.

| TABLE 5-9<br>TOTAL GENERAL AVIATION AIRCRAFT APRON REQUIREMENTS | | | |
|---|---|---|---|
| **Year** | **Itinerant Aircraft Area (SY)** | **Based Aircraft Area (SY)** | **Total General Aviation Area (SY)** |
| ***Base Year*** | | | |
| 2001 | 31,480 | 18,300 | 49,780 |
| ***Forecast*** | | | |
| 2007 | 40,600 | 21,600 | 62,200 |
| 2012 | 44,480 | 23,700 | 68,180 |
| 2022 | 54,880 | 28,200 | 83,080 |

Source: THE LPA GROUP INCORPORATED, 2003.

### Hangar Demand

Because the demand for based aircraft apron area is expected to remain roughly 30 percent, the demand for based aircraft hangar space at TIX, in turn, will be approximately 70 percent throughout the planning period. Since only a very small percentage of itinerant traffic (maintenance and occasional overnights) utilizes an airport's hangar facilities, only based aircraft demand has been used to plan the minimum hangar space requirements. **Table 5-10** reflects the number of based aircraft that will require hangar space in the future.

| TABLE 5-10<br>TOTAL HANGAR REQUIREMENTS | | | |
|---|---|---|---|
| **Year** | **Percent of Based Aircraft Stored in Hangars** | **Total Number of Based Aircraft** | **Total Number of Hangar Spaces** |
| ***Base Year*** | | | |
| 2001 | 68% | 190 | 129 |
| ***Forecast*** | | | |
| 2007 | 70% | 240 | 168 |
| 2012 | 70% | 262 | 183 |
| 2022 | 70% | 312 | 218 |

Source: THE LPA GROUP INCORPORATED, 2003.

During a field visit to the airport, there were 129 of the 190 based aircraft stored in hangars. Of these 129 aircraft, 70 were stored in T-hangars, 4 in Port-a-Port hangars (considered like stand alone t-hangars), 40 in six larger clearspan hangars, and the remaining 14 aircraft in four private clearspan hangars. While TIX continues to have a significant number of aircraft on a waiting list for t-hangars, the historic distribution of hangared aircraft has been applied to represent the future breakdown of hangar types expected at TIX. The resulting figures reflect that roughly 58 percent will be stored in T-hangars (beginning in 2007), 31 percent in FBO/large clearspan hangars, and 11 percent in corporate/private clearspan hangars. **Table 5-11** reflects the number of hangars required during the planning period in addition to the existing hangars.

**TABLE 5-11**
**REQUIREMENT FOR HANGAR SPACE BY TYPE**

| Year | T-Hangars | | FBO/Large Clearspan Hangars (± 6 aircraft per) | | Corporate/Private Clearspan Hangars (± 3 aircraft per) | |
|---|---|---|---|---|---|---|
| | Aircraft to Use (58%) | Units Required* | Aircraft to Use (31%) | Number Required* | Aircraft to Use (11%) | Number Required* |
| ***Base Year*** | | | | | | |
| 2001 | 75 | 0 | 40 | 0 | 14 | 0 |
| ***Forecast*** | | | | | | |
| 2007 | 97 | 22 | 52 | 2 | 19 | 2 |
| 2012 | 106 | 9 | 57 | 1 | 20 | 1 |
| 2022 | 126 | 20 | 68 | 2 | 24 | 2 |

Source: THE LPA GROUP INCORPORATED, 2003.
*Note: Column represents the total number of additional facilities required during that planning period.

**Demand for General Aviation Pilot and Passenger Terminal Space**

Currently, two FBOs on the airfield provide an undetermined amount of pilot and passenger space. However, the airport needs a terminal building that can become the primary focal point for the itinerant traffic coming into TIX. The following analysis was conducted to estimate the size and location of a terminal facility that would be required to accommodate the pilots/passengers expected during the planning period.

Peak hour pilots/passengers for general aviation operations project the highest average number of pilots and passengers that use an airport during a one-hour period. To estimate the peak hour pilots/passengers for TIX, the following assumptions were made:

- Only itinerant operations would require terminal space at the Airport.
- Since arriving and departing general aviation pilots/passengers could use the terminal at the same time, the number of peak hour itinerant operations was not adjusted (i.e. was not split in half).
- Each general aviation operation (arriving or departing) was estimated to have an average of two people on board (passengers and pilots).
- An area of 200 square feet was used for each pilot/passenger to determine the terminal space requirements. This value per pilot/passenger incorporates all functions of a full service general aviation terminal building such as FBO counter, flight planning, waiting area, snack room, pilot's lounge, restrooms, etc.

The results in **Table 5-12** show that 16,400 square feet (SF) of terminal space will be required by the end of the planning period. These estimations are based on the peak hour projections from the Forecast – Chapter 3.

| TABLE 5-12<br>GENERAL AVIATION TERMINAL SPACE | | | | |
|---|---|---|---|---|
| **Year** | **Peak Hour (ADPM)** | **Peak Hour Itinerant Ops** | **Number of Pilots/Pax** | **Total Terminal Space (SF)** |
| ***Base Year*** | | | | |
| 2001 | 71 | 25 | 50 | 10,000 |
| ***Forecast*** | | | | |
| 2007 | 90 | 32 | 64 | 12,800 |
| 2012 | 98 | 34 | 68 | 13,600 |
| 2022 | 117 | 41 | 82 | 16,400 |

Source: THE LPA GROUP INCORPORATED, 2003.

## AIRPORT ACCESS, UTILITY INFRASTRUCTURE, AND AUTOMOBILE PARKING

An integral yet often overlooked aspect of an airport's operation is not related to aircraft or air travel. The landside facilities such as local street access, airport circulation roads, utilities, and automobile parking are of major importance to the airport user. Likewise, the airside components addressed previously are dependent upon the availability of the proper landside features. The following sections address these elements.

### Airport Access

Since a majority of users at TIX arrives and departs using the current road system, these roads are typically the first and last impressions that users have of the airfield. Thus, their experience getting to and going from the airfield is important to the overall perception of the airport facility. At a minimum, the Airport Authority as well as the City of Titusville and Brevard County should continue to maintain the existing access roads to accommodate the activity anticipated during the planning period. Although Perimeter Road connects the two sides of the airport, for the purpose of discussions, improvements to the current airport access have been split between the requirements for the East Side and West Side of the airport.

#### *East Side*

The East Side of TIX is primarily accessed by either TICO Road or Golden Knights Boulevard. Unfortunately, both of these roadways are plagued with very significant problems, which may limit the possibility for improvements. TICO Road, which ties into State Road 405 (Columbia Boulevard) to the north only allows vehicles to make a right (eastbound) onto 405. Therefore, anyone departing the airport from the East Side of the airport and heading west, must either turn right on 405 and make a u-turn near the entrance to NASA, take Perimeter Road all the way around, or use Golden Knights Boulevard. Golden Knights Boulevard, which runs out to U.S. Highway 1, suffers from an at-grade rail crossing of the Florida East Coast (FEC) railroad, which parallels U.S. 1. This rail line accommodates a number of north or southbound trains every day, each with numerous cars, causing significant delays for vehicles going to or from the airport.

The East Side of the airport will be the site for the future general aviation terminal building being planned by the Airport Authority. As such, improvements to TICO Road and/or Golden Knights Boulevard is necessary during the short term planning period. A series of options will be evaluated as part of the Alternatives Analysis – Chapter 6 as to which option may be the best. However, given the proximity of the State Road 405 and U.S. 1 interchange, it is not certain what options may exist for TICO Road. There are also a number of tractor truck car carriers that operate on TICO Road and through the intersection of

State Road 405. These tractor-trailers, which originate from the rail off-load station just to the northeast of the airport, also need to be considered. One thing is certain with respect to the potential improvement alternatives to Golden Knights Boulevard, the FEC rail line will remain. Therefore, the potential for an overpass will be explored; however, the costs are expected to be very prohibitive to other potential options.

***West Side***

Other than taking Perimeter Road around the approach end of Runway 36 to the East Side, the only other way in or out of the facilities located on the West Side of the airport is via Perimeter Road to the west. Perimeter Road intersects with Grissom Parkway at the edge of the current airport property boundary. Straight across the intersection, Perimeter Road becomes Shepard Drive. Currently both Perimeter Road and Shepard drive are two lane roads, while Grissom Parkway has four lanes. Although Grissom Parkway has four lanes and ties into State Road 405 to the north, it primarily serves the various businesses located within the Spaceport Florida industrial park. Shepard Drive continues west of the airport to tie into State Road 407 (Challenger Memorial Parkway), which ties into State Road 405 to the north and Interstate 95 to the south. If State Road 407 is followed to the south/southwest beyond the interchange with I-95, it ultimately ends into Florida Toll Road 528 (the Bee Line).

Because of the proposed improvements to Shepard Drive, this will be the most direct access to and from the airport property boundary to all points north, south, and west. Depending on the ultimate configuration for the West Side of the airport, Perimeter Road needs to remain tied into the intersection with Shepard Drive and Grissom Parkway. The future alignment of this road will not only need to consider how facilities develop on this side of the airport, but also take into considerations the need to provide four lanes and to address any environmental considerations that may arise on this side of the airport. These issues will all be considered in the Alternatives Analysis – Chapter 6.

Consideration should also be given to the potential for the space related industries to establish an off-load facility at the airport. Discussions in the past have explored the potential of such a facility on the West Side of the airport. Due to the size of the various space bound payloads, the access to and from such a facility would need to provide the ability to accommodate oversized loads with potentially significant vertical clearance requirements. Options for such access will be analyzed in the alternatives section of this study. Finally, all future access improvements will need to be coordinated with the Comprehensive Plans for the City and Brevard County, as the FAA and Aviation Office of the Florida Department of Transportation typically only fund improvements that are on-airport property.

**Utility Infrastructure**

As described in the Inventory – Chapter 2, the airport currently has the appropriate utilities to serve the existing users of the airport. During interviews with airport management, air traffic control management, and all of the major tenants, no problems were identified with respect to the availability of water, sanitary sewer, electrical power, telephone, or stormwater services.

Obviously as additional facilities on the airfield develop over the course of the planning period, some infrastructure improvements will be necessary. This is especially true on the West Side of the airport where much of the future development is expected to occur. The various configurations for this area that will be addressed as part of the Alternatives Analysis – Chapter 6 will need to take into consideration the existing service which includes the recent improvements to both water and sanitary sewer lines along a portion of Perimeter Road. On the East Side, the ability to provide sanitary sewer service would certainly be an improvement; however, the costs associated might delay the decision to bring such service to this side of the airport.

**Automobile Parking**

The availability of automobile parking is good for most of the facilities at TIX. The biggest exception to this is the multi-purpose lot on the East Side. It was noted on numerous field visits that the 71 spaces shared by Helicopter Adventures, Gateway Aviation, DeBenair, and the Airport Authority are always full. At a minimum, additional spaces need to be provided for the users and employees of each of these facilities. It is anticipated that the general aviation terminal building proposed by the Airport Authority for this area of the airport will include improvements to accommodate the current parking situation. These improvements will be coordinated with other improvements proposed in this study and ultimately reflected on the ALP.

For the remaining facilities, it is assumed that each of the individual FBOs, as well as any private clearspan hangars, will provide their own parking spaces based on their own anticipated demand and local codes. In laying out the future facilities, an adequate amount of space shall be allotted for parking lots in these areas. This includes separate parking lots for any small clearspan or t-hangar facilities, despite the fact that users of these facilities typically park their automobiles in their hangars.

## LAND ACQUISITION

The master plan analysis to this point has focused on the development of physical improvements to the airport and its ancillary facilities that are deemed necessary to meet the projected level of future operational activity at TIX. However, the requirement to absorb additional property for aviation related development at TIX and to ensure future land use compatibility must remain as one of the short-term priorities of the Airport Authority. Given the surrounding uses and development to the current airport property, land development pressure continues to be strong in the Titusville and Brevard County area increasing the potential for the development of land that is presently devoted to uses other than aviation related. Once these surrounding lands are committed to another form of land use, the ability of the airport to acquire the property is essentially non-existent. In short, as development pressure builds in the areas near the airport, the window of opportunity for the airport to acquire enough land at a reasonable cost to ensure its future viability closes. For these reasons, consideration must be given to the identification of a future property envelope that the airport should secure to address demand and development needs beyond this master planning horizon. Based on the actions of numerous general aviation and even large hub commercial airports, this approach to determining future land acquisition requirements is not unique to TIX. While defining the boundaries and extent of future property the airport has targeted for acquisition, it is recognized that the availability of federal funding for the acquisition of these tracts will be based on the provision of justification in conformity with FAA priorities and funding formulas.

A program of acquisition focusing primarily on property to the south and west of the airport is required to ensure that the airport can adequately provide the future development area necessary to support future operational demands and provide compatibility with other community concerns. Adequate land to the south of Runway 18-36 should be obtained to protect the existing precision instrument approach as well as to preserve the ability to potentially provide the ultimate extension of the runway to the south. At a minimum, additional land to the west and southwest of the airport needs to be acquired up to Grissom Parkway. Not only will this area provide the space necessary to accommodate the future configuration of the West Side, it will also protect the existing helicopter training flight corridor to the southwest. Additionally, land west of Grissom Parkway should be considered to allow additional environmental and economic opportunities for the Airport as well as additional flight corridor protection.

Another area required for the long-term development of the airfield includes land to the west of Runway 18-36 and north of Runway 9-27. Much of this property cannot currently be obtained due to the history of government involvement with the land of and surrounding the existing armament facilities. Nonetheless, conversations should begin in an effort to obtain the necessary property interests in this area for future facilities. This property should also be considered to maintain the transitional surfaces associated with both runways, especially if Runway 9-27 should receive a precision instrument approach. In addition, this may be the best location for some of the large space related local industries to establish an off-load area at the airport for their operations.

Finally, if possible, it is recommended that sufficient property interests be obtained for all of the RPZs at TIX. Basically, this would include the property previously described to the south of Runway 18-36, additional property to the west of Runway 9-27, and some property north of Runway 18-36. At a minimum, the Airport Authority should obtain control of the property within the ultimate RPZs as this is a specific requirement set forth in FAA AC 150/5300-13, Change 8. If an airport cannot purchase the property within the RPZ, then land use controls or agreements such as avigation easements should be obtained. The amount of land, options available, and associated costs will be addressed in later sections of this study.

## SUMMARY OF FACILITY REQUIREMENTS

**Table 5-13** provides a summary of the facility requirements that were determined necessary to satisfy the forecasts of aviation demand presented earlier in this study. Essentially, this table includes the minimum facility requirements over the 20-year planning period. Some additional facilities will also be planned and included as part of the final ALP and Capital Improvement Program to enhance the airport. The order in which these improvements are listed does not have any relation to the priority or phasing of such projects.

| **TABLE 5-13<br>SUMMARY OF 20 YEAR FACILITY REQUIREMENTS** | |
|---|---|
| **Runways** | 1. Construct 25 foot paved shoulders on Runway 18-36 and widen both blast pads to 200 feet.<br>2. Runway 18-36 Environmental Assessment<br>3. 680 Foot Extension to Runway 18-36<br>4. Strengthen Runway 18-36<br>5. Rehabilitate Runway 18-36<br>6. Rehabilitate Runway 9-27 |
| **Taxiways** | 1. Widen entire length of Taxiway A to 75 feet.<br>2. Extend Taxiway A to departure end of Runway 18<br>3. Rehabilitate Taxiway B<br>4. Rehabilitate Taxiway C<br>5. Reconstruct Taxiway D<br>6. Overlay northeast end of Taxiway E<br>7. Maintain Taxiway F to a safe and usable condition<br>8. Construct Bypass Taxiways and Aircraft Run-up Areas<br>9. Construct Parallel Taxiway west of Runway 18-36<br>10. Construct Parallel Taxiway north of Runway 9-27 |
| **Navigational and Visual Landing Aids** | 1. Runway 9-27 Precision Approach Environmental Assessment<br>2. Runway 9-27 Precision Approach Lighting System and Markings<br>3. Upgrade rotating beacon system<br>4. Lighted Windsock for Runway 27 end |
| **Airfield Facilities** | 1. Periodic Remarking of all Airfield Pavements<br>2. Provide 5 additional helispots for rotorcraft training<br>3. Install High Intensity Runway Lights on Runway 9-27<br>4. Install Apron Floodlighting for Discovery Aviation Ramp<br>5. Eliminate Runway 18 Displaced Threshold (includes reconfiguring lighting, markings, REILs, PAPI system, signage, and distance remaining signs)<br>6. Relocate Air Traffic Control Tower<br>7. Move and Expand Airfield Electrical Vault |
| **Apron Space** | 1. Construct 33,300 Square Yards of Apron Space |
| **Buildings** | 1. Construct 51 T-hangar Units<br>2. Construct 5 FBO/Large Clearspan Hangars<br>3. Construct 5 Corporate/Private Clearspan Hangars |

Source: THE LPA GROUP INCORPORATED, 2003.