



## **Chapter Six – Airport Alternatives**

### **INTRODUCTION**

The goal of the master planning process is to provide the Titusville-Cocoa Airport Authority with an assessment of the adequacy and capabilities of the airport as well as to identify the best options available for addressing future development needs at the facility. To accomplish this goal it is necessary to identify and evaluate alternatives for meeting the needs identified in the previous chapters and ultimately provide a planning framework on which to base future airport development decisions. The previous chapter of the Master Plan identified a series of facilities that are deemed necessary for the Space Coast Regional Airport (TIX) to adequately accommodate the aviation demands expected over the course of the 20-year planning period. While the Facilities Requirements – Chapter 5 identified the optimum airport improvements that would be desired, it is the Alternatives section that analyzes both the viability of meeting the identified need as well as how best to undertake the improvements from an operational, environmental, political, and construction perspective. Thus, this chapter addresses the options for providing these requirements and explores issues of operational efficiency and community acceptance of meeting the identified needs of the airport over the planning period. The following sections identify potential development schemes for meeting each major facility enhancement needed and evaluates the positive and negative aspects of each concept.

#### **General**

The primary outcome of the Master Plan study will be the development of the future configuration of TIX as presented on the Airport Layout Plan (ALP). The ALP is the key funding document to which the Federal Aviation Administration (FAA) and Florida Department of Transportation (FDOT) refer for project eligibility determinations, in addition to being an essential guide for orderly development. To develop this conceptual plan, it is necessary to conduct a complete and thorough review of the airport's role in the community. Then, the best overall approach for the development of the facilities can be planned to maintain the airport's required level of public service. Along these lines, an economically self-sufficient operating facility is the goal of a well-planned airport. To achieve that goal, it is not only necessary to satisfy the anticipated aviation demands, but also to manage land use for both non-aviation and aviation developments, to minimize adverse impacts and costs, and maximize airport revenue.

In analyzing and comparing the benefits of various development alternatives, it is important to consider the consequences of no future development at TIX. The "do-nothing" alternative essentially considers keeping the airport in its present condition without any further improvements to the existing facilities. The primary result of this alternative would be the inability of the airport to safely accommodate the projected demand. For example, the Facility Requirements – Chapter 5 discussion indicated the need for various airfield improvements, including regular pavement rehabilitation. Without these improvements and rehabilitation, areas would fall into disrepair. This would seriously affect the capability of the airfield to continue serving users and the community. Expanding facilities at the airport is also necessary over the next 20 years. To ignore this would restrict the growth of aviation in the local area and region, which in turn, would reflect on commerce and economic growth in the region. In addition, the airport has made assurances to the FAA in accepting past federal grants for airport improvement projects that the facility would be operated at all times in a safe and serviceable condition. It would represent an irresponsible action affecting the long-term viability of the airport and the airport's service area. Therefore, the "do-nothing" alternative is not considered prudent or feasible, nor is it consistent with the long-term goals of the Titusville-Cocoa Airport Authority.



It should be pointed out here that any development proposed in the Master Plan evolves from an analysis of projected needs over a set timeframe. Even though the needs were determined by reliable methods, it cannot be assumed that future events will not change these needs. The Master Plan attempts to develop a viable scheme for meeting the needs brought about by projected demands for the next 20 years. No scheme should be adopted that requires expensive commitments prior to the certainty of need. However, the plan should allow for flexibility to expand beyond the plan, should the need arise. In addition, no plan of action should be developed that is not consistent with the goals and objectives of the Titusville-Cocoa Airport Authority, which has a vested interest in the results of any development or lack thereof. TIX should be developed so that the facilities accommodate the demand and minimize any operational constraints. While these objectives may not be all inclusive, they should provide a point of reference in this alternatives evaluation process.

### **Airport Considerations**

Prior to defining and evaluating specific airport alternatives, development objectives to guide the evaluation were identified. The Titusville-Cocoa Airport Authority wants to market, develop, and operate the airport so as to better the aviation services and economic base of the surrounding community. Key objectives to achieving these goals include:

- Providing the airfield facilities to support the maximum service level for the community;
- Operating TIX as an attractive, easy-to-use, safe, and environmentally-compatible facility; and
- Marketing and developing the airport facilities and available land as unique business opportunities.

Since a strategic goal of this Master Plan update is to develop balanced airside and landside facilities to serve all segments of the forecast aviation demand, it is necessary to keep in mind a number of factors or considerations that impact and influence future development at TIX. These considerations form a basis for the initial identification of options as well as provide a set of issues that should be kept in mind throughout the review and selection of alternatives. In addressing these objectives, development of facilities should be undertaken in such a manner as to minimize existing and potential operational constraints. Flexibility in airport development is essential to assure adequate capacity should market conditions change unexpectedly. Additionally, it should be noted that a goal of the Master Plan is to mitigate to the maximum extent possible all of the factors that adversely impact the airport's ability to meet demand or to comply with governmental standards. While this goal is attainable, it must often be weighed against the financial, social, and political costs of doing so. As a result, it is possible that the alternatives analysis may find that not all of the identified facility requirements at TIX can be fully addressed and some must be left unfulfilled or only partially fulfilled. Furthermore, a number of factors, related to the existing conditions at TIX, must be considered in the alternatives analysis, some of which have more significant impacts or influences on the development alternatives than others, are listed below:

- TIX is the closest airport to the complexes of Kennedy Space Center, Cape Canaveral Air Station, and the Port of Canaveral;
- While there is a significant amount of land available at the airport, the impacts of future developments on existing facilities has to be evaluated;
- Existing landside access to the airport is less than optimal for all uses and users; and
- Several wetlands, shown on **Exhibit 6-1**, are situated on the western and southwestern sides of the airport property and could impact development of future facilities.

The preceding considerations have been factored into the identification of potential alternatives to address the needs identified for the airport. These issues should also be considered when reviewing the following sections



Insert Exhibit 6-1 Wetlands Map



due to the impact they may have on the options that have been identified. These concerns are very real, and if money were not an issue, most could certainly be mitigated; however, funding is a considerable factor in any analysis of options and, as such, many of the alternatives are designed to mitigate issues without having to undertake extensive, costly redevelopment of the airport facilities.

### **Development Concepts**

Potential development schemes have been created for the future improvements identified in the Facility Requirements – Chapter 5. Only those concepts considered in depth are presented in this chapter. For ease of discussion these schemes are centered on the following key facility components:

- Airfield Infrastructure
- Navigational Aid Equipment
- General Aviation Facilities
- Support Facility Facilities
- Airport Access

While development alternatives for these facilities are considered separately, none of these facilities truly functions independently of the others. For example, airport access routes tie into the various general aviation (GA) and support facilities, such as hangars and the Air Traffic Control Tower (ATCT). Therefore, an important evaluation criterion is how these different components interact with each other so that developments in one area do not preclude improvements in another.

These development concepts, discussed in the following sections, were also evaluated based upon several other criteria. Key evaluation criteria varied based upon the development under evaluation, but generally included safety, probable community acceptance, and compliance with FAA standards. The following sections discuss the proposed development concepts and highlight the positives and negatives of each layout.

### **AIRFIELD IMPROVEMENTS**

The Facility Requirements – Chapter 5 identified several areas where airfield improvements and enhancements were considered to be either necessary or of benefit to the overall operational efficiency of the airfield. The analysis of airfield alternatives contained in this section will evaluate various concepts for meeting these needs and determine which future runway and taxiway options will best meet TIX’s needs during the planning period.

#### **Runway Alternatives**

As discussed in prior chapters, TIX has two active runways. Runway 18-36 has published dimensions of 7,320 feet by 150 feet, and Runway 9-27 has a length of 5,000 feet and width of 100 feet. These two runways are considered efficient to accommodate the anticipated operational activity at the airport. However, runway length discussions supported the fact that under certain conditions, and if changes in the operational jet fleet occur, additional runway length should be provided. For now, the ability to ultimately provide the appropriate length identified, 8,000 feet, needs to be preserved. As such, three options were considered.

A number of factors were taken into account during the runway alternatives analysis. A combination of land uses, existing roadways, wetlands, and property acquisition affect the capability to fully address the runway length issue. It should be noted that although additional property needs are addressed under each runway alternative, a later section will discuss the final proposed land acquisition based upon all the facility alternatives discussed in this chapter. The following sections discuss three runway alternatives seen as potential solutions to achieving a



runway length of 8,000 feet with the appropriate safety standards, including the required Runway Safety Area (RSA) and Runway Protection Zone (RPZ).

*Alternative A – Extend Runway 18-36 to the South*

Runway Alternative A involves the extension of Runway 18-36 by 681 feet to the south, as shown on **Exhibit 6-2**, to provide the recommended 8,000-foot length. Associated with the runway extension would be an extension of Taxiway A to the new runway threshold, reconfiguration of the runway lighting system and signage, and relocation of a portion of the instrument landing system (ILS). While the 681-foot extension provides for the recommended length on Runway 18-36, there may be limitations to the full use of the runway. Takeoffs could be executed fully from the proposed Runway 36 end, but there could be the need to displace this threshold due to approach surface penetrations, discussed in further detail below. Additionally, there are limitations on the full length of pavement that would be usable due to the existing 319-foot displaced threshold on Runway 18.

Alternative A preserves the ability to provide the ultimate runway length determined to fully serve the future business aircraft fleet at TIX. The construction associated with this alternative would occur on land presently owned by the Authority. The undeveloped site reserved for the runway extension, including the RSA, is considered undisturbed land (orange groves) with no significant environmental or archeological concerns at the time this planning study was conducted. Presently, there are no known jurisdictional wetlands located within the proposed development site for the runway extension. The terrain characteristics south of the Runway 36 threshold are relatively flat with a ground elevation similar to the existing runway surface. Therefore, minimal earthwork or fill material would be required to accomplish the runway and taxiway improvements associated with this alternative. Residential land uses were identified south of King's Highway, approximately one mile from the existing Runway 36 threshold; however, with the length of the proposed extension no major changes from what residents currently experience should be observed.

The south extension does not result in impacts to any existing major road right-of-ways in the airport vicinity. The closest road right-of-way (Kings Highway) is located approximately 5,600 feet south of the proposed runway threshold. However, the existing Perimeter Road used by the public to access the airport is located approximately 960 feet from the existing threshold and would be 275 feet from the proposed threshold, which places it within the current and future RSA. Additionally, Perimeter Road infringes upon the Runway Object Free Area (ROFA), RPZ, and approach surface clearances of the proposed runway end. Thus, the relocation and realignment of Perimeter Road would be necessary to accommodate these required areas to be in compliance and to ensure proper safety. It is proposed that this relocation be completed early in the development program to provide the necessary development area and to address the existing non-standard Runway 36 RSA.

Another impact considered was the high-tension power transmission lines located approximately 3,060 feet from the proposed extension. A review of the existing topography south of the airport indicated that providing a 50 to 1 slope to the proposed runway end would not be feasible, due to the presence of existing power lines that would penetrate the precision approach slope by approximately 8 feet. Therefore, this issue would need to be resolved in conjunction with the power line owner, Orlando Utilities Company. One solution is to remove the power poles and to place the lines underground; however, preliminary cost estimates determined that this option would be very expensive, as it would cost approximately \$4.7 million to do this. Another less expensive alternative would be to lower the existing poles to a height that does not affect the approach surface and an even less expensive option is to apply



INSERT Exhibit 6-2: Runway Alternative A

for a modification to standard to allow the poles to remain in their current location and height with the addition of special object lighting. The modification to standard option would be the most cost feasible but it may negatively impact the approach minimums thereby increasing the decision height of the precision approach. A specific analysis of each of these options would have to be explored in detail to determine the viability, cost, advantages, and disadvantages prior to making a final decision. Without a proper resolution to this issue, the threshold would need to be displaced approximately 500 feet to the north in order to clear the power lines at their existing height. Thus, only 180 feet of the proposed runway extension would be useable for landings to Runway 36. This is not seen as detrimental since the need for an overall runway length of 8,000 feet was primarily to meet take-off distance requirements.

There are several construction related impacts associated with this alternative, some of which are minimal. Should this alternative occur, the existing Precision Approach Path Indicator (PAPI) system, Runway End Identification Lights (REILs), glideslope antenna, and approach lighting system associated with the ILS would need to be relocated to be in alignment with the new threshold. During these relocations, especially of the glideslope and approach lights, the approach category would have to be temporarily reduced from a precision to a non-precision or visual approach. This is probably the most negative, yet unavoidable, aspect related to this alternative for airport users because Runway 36 has the only precision approach at TIX. Additionally, while earthmoving/construction equipment is located near the runway end under construction, a temporary displacement to that runway end of 600 to 700 feet would be required due to height restrictions associated with the approach slope. This would temporarily limit the runway length available. These construction impacts, as well as other impacts and attributes of this alternative, are summarized below.

#### Attributes

- Meets the identified runway length requirements;
- Only minimal effects to residential development/uses;
- Does not have obvious environmental impacts; and
- Does not require land acquisition.

#### Impacts

- Requires relocation and realignment of Perimeter Road;
- Requires relocation of the PAPIs, REILs, glideslope antenna, and approach lighting system;
- Requires resolution of the high-tension power lines penetrating the 50 to 1 approach surface; and
- Requires a temporary downgrade of the precision approach during the construction period.

#### *Alternative B – Extend Runway 18-36 to the North*

The Titusville-Cocoa Airport Authority has stated that they will not extend or expand the airport north into the Enchanted Forest; however, in order to consider all possibilities, this north extension option was evaluated. This was determined to be a necessary part of any future environmental studies required to support this ultimate development. Thus, this second alternative, as displayed in **Exhibit 6-3**, involves the extension of Runway 18-36 to the north to provide the full 8,000-foot runway. The existing parallel taxiway would be extended to serve the runway end, as would the runway and taxiway lights. Additionally, the northern extension of the runway would also require the relocation of the PAPI system,



REIL system, and ILS localizer antennae array. During the construction period, the precision approach to Runway 36 would not be available, which is the same operational constraint as discussed in Alternative A. In addition, this alternative, to be considered a viable option would need to fully accommodate the required RSA, ROFA, RPZ, and approach surfaces.



INSERT Exhibit 6-3: Runway Alternative B

As with the other extension possibilities, Alternative B would meet the required 8,000-foot length. Because of the lack of development immediately north of TIX, this alternative would not have any significant impacts to incompatible land uses such as residential areas. These attributes are comparable to those of the other runway alternatives under consideration. Other than these factors, Alternative B has no other positive attributes.

Implementation of Alternative B would pose a number of major impacts from a cost, constructability, public acceptance, and political viability perspective. Any northern runway extension must take into consideration the alignment of Columbia Boulevard (SR 405). As discussed in prior sections of this study, Columbia Boulevard is a key element in the local road and street network, providing one of the primary connections between the Kennedy Space Center and points west, such as Interstate 95 and Orlando. Thus, if the runway were extended to the north, then Columbia Boulevard must either be relocated around the runway end and the associated RSA or be lowered and bridged by the runway and the RSA. Additionally, vertical clearance standards would require that the road be sited so as not to penetrate the criteria associated with the approach surface. Applying FAA criteria for an ultimate 34 to 1 approach slope with the appropriate Airport Reference Code (C-III) and assuming that the realigned roadway is at the same runway end elevation, then the relocated portion of Columbia Boulevard would need to be a minimum of 1,000 feet from the end of the extended runway.

However, relocating the alignment of Columbia Boulevard around the runway end was not considered feasible for several reasons. First, in order to minimize the amount of acquired land that would be needed, tight turns would be required to circumvent the RSA and bring Columbia Boulevard back onto its present alignment prior to the Florida East Coast (F.E.C.) Railway overpass and intersection with U.S. 1. However, given an anticipated design speed of 45 miles per hour or higher, the radius of these turns could be 600 feet or more, which pushes the realigned portion further to the north and increases the impacts to the Enchanted Forest. Given the local political atmosphere and the public-use nature of this land, the Airport Authority would have a very difficult time acquiring any land in this park. Lastly, the topography north of TIX varies by 5 to 15 feet from the existing runway's elevation, extensive earthwork to provide the appropriate grade for the runway extension as well as the relocated road. Given these considerations, the option to relocate Columbia Boulevard around the end of the extended runway was abandoned.

Since the relocation of Columbia Boulevard was considered out-of-range, another alternative that might be possible is bridging the runway extension over a portion of Columbia Boulevard and possibly placing the road in a tunnel. Because of the grading requirements, significant excavation and earthwork, involving many cubic yards of fill, would be required to obtain both the vertical roadway clearance and a suitable grade for aircraft operating on the extended runway. For estimating purposes, approximately 1,300 linear feet of roadway was considered giving an estimated project cost ranging between \$20 and \$25 million for construction. Moreover, implementation of this alternative to tunnel or bridge the roadway would significantly affect the accessibility of large transport trucks hauling equipment to both the Kennedy Space Center and Cape Canaveral Air Station in support of the U.S. space industry, such as conducted by Astrotech. Located in Spaceport Florida, the industrial park west of TIX, Astrotech utilizes Columbia Boulevard to transport payloads to the various launch pads of the Kennedy Space Center and Cape Canaveral Air Station. Currently, Columbia Boulevard has to be shut down to normal traffic while these payloads are being transported due to their size and height. In some cases, it also necessitates temporary removal or elevation of overhead wires, such as electrical lines and traffic signal cabling. If any portion of this roadway were tunneled or bridged, this could severely limit the dimensions of payloads that could be delivered by Astrotech or other companies, which would be detrimental to these firms, since they would need to identify alternate routes or have to relocate their activity altogether from Spaceport Florida.



In summary, Alternative B was not considered a viable approach to meeting the anticipated runway length of 8,000 feet. The largest hurdles that would have to be overcome relate to land acquisition and the realignment of Columbia Boulevard. As previously mentioned, the property to the north of Runway 18-36 is part of the Enchanted Forest and is not readily available for acquisition. However, it is recommended that the Airport Authority obtain some form of control of the property located under the ultimate 34:1 approach surface as specified by the FAA. This could be through appropriate land use controls or legal agreements, such as avigation easements. In addition to these impacts, changes and additions to the lighting and signage associated with operations on Runway 18-36 would also be necessary and would add to the costs of this alternative. These and other attributes and impacts associated with this alternative are summarized below.

**Attributes**

- Meets the identified runway length requirements; and
- Does not impact any residential development/uses.

**Impacts**

- Impacts significantly the Enchanted Forest and Columbia Boulevard;
- Bridging the runway over Columbia Boulevard would impact operations of space industry such as Astrotech;
- Requires acquisition of land to accommodate extension and safety areas; and
- Requires the relocation of navigational aids, lighting, and signage.

***Alternative C – Extension of Runway 9-27***

While the Facility Requirements – Chapter 5 discussed extending Runway 18-36, the current primary runway, the viability of ultimately providing 8,000 feet on Runway 9-27 was considered as an option since this runway orientation also provides the proper wind coverage for those aircraft requiring such a length. If this alternative were to occur, Runway 9-27 would then be considered the primary runway since it would have a longer length than Runway 18-36. Additionally, since it is planned that the primary runway would have an Airport Reference Code of D-III and would be designed to serve aircraft over 150,000 pounds, a 50-foot widening of Runway 9-27 would be needed. Furthermore, as noted in Chapter 5, precision approach capability would be needed to the primary runway and hence should be provided to at least one runway end. The following discussion highlights the potential pros and cons of extending Runway 9-27 to an ultimate length of 8,000 feet.

Two options exist for any runway extension – extending one or both runway ends to meet the overall required length. At TIX, the option of a single 3,000-foot extension off either end of Runway 9-27 was not considered realistic due to the negative attributes of such a development, especially to the east where U.S. 1 and the F.E.C. Railway lie approximately 2,500 feet from the Runway 27 threshold. Thus, it seemed more viable to consider splitting the 3,000 feet to have extensions from both ends of Runway 9-27, as shown by **Exhibit 6-4**, which depicts 1,500-foot extensions of both ends. These extensions, as well as the associated RSAs, go beyond the airport’s existing property boundary; thus, impacting adjacent properties.



INSERT Exhibit 6-4: Runway Alternative C

As observed on **Exhibit 6-4**, any westerly extension of Runway 9 bisects Grissom Parkway, which is a four-lane road tying into Columbia Boulevard to the north and primarily serving the businesses within the Spaceport Florida industrial park. This thoroughfare serves residents of Port St. Johns to the south and ties into Interstate 95 and State Toll Road 528. Maintaining this north-south route with its current traffic handling capability would be necessary if this alternative were developed. Several options exist for addressing this negative consequence of Alternative C. The first option evaluated involves relocating Grissom Parkway around the runway end with an alignment that would not impact the RSA or required approach surface. This realignment would impact businesses located west of Grissom Parkway, south of Armstrong Drive, and north of Shepherd Drive. Another solution would be to close the portion of Grissom Parkway between Shepherd Drive and Armstrong Drive. Most likely, this option would reroute traffic to Challenger Memorial Highway (which would still provide adequate access from the Port St. John area to northern Brevard County) and would require the widening of Shepherd Drive. A third possibility would involve bridging the runway and taxiway over Grissom Parkway. This requires lowering the road's grade by as much as 15 feet to provide adequate clearance by the aircraft approach surface. Historical groundwater data was reviewed and showed that elevations have been as high as 19 feet above mean sea level, with an average elevation of 15 feet above mean sea level. Ground elevations in this general area average approximately 30 feet above mean sea level. Thus, the road lowering is very likely to hit the groundwater table. Thus, the lowering of Grissom Parkway was not deemed very viable because of the cost associated with addressing control of groundwater in the development area. Of these three options, either relocating or closing a portion of Grissom Parkway would be the preferred resolution to this impact because bridging the runway over the road was considered cost prohibitive.

Extending Taxiway B in conjunction with the runway significantly impacts the business located at the corner of Grissom Parkway and Shepard Drive. As highlighted on **Exhibit 6-4**, Taxiway B physically intrudes into this industrial development. Two solutions exist for solving this effect. The first would be for the business to sell the facility and land to the Airport Authority. The Airport Authority could potentially be responsible for relocation costs if the company wanted to remain open. The second option would require the Airport Authority to undertake condemnation proceedings based upon the exercise of eminent domain powers. The airport would still be required to pay fair market value for the facility and land as well as having to compensate the company for relocating. As of January 2004, the Brevard County Property Appraiser listed a fair market value for this property and facility as approximately \$2.2 million. Additionally, several parcels at the south end of Schira Court would also likely need to be acquired at an estimated cost of \$600,000.

**Exhibit 6-4** also depicts a 1,500-foot extension to the east. This alternative to extend Runway 27 would also have similar restrictions and limitations as indicated for the extension to Runway 9. TICO Road would be bisected by this proposed extension and due to existing developments, mainly the F.E.C. Railway, there would be no way to relocate this airport access road. Additionally, a 1,500-foot runway extension comes very close to encroaching upon F.E.C.'s right-of-way. Other major negative impacts, creating a higher development cost, of this easterly expansion were identified. Earthwork quantities associated with the needed fill of the borrow pit located east of Runway 27 would be substantial to bring this area up to the grade of the runway extension and the required RSA.

The probable cost of this split extension of Runway 9-27 are high due to the many issues discussed above including the road improvements as well as the additional length of runway pavement compared to either Alternative A or B. Furthermore, the potential development of this runway alternative could pose some serious concerns from a constructability, local community acceptance, and political perspective. Alternative C requires extensive clearing and earthwork to prepare the proper grade for the runway and provide the future approach slope criteria for both ends of the runway (see subsequent section on

navigational aid alternatives). Any objects such as trees, buildings, poles, or natural features that extend above the required imaginary surfaces would have to be removed or demolished to provide the appropriate safety and design criteria. It should be noted that if this alternative were selected as the preferred runway improvement option, additional analysis could be undertaken to determine how differing the lengths from the two runway ends would lessen these impacts. The following includes a listing of attributes and impacts related to Alternative C as presented in **Exhibit 6-4**.

#### **Attributes**

- Meets the identified runway length requirements; and
- Does not impact any residential development/uses.

#### **Impacts**

- Affects wetlands west of Grissom Parkway;
- Requires significant land acquisition to accommodate extension and safety areas;
- Requires relocating or closing a portion of Grissom Parkway;
- Widening of runway by 50 feet required;
- Impacts at least two businesses in Spaceport Florida; and
- Requires a new or relocated ILS to support precision approach.

### **Selection of the Preferred Runway Alternative**

Typically, the most advantageous alternative would be the one that satisfies all of the requirements with the least amount of impact. This is true for the recommended runway extension to provide a primary runway length of 8,000 feet at TIX. While the airport does not currently have the minimum 500 annual operations conducted by aircraft requiring the increase in runway length, it is fully anticipated to occur during the course of this master planning period. As such, the future runway length recommended needs to be incorporated into the development plans for the airfield. This way, once the justification is documented, the airport will be in a position to move forward with the environmental and design portions of the runway extension, as well as to obtain necessary funding.

The above discussions show that the alternative to obtain an overall length of 8,000 feet by extending Runway 18-36 to the north (Alternative B) would have significant impacts to Columbia Boulevard, the Enchanted Forest, and potentially the space industries in Spaceport Florida. These features coupled with the lack of available land off the northern end of Runway 18-36 would not accommodate the required length and its associated safety criteria without incurring very significant costs. Likewise, the option to provide the ultimate length of 8,000 feet by extending Runway 9-27 was not deemed viable. Because an extension of 3,000 feet would be required, Alternative C looked at extending a portion of the runway to the east and a portion to the west. Any combination of the split extensions would have impacts to surrounding roadways and buildings. In addition, if the crosswind runway were extended, the provision for a precision instrument approach would likely have to be considered in conjunction with the extension, if it were not already established at that time. Some airspace limitations could be imposed related not only to operations and protection zones around the Kennedy Space Center, but also due to the proximity of Orlando International Airport's Class B airspace.

Therefore, the first option explored, extending Runway 18-36 to the south, was identified as having the least impacts. This proposed development option, Alternative A, had the smallest estimated quantities for land acquisition and earthwork. Additionally, it is considered the alternative that would be the most politically viable, given the negative impacts of Alternative B on the Enchanted Forest and Columbia Boulevard and of Alternative



C on Spaceport Florida. For the reasons stated above, Alternative A has been selected as the preferred runway alternative for this study. Therefore, this runway configuration will be utilized throughout the rest of this alternatives analysis and will be shown on the ALP.

### **Taxiway Improvements**

As noted in the Airfield Demand/Capacity Analysis – Chapter 4, some taxiway improvements are likely to be required in the future to enhance the overall airfield capacity. Having more runway exits would decrease the runway dwell time for each landing operation, thereby, increasing the overall airfield capacity. Other considerations in determining needed taxiway improvements at TIX included airfield safety and operational efficient enhancements. Three categories of taxiway improvements are recommended for TIX over the 20-year planning period; each of which is discussed below and are represented on **Exhibit 6-5**.

#### ***Parallel Taxiway Improvements***

The construction of second parallel taxiways along both runways will allow for the provision of additional runway exits; hence, increasing the overall airfield capacity. These proposed taxiway improvements create new circulation routes for the handling of arriving and departing aircraft. This should increase airfield safety by lowering the number of runway crossings by aircraft, especially as additional general aviation facilities are developed on the southwest side of the airport. Furthermore, these developments support the eventual development beyond the 20-year planning period of aviation relation facilities in the northwest sector of the airfield.

The first parallel taxiway improvement at TIX to be considered was extending Taxiway A to the north so that it ties into the Runway 18 end. Taxiway A is spaced at a 500-foot separation from Runway 18-36, which exceeds FAA minimum runway to taxiway separation guidance based upon the demand aircraft. Extending the taxiway at this same separation distance will impact a drainage ditch located west of TICO Road near the Runway 18 end; however, constructing this extension at the minimum distance of 400 feet from Runway 18-36 would not eliminate this impact. Additionally, spacing the extension at 500 feet would provide the most straightforward pavement geometry, thereby, offering a safer operating environment at TIX. Therefore, the ALP will show an approximate 1,400-foot extension to Taxiway A, having a width of 60 feet, at a separation of 500 feet from Runway 18-36.

Additionally, a parallel taxiway west of Runway 18-36 is also recommended. This taxiway would need to be placed at a minimum of 400 feet from Runway 18-36 based upon FAA separation standards for a runway with an ARC of D-III and having a precision approach with lower than 3/4-mile visibility. However, given the existing airfield layout at TIX, it is proposed that this parallel taxiway be constructed approximately 550 feet west of the runway so that it traverses the intersection of Taxiways C and E. A further advantage of this separation distance is that the new taxiway will fall just beyond the critical area for the Runway 36 glide slope. Thus, if this taxiway were developed prior to the Runway 36 extension occurring, the glide slope would not have to be relocated. Future development alternatives and the ALP will reflect this parallel taxiway, having a width of 60 feet, located approximately 550 feet west of Runway 18-36.

For Runway 9-27, a north parallel taxiway would open up development opportunities north of Runway 9-27 and west of 18-36. Furthermore, this additional taxiway would provide new runway exits and would increase airfield capacity. Based upon current conditions at TIX, the taxiway would need to be placed at 300 feet from Runway 9-27; however, with the planned implementation of a precision approach to the runway, which will likely have a visibility minimum less than 3/4 mile, the required separation distance



**Insert Exhibit 6-5 Taxiway Improvements**



would be 400 feet. Therefore, to provide the airport with the most flexibility and to ensure that the appropriate land is available the ALP will show the taxiway at a 400-foot separation. The taxiway width will be shown as 35 feet since Runway 9-27 has a future ARC of D-II. It should be noted that if a large aircraft operator moved to the west side having operations by aircraft classified above Design Group II, the taxiway would need to be widened.

### *Connector Taxiway Improvements*

Connector taxiways serve as runway exits for arriving aircraft as well as providing general airfield circulation routes. As noted previously, additional connectors would enhance the overall airfield capacity at TIX. Several new connectors to each runway would be constructed with the development of the additional parallel taxiways. However, development of these parallel taxiways may not begin for several years. A short-term improvement, which could be completed relatively quickly, would be to add an additional connector from Runway 9-27 to Taxiway B, thus, providing an additional runway exit for aircraft arriving to Runway 27. The location of this connector was determined by reviewing the optimum distance from the threshold as given in FAA Advisory Circular (AC) 150/5060-5, Change 2, entitled "Airport Capacity and Delay". This distance, influenced by the aircraft fleet mix, was determined to be from 2,000 to 4,000 feet from the landing threshold. This connector, as shown on **Exhibit 6-5**, will be incorporated into the ALP drawing set.

### *Bypass Taxiway Improvements*

A bypass taxiway located near the runway threshold is a specific variation of a connector taxiway. Its specific purpose is to allow multiple aircraft to easily maneuver onto and off a runway. Currently, no bypass capabilities exist at TIX, but considering the projected activity this capability was considered extremely beneficial to improving safety and operational efficiency at TIX. Therefore, each runway end was studied to determine the most appropriate manner in which to provide this bypass capability. For Runways 9 and 18 the addition of a bypass connector taxiway should be planned. Since Runway 36 will be extended in the future, the addition of a bypass taxiway prior to the extension was not deemed appropriate because Taxiway A will be extended to the south in conjunction with the runway, yielding the necessary bypass capability. The existing airfield layout at the Runway 27 threshold precludes the addition of bypass taxiways; however, if absolutely necessary, Runway 18-36 could be utilized as a bypass to Taxiway A. The ALP will reflect these improvements as shown on **Exhibit 6-5**.

## NAVIGATIONAL AID ALTERNATIVES

As noted previously in this report, one precision instrument approach is currently available at TIX to Runway 36. In the Facility Requirements – Chapter 5 discussion, the ability to install a precision approach to the crosswind runway was identified as a recommendation. Since it is anticipated that this precision instrument approach would not be added until later in the planning period, the use of a Global Positioning Satellite (GPS) system, such as a Wide Area Augmentation System (WAAS), will be planned to meet this improved approach capability. The following discussion reviews the various attributes and impacts associated with the possible precision approach implementation at either end of Runway 9-27.

One key consideration in implementation of a precision approach is the wind coverage of the individual runway end under consideration. Placement of the precision approach should be to the runway end yielding the greatest coverage for the anticipated aircraft design group expected to utilize the runway. This creates the safest operating parameters and allows for the greatest availability of the approach to the airport users. Wind analysis for TIX revealed that instrument flight rule (IFR) conditions exist on average approximately 4.3 percent, or 16 days,



during any given year. Looking at each runway end and assuming a 16-knot crosswind (since the runway will ultimately have a designated ARC of C-II), showed that Runway 9 has 75.94 percent wind coverage, while Runway 27 has 86.04 percent wind coverage. This equates to 12 and 14 days, respectively, out of the overall 16 days of IFR conditions expected at TIX. When comparing the wind coverage for the individual runway ends, a difference of two days was not considered significant given the level of operations at the airport; therefore, implementation of the precision approach could be applicable at either end if wind conditions were the only factor considered. However, additional factors, such as potential airspace conflicts, had to be evaluated also.

In considering the addition of a precision approach to Runway 27, several negative factors were identified. The first relates to potential obstructions to the required 50 to 1 approach surface. Conflicts with multiple trees and poles would need to be resolved prior to the precision approach being implemented. The other negative impact, related to potential airspace conflicts, would be much more difficult to overcome. As discussed in the Inventory – Chapter 2 and shown on **Exhibit 2-4**, several restricted airspace areas are located due east of TIX. These areas, identified as R-2932 through R-2935, are related to operations conducted at the Kennedy Space Center. The restricted area R-2934 is located approximately four statute miles from TIX and R-2935 is approximately two miles east. While R-2935 is more restrictive it is active only intermittently; however, of more concern is R-2934, which is active continuously up to an altitude of 5,000 feet above mean sea level. Additionally, flight limitations are imposed in the days leading up to a space shuttle launch affecting all aircraft operations at TIX. Any precision approach would take aircraft over these areas at lower altitudes, which due to existing security precautions, may not be feasible. Therefore, given the existing concerns about national security, it is anticipated that implementing a precision approach to Runway 27 may not be viable.

Consequently, it is recommended that the Airport Authority preserve the ability to implement a CAT I precision approach to Runway 9. In reviewing the 50 to 1 approach surface, several obstructions were identified, including multiple trees, a utility pole, and a building to the northwest of the Grissom Parkway and Shepherd Drive intersection. The trees and pole could be resolved through relocation or removal; however, the penetrating building is not likely to be relocated. The facility, which penetrates the future precision instrument approach surface by four feet, is located approximately 1,350 feet west of the threshold and 600 feet south of the extended centerline. It is possible that appropriate obstruction lighting could be placed on the building. While this would not remove the penetrating facility, it would be more easily identifiable to pilots and should only slightly increase the landing minimums associated with the proposed approach. Further information will be included on the Runway 9 Inner Portion of the Approach Surface Drawing included in the Airport Layout Plan set. Additionally, further study would be needed to determine if the missed approach procedure would have any conflicts with the Kennedy Space Center restricted airspace areas. The preservation of this precision approach capability should ensure that further conflicts do not develop prior to the implementation of the precision approach to Runway 9.

## **GENERAL AVIATION DEVELOPMENTS**

As previously noted, TIX serves the general aviation (GA) community in the Titusville and north Brevard County area. As such, certain types of facilities, including hangars and a GA terminal, are needed to adequately support this aviation community. Three general areas have been identified as locations for future growth. It is important to note that these alternatives go beyond the needs stated in the previous chapter; instead, a layout for each area, showing one of the multiple development possibilities, has been developed and is discussed below. Thus, these alternatives show the development potential for each area and account for the necessary access to both the airfield and landside roadways. The actual developments will be determined by the need at the time of implementation. Showing the possible maximum developments in these areas will provide adequate flexibility to the Airport Authority as they seek to meet user needs.

### **General Aviation Terminal Area**

During the course of this study, the airport began design and construction of a new GA terminal facility east of Runway 18-36. In the short term, future growth is expected to occur in this area with the new GA terminal serving as the cornerstone around which other facilities would develop. **Exhibit 6-6** shows a proposed development scheme for this area. The major focus in this area was to increase the aircraft storage capacity, particularly of transient aircraft. As such, this layout shows approximately 72,500 square yards of additional apron for aircraft storage. Several existing facilities (TICO Executive Aviation, Cape Kennedy Communications, and the ATCT) would need to be relocated and the existing structures removed. Taxilanes are shown to accommodate up to ADG III aircraft. Along the northern boundary of the apron, four hangars, 130 by 150 feet, are planned. These hangars could easily house one larger Gulfstream aircraft or several smaller aircraft, such as Lear jets or single-engine Cessna aircraft. Vehicular access to these corporate hangar facilities would be via the north access road that will be constructed in conjunction with the GA terminal development project. Seven smaller hangars, 100 x 100 feet in size, are shown north of this access road. These hangars will easily accommodate most ADG II aircraft. Airside access to these hangars would be possible via a taxilane off of Taxiway A.

The ramp expansion as shown will need to occur over several phases. The first phase will require the relocation of Cape Kennedy Communications, which could be accommodated in the southwest development area. The second phase of the apron expansion necessitates the relocation of the ATCT and of TICO Executive Aviation. This second phase is not anticipated until the later half of the planning period. By this time, both facilities housing the ATCT and TICO Executive will likely be in need of upgrading or full replacement. Given the amount of developable land located in the southwest corner of the runways, it is anticipated that TICO Executive could be relocated to that area. Due to the clear lines of sight needed from the ATCT to all portions of the aircraft operations areas, a separate analysis of potential sites for the ATCT will be discussed later in this report. A temporary access route to Cape Kennedy Communications, the ATCT, and TICO Executive is included as part of the GA terminal construction project. Access will be maintained to these facilities until they are relocated.

### **T-Hangar Area**

In the first half of 2003, the Airport Authority purchased additional land to the south of Perimeter Road and the existing T-hangars. Additionally, a 14-unit T-hangar was constructed and opened in this same timeframe. However, this did not relieve the airport of its need for more T-hangars since, currently, the airport still has approximately 60 aircraft on their waiting list for T-hangars, with some of the potential tenants having made their initial request in 2001. Therefore, it is likely that if several more T-hangar units were constructed, the airport should be able to rent them rather quickly.

A proposed development plan for constructing additional T-hangars south of the existing facilities is shown in **Exhibit 6-7**. This layout shows the addition of two 10-unit and four 14-unit T-hangars, which should serve the Space Coast community well beyond the end of the planning period. Additionally, three box hangars, measuring 50 by 50 feet, are depicted. The area between Taxiway A and the first row of T-hangars would be paved to allow for more aircraft tiedowns. A common-use parking lot directly off Perimeter Road is planned to provide adequate parking for these additional based aircraft facilities. Existing drainage areas located between the existing T-hangars and Perimeter Road will need to be routed into storm drainage pipe to allow for landside access to these T-hangars. This proposed scheme necessitates the relocation of the airport maintenance facilities as well as Perimeter Road.



**Insert Exhibit 6-6 Terminal Development Area**



**Insert Exhibit 6-7 T-Hangar Development Area**

### **Southwest Flightline**

As noted in the preceding discussions, the majority of short-term GA facility development is likely to occur along the eastside of Runway 18-36, mainly due to existing infrastructure. However, as this area is built up there will be little room for expansion beyond what was shown on the previous two exhibits. Hence, future growth would have to occur at another location. It is proposed that this new growth occur southwest of the two runways.

One possible development plan is shown on **Exhibit 6-8**, which shows a location for a new or expanded FBO, multiple corporate hangars located directly off existing taxiways, and an apron (28,500 square yards) for aircraft tiedowns. Additionally, this layout reserves areas for future aviation-related economic development and for the airport maintenance facilities (to be discussed subsequently). It is likely that developments located along Challenger Avenue and Taxiway D would occur first since much of the necessary infrastructure currently exists. A related development shown by this figure is the realignment of Perimeter Road. This will allow for a more direct route from Challenger Parkway to the eastside of the Airport. This realignment also opens up additional room for development. This road realignment does impact an identified wetland area, which will require some form of mitigation.

One key advantage to having GA facilities in this location is that with the proposed taxiway improvements, most aircraft would no longer have to cross Runway 18-36; they could simply exit to the south or west of whichever runway they were on and travel to their final destination. This would relieve the tower of having to coordinate numerous runway crossings; thus, improving overall airfield safety.

### **SUPPORT FACILITY ALTERNATIVES**

Aviation activity at the airport is supported by a variety of other facilities. The following sections identify and discuss potential developments to enhance the operation of these support facilities.

#### **Airport Maintenance Facility Relocation**

The airport maintenance department is currently located along Perimeter Road south of the current T-hangar area. This area has been earmarked for additional T-hangar developments within the first half of the planning period; therefore, requiring the relocation of the airport maintenance facility. Given the fact that much of the maintenance activities are centered on the airfield, this facility would function most efficiently if it were placed in closer proximity to or had direct access to the airfield. The preferred development area, shown on **Exhibit 6-8**, has been reserved for this facility located along Taxiway E. This area is currently owned by Brevard County Mosquito Control. Landside access to this maintenance area would be via Perimeter Road. An alternate location (shown on **Exhibit 6-7**) has been selected south of the existing location and east of the future Runway 18-36 extension. A detailed development plan for the required facility would be elaborated upon during any design efforts undertaken in the future.

#### **Air Traffic Control Tower Site Alternatives**

Due to the ultimate need for additional apron near the main GA terminal, as well as the expected condition of the existing ATCT 10 to 15 years from now, a new tower will be needed. In discussions with airport representatives, the desired approach is to plan for the development of the new, and possibly taller, tower at a new location. This relocation will also involve moving the electrical vault and PAPI control building. A major benefit of developing the tower on a new site is that the existing tower can remain operational while the new facility is constructed, which will lessen the operational impacts to the airport and its users. Four sites, as shown on **Exhibit 6-9**, were initially considered as possible future locations of the ATCT. This initial review of sites did not assume a height



**Insert Exhibit 6-8 Southwest GA Development Area**



**INSERT Exhibit 6-9 ATCT Sites**

for the tower cab; instead, the cab height was determined once a preliminary site was selected and the appropriate line-of-sight analysis was completed. Additionally, the Part 77 transitional surfaces for the approaches planned to each runway would need to be considered.

### *Site 1*

The first area considered is located to the northwest of the runway intersection, labeled Site 1 on **Exhibit 6-9**. Any facility located in this area would need to be outside of the runway object free areas and clear of the ultimate runway visibility zone. This alternative could easily provide the necessary line-of-sight from the tower cab to each runway end. Vehicular access to this area could be accomplished via a new access road from Grissom Parkway. This access road would be the longest needed for any of the alternatives. Probably the most negative factor associated with this potential site is that the Airport Authority does not currently own the property and it may be some time before the property is available for purchase. Also, since this site is currently undeveloped, utilities would have to be provided, raising the overall project costs associated with this site. Due to property acquisition needs and the needed development of relatively lengthy access roads, this site would have the highest construction cost associated with developing the tower.

### *Site 2*

Site 2 locates the tower southwest of the intersection of the runways. The proposed site would place the ATCT so that it would not cross the building restriction line or protrude into the future runway visibility zone, which takes into account the 681-foot extension to Runway 36. Air traffic controllers would have a clear line-of-sight to each of the runway ends from this general location. However, several negatives are related to this potential site, including vehicular access from Perimeter Road to the site and infrastructure relocation costs. Additionally as previously discussed, it is proposed that GA facilities, such as corporate hangars and additional space for an FBO, be located in this general area. Having the ATCT in this area could limit these possible developments. Furthermore, this area has the best direct access to and from each of the runways; therefore, placing the facility in this location would not be the most appropriate land use for the area.

### *Site 3*

Site 3 would involve locating the air traffic facility near the existing TICO Executive Aviation facilities, which would have to be removed. It is likely that this company could be relocated to the southwest development area. The ATCT at this site would need to be located outside of the future building restriction line and the future Runway 27 RPZ. Vehicular access could easily be provided off TICO Road. Utility lines and airfield power and control cables would have to be relocated the least distance of any of the four sites initially considered, which would keep development costs as low as possible. Moving the ATCT north of its existing site would allow for the area between the new GA terminal and the new ATCT to be developed as previously discussed under GA alternatives once the existing ATCT was removed.

### *Site 4*

The final location considered involves placing the facility north of the Runway 27 threshold and east of Taxiway A. The facility would need to be placed to minimize any penetrations to Part 77 surfaces associated with the two runways. Constructing the facility on this site would have less of an impact on limiting future growth of other facilities and would not require the airport to acquire any additional land

for this development. Vehicle access could be easily obtained by constructing a short access road from TICO Road. Given that Site 4 is closer than either Site 1 or Site 2 to the current ATCT, the existing airfield infrastructure would not have to be relocated as far as in those two site alternatives. This relocation would be further than in Site 3. A potential conflict with designated helicopter training circuits is likely with an ATCT at this site.

#### *Preferred Air Traffic Control Tower Site*

Considering the above discussion, Site 3 was selected as the preferred development location for the new ATCT, due mainly to the anticipated lower development costs. This general location was then further developed as shown on **Exhibit 6-10** to take into account the necessary line-of-sight to each of the four runway ends. This location was maximized so that the facility did not penetrate Part 77 surfaces for either runway anymore than the existing ATCT does. A line-of-sight analysis gave an anticipated cab floor height of at least 51 feet, assuming an eye-level of 56 feet. The analysis took into account the extension to Runway 36 and the heights of existing and future buildings. At this location and height, the future ATCT will penetrate the Part 77 transitional surfaces for both runways. However, no impacts to the existing or future instrument approach minimums are expected. Additionally, aircraft parking on the existing and future ramps will need to be configured so that aircraft do not create any blind spots or shadows for the controllers. It should be noted that a full tower siting analysis would be required during the preliminary design phase for the new tower, which will be required during the latter half of the planning period.

#### **Joint-Use Apron Alternatives**

As identified in the previous chapter, five new helispots and a large cargo unloading area were identified as being needed within the 20-year planning period. In order to make the best use of available property and of financial resources, it is proposed that a joint-use apron be developed that would accommodate both of these needs with the primary use being helicopter training activity. Nonetheless, this apron would need to be sized and constructed to handle the weight and breadth of the Antonov-124 aircraft, which is used a number of times during the year to deliver space payloads to firms such as Astrotech. Thus, a minimum apron area of 450 feet by 450 feet (equating to 22,500 square yards) is proposed. This area was based upon the required turn radii of an Antonov-124 powering out to leave the apron. With these dimensions, the apron could also be marked to accommodate three helispots or helicopter skid landing strips, in an east to west, north to south, or in both orientations.

Only sites north of Runway 9-27 were evaluated due to the proposed GA developments planned south of this runway, which are sensitive to constant, low-altitude helicopter overflights. The two sites evaluated as potential locations for a joint-use apron are shown on **Exhibit 6-11**. Appropriate connector taxiways from the proposed apron to the airfield are also reflected in this exhibit. Additionally, Helicopter Adventures is required by their current lease to relocate sometime during the planning period and, potentially, they could be located in close proximity with this joint-use apron. This relocation will allow for additional growth of the FBO and GA terminal now under construction east of Runway 18-36. Conceptual helicopter training circuits, based upon the active runway determined by the prevailing wind conditions, are discussed for each site alternative; however, prior to the development of this facility, the formal training routes will need to be established through agreements between the helicopter training operator, the ATCT, and the Airport Authority.



**INSERT Exhibit 6-10 ATCT Preferred Site Layout**



**INSERT Exhibit 6-11 Joint-Use Apron Alternatives**

### *Site 1*

As shown on **Exhibit 6-11**, Site 1 is located north of the Runway 9 threshold. Presently, the airport does not own all the land needed for this proposed development. Approximately 12 acres would need to be acquired prior to going forward with the necessary development at this site. The required property is part of a former munitions facility and it has been reported that the current owner cannot sell for at least another five years, due to environmental and safety concerns. However, it is not anticipated that TIX could move forward with this joint-use apron prior to five years; therefore, the delay in acquiring the requisite property should not be considered a significant setback.

Two helicopter training circuits could be developed incorporating the helispots at Site 1. During north-south operations, the three helispots proposed on the joint-use apron could be incorporated into the existing north-south training circuit. For east-west operating flows, a new training circuit north of Runway 9-27 would need to be established. Two additional helispots located at the north end of Runway 18-36 could be incorporated into this east-west training circuit. Coordination with the ATCT would be needed for helicopters entering this east-west training circuit by crossing over the Runway 9-27 mid-point from the offsite training corridor.

The pros and cons of Site 1 in regards to the apron's secondary purpose were also evaluated. Site 1 is located as close to Spaceport Florida as possible, simplifying the current delivery route. Thus, a new +- access road from the apron to Grissom Parkway could be provided at relatively low cost. With this access route, it is anticipated that very few special provisions would be needed to accommodate the flat bed delivery trucks handling the various space payload shipments.

### *Site 2*

The second site evaluated is located northeast of the runway intersection, but south of the Valiant Air Command Museum. At this location, proposed helicopter training circuits, using these additional helispots as well as existing ones, could be developed for both general runway operating flows, north-south and east-west. The north-south circuit would likely take helicopters over U.S. 1 and mostly commercial and industrial areas. Some residential areas are located north of Columbia Boulevard near its intersection with U.S. 1; thus, any proposed north-south route would need to be carefully studied to avoid these overflight sensitive areas. Helicopters would need to enter this circuit by crossing at the Runway 18-36 midpoint, with ATCT coordination, to avoid crossing the aircraft arrival and departure streams. It should be noted that no existing helispots are located east of Runway 18-36, placing limits on the usefulness of the north-south training circuit utilizing the apron at Site 2. During an east-west flow, helicopter traffic would remain mostly over airport property and would swing out over areas along U.S. 1. As with the north-south circuit there are potential conflicts with the airplane arrival and departure streams and helicopters entering the training circuit; therefore, they would have to cross Runway 9-27 at the mid-point, requiring prior coordination with ATCT personnel. Two additional helispots, could be designated along Taxiway A near the Runway 18 threshold, yielding the requisite five additional spots.

Although locating the joint-use apron at Site 2 could work for support of helicopter training activities, several potential problems were identified in regards to the apron's secondary purpose as a cargo apron. Vehicular access to and from the Site 2 area could be via TICO Road; however, this would be problematic for delivery of payload shipments from the apron to facilities such as Astrotech. This is due to the large size of the anticipated shipments which often would be considered wide loads and at times are tall enough when loaded on a flatbed truck to require the temporary removal of overhead traffic signals and other utility lines. If this site were selected, these delivery trucks would have to travel the full length



of TICO and Perimeter roads, disrupting access to and from TIX and placing very heavy loads on these roads, thus potentially increasing the amount of pavement maintenance or reconstruction. An alternate solution to this access issue would be to tie the apron into the taxiway system (including the future parallel taxiway north of Runway 9-27), thus connecting the joint-use apron to Grissom Parkway. This potential solution is likely to increase the cost so much as to make it impractical.

### *Preferred Joint-Use Apron Site*

Both joint-use apron sites would provide additional helicopter training sites as well as providing an area for handling space payload and other cargo shipments. An important difference between the two sites relate to usefulness of each site for helicopter training activities. Site 2 has more constraints related to needed ATCT coordination for entering both training circuits and the fact that there are no existing helispots east of Runway 18-36. Another dividing factor between the sites was vehicular access, to and from the joint-use apron to Astrotech and other facilities in Spaceport Florida. The appropriate access routes to Site 1 could be developed at a substantially lower cost than Site 2. Therefore, Site 1 was selected as the preferred development area for this joint-use apron. The conceptual helicopter training routes for Site 1 are shown on **Exhibit 6-12**. Although not discussed in depth, it should be noted that this joint-use apron could also be used as an overflow area to tie-down aircraft during peak periods. This would be especially helpful in the days leading up to a space shuttle launch or during the annual Warbird Airshow when TIX experiences an increase in transient overnight aircraft.

### **Aircraft Rescue and Fire Fighting Facility Site Alternatives**

Over the past several years, Airport and county officials have discussed the possibility of locating a joint-use fire station at TIX. The station would be responsible for responding to general fire or emergency responses in the county as well as providing Aircraft Rescue and Fire Fighting (ARFF) capabilities. The Airport is supportive of this due to the shortened response time of emergency personnel located on-site. Personnel assigned to this station would receive additional training related to aircraft emergency response. It should be noted that in February 2004 the FAA issued changes to ARFF requirements for all airports holding an Airport Operating Certificate, issued by the FAA. TIX will maintain its operating certificate due to passenger charter activities. As such, during each passenger charter activity, which the FAA defines as 15 before and after the operation, ARFF equipment and personnel must be available for emergency responses. Therefore, two potential sites, depicted on **Exhibit 6-13**, were evaluated.

Several evaluation criteria were used in determining an appropriate site for such a facility, such as having the required development area as well as access issues. This joint-use fire fighting facility is not expected to require a large land area requirement. The site would need to accommodate a facility capable of housing multiple emergency response vehicles as well as a small parking lot. The two alternative sites show an area one acre in size, which should be sufficient to develop an appropriately sized ARFF facility. Another important consideration in evaluating the potential sites relates to access from the facility to county roads.

#### *Site 1*

This site alternative places the ARFF facility east of Taxiway A between the Valiant Air Command Museum and the Runway 27 threshold giving the facility direct access to either runway. Landside access from this site to other areas within the county would be via TICO Road to S.R. 405 or to Golden Knights Boulevard and U.S. 1. As noted in other portions of the report, these access routes have potential problems – mainly the fact that there is no capability to turn west onto S.R. 405 from TICO Road and that



at times train activity would limit the use of Golden Knights Boulevard. As shown on **Exhibit 6-13**, the facility could be expanded towards TICO Road in the future as needed.

*Site 2*

This second alternative places the ARFF facility on the westside of the airfield near the Runway 9 threshold. Direct airfield access would be via Taxiway B whereas landside access would be via Perimeter Road to Grissom Parkway, which ties into S.R. 405 (Columbia Boulevard) to the north and Kings Highway to the south. Response time from this site to other areas within the county, such as Port St. John to the south or Titusville to the north, would likely be less than from Site 1. However, airfield response times to portions of the primary runway, 18-36, would be longer from this site although still under three or four minutes given that the Runway 18 and 36 thresholds are within 1.5 miles away. A one-acre site is possible at this location with future expansions possible to the west.



**INSERT Exhibit 6-12 Proposed Helicopter Training Circuits**



**Exhibit 6-13 ARFF Site Alternatives**

### *Preferred ARFF Facility Site Alternative*

Given that both sites have sufficient room for the proposed initial development as well as for a future expansion, the site selection was based upon the probable access routes for emergency response vehicles not only to airfield areas, but also to other county areas. Although Site 1 provides quicker response times to three of the four runway thresholds, it does not provide sufficient landside access routes. Site 2 does provide good access to other county areas and provides sufficient airfield access; therefore, Site 2 was selected as the preferred development site.

### **AIRPORT ACCESS ALTERNATIVES**

As noted in the Inventory – Chapter 2, current vehicular access to the east side of the airport is via either TICO Road from Columbia Boulevard or Golden Knights Boulevard from U.S. 1. Problems with each of these access points were noted in Facility Requirements – Chapter 5. Traffic leaving TIX via TICO Road cannot turn left onto Columbia Boulevard, which is a four-lane divided roadway. Due to safety concerns related to high traffic volumes from west of TIX, it is not likely that the necessary improvements to the Columbia Boulevard median, allowing for a left turn onto Columbia Boulevard, would ever go forward. It is also quite unlikely that improvements along Golden Knights Boulevard could be made, which would address airport access restrictions due to the frequent activity on the F.E.C. Railway. As pointed out in the previous chapter, wait times for airport users can be significant when the railway is in use. Consideration was given to creating a bypass system from Golden Knights Boulevard to and from U.S. 1, which would involve bridging the existing at-grade railway. Any structure put in place would need to be elevated higher than the minimum vertical clearance of 23 feet above the rail tracks. Grade changes along the elevated portion of Golden Knights Boulevard would need to stay within 3 to 5 percent. This translates to requiring a 600 to 1,000-foot approach along Golden Knights Boulevard (on each side of the F.E.C. Railroad) to raise the grade to meet an estimated 30-foot high bridge and then back down to the existing grade. Currently, there is adequate room to the west of the railway, but not to the east where only 200 feet separate the rail track and the existing turn lanes at the intersection of U.S. 1. Therefore, to provide access to both the northbound and southbound lanes on U.S. 1 a structure crossing over U.S. 1 would be needed to access northbound lanes as well as structures to flyover the rail tracks to and from the U.S. 1 southbound lane. This access option is not considered feasible due to the anticipated development cost.

Therefore, other access alternatives were considered for both developments on the east and west sides of the airfield. Essentially, the re-alignment of Perimeter Road is the only option for enhancing airfield access. Not only would this accommodate the extension of Runway 18-36 to the south and the T-hangar expansion, but also the additional development planned for the airport's southwest side. Improving Perimeter Road's access to the intersection of Grissom Parkway and Shepherd Drive also develops the most direct route to Challenger Parkway, which has direct access to Interstate 95 and the Beeline (State Toll Road 528). It should be noted that the final alignment of these proposed road improvements will have to take into account the existing ponds and wetlands areas located west and southwest of Perimeter Road. Additionally, two other new access points are proposed – one to Kings Highway south of TIX and the other to Grissom Parkway west of TIX. These two connecting points with existing roads would address the concerns related to inadequate access at S.R. 405 and U.S. 1.

**Exhibit 6-14** shows these access improvements being completed in two phases. The first would include relocating Perimeter Road to the south so that the Runway 36 safety area can be brought into compliance and to open up the T-hangar development area. Additionally, this includes tying into Kings Highway to the south and straightening Perimeter Road along the southwest GA development area. The second phase creates access to Grissom Parkway along the southwest corner of TIX property. This could also potentially include a road running parallel to but east of Grissom Parkway, which would support commercial or industrial developments in this area.



**INSERT Exhibit 6-14 Airport Access Improvements**



## **PROPERTY ACQUISITION PLAN**

As highlighted in earlier portions of this chapter, several of the development alternatives extend beyond the airport's boundary; thus, the airport will need to acquire additional property in order to facilitate the planned developments. The majority of these properties are to support developments considered to be in the long term, meaning the need for them is 10 years or more in the future. These areas are identified on **Exhibit 6-15**.

## **SUMMARY OF AIRPORT ALTERNATIVES**

The preceding sections have identified and analyzed a number of planning alternatives for future development at the TIX. In addition to showing the proposed access improvements, **Exhibit 6-14** shows all the facilities discussed in the previous sections. The alternatives presented focused on meeting future facility needs at the airport while maintaining operational efficiency and safety standards. The positive and negative aspects of each alternative were presented and discussed to provide an indication of differentials between various options. These alternatives were presented and discussed with the Master Plan Technical Advisory Group, FDOT, FAA, and Airport Management. In addition, feedback from the public presentation at an Airport Authority meeting was also included to finalize the selected alternatives, which will be utilized in the future layout plans for the airport.



**INSERT Exhibit 6-15 Proposed Property Acquisition**