CHAPTER FOUR

Airfield Demand/Capacity Analysis & Facility Requirements

INTRODUCTION

A key step in the master plan process is the determination of airport facility requirements to allow airside and landside evolution throughout the planning period. By comparing existing conditions to predicted growth projections, based upon existing and future aircraft usage, the airport can define requirements for runways, taxiways, aprons, terminal facilities, aircraft storage, and other related facilities to accommodate planned growth over the short-, intermediate-, and long-terms. As a result, the demand/capacity analyses aid in the identification of airport deficiencies, surpluses and opportunities for future development.

This chapter, therefore, evaluates the ability of existing facilities at the Herlong Airport (HEG) to meet both forecast planning activity levels, as shown in **Chapter 3**, *Projection of Aviation Demand*, as well as meet anticipated aircraft group category demand. Thus, the airfield demand/capacity analysis seeks to identify at what point, if any, during the 20-year planning period that an unacceptable level of delay would be experienced by airport users. This analysis compares the forecast annual aircraft operations to a theoretical airfield capacity. If a shortfall is identified, airfield improvements may be required to accommodate future demand. The Federal Aviation Administration (FAA) has developed a standard methodology in FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*, to determine this theoretical airfield capacity, termed Annual Service Volume (ASV). This methodology accounts for the most common airfield layouts observed at U.S. airports. The *Capacity* AC provides a systematic approach for determining the hourly runway and annual airfield capacities, as well as the projected average hourly and annual delays. Each of these was calculated for existing conditions as well as for key study years during the 20-year planning period; the results of which are described in the following sections.

General

An essential step in the process of predicting airport needs is the determination of an airport's current capacity to accommodate anticipated demand. There are two inter-related types of aviation demand: Operational Demand and Aircraft Group Category Demand. Each of these demand types affects capacity and development at an airport. Demand associated with operational capacity is determined through an analysis of the ASV. The ASV determines an airport's annual capacity based upon historic and forecast operations and fleet mix. It does not take into account, however, significant changes in aircraft group categories, which do not historically or currently exist at an airport. This is a deficiency in the airport capacity analysis. ASV only accounts for deficiencies in runway use, aircraft fleet mix, weather conditions, etc. that would be encountered based upon the existing aircraft group category and usage.

In order to compensate for this deficiency, capacity and demand based upon the potential aircraft group category was determined. The Airport Group Category demand analysis evaluates not only the existing fleet mix, but also anticipated future fleet mix based upon a variety of external and internal factors unique to each particular airport. In the case of HEG, potential changes in roadway infrastructure, development within the region, existing demand by more sophisticated general aviation aircraft, and the introduction of small light jet aircraft, all impact airport infrastructure, such as runway length, strength, navigational aids (NAVAIDS), aircraft storage facilities, etc.

Airport Reference Code

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, airports are designated specific design standards that reflect what is identified as the Airport Reference Code (ARC). The ARC is a coding system that coordinates airport design criteria with the characteristics of the aircraft intended to operate at the airport. Two components make up the ARC—aircraft approach category and airplane design group. The first component, aircraft approach category, refers to an aircraft's approach speed and is generally a factor of the aircraft's operational characteristic. The second component, airplane design group, is a physical characteristic depicted by a Roman numeral and specifically relates to the aircraft's wingspan. Whereas the aircraft approach category affects runway design characteristics, the airplane design group affects the physical and design attributes of taxiways, taxi lanes and aprons.

Critical Aircraft

Determination of the critical aircraft is fundamental in developing an airport's design criteria as well as the development of the ARC. Characteristically, the critical aircraft is defined as the most demanding aircraft (highest approach speed and longest wingspan) that utilizes the airport on a regular basis. FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, defines substantial use as scheduled commercial service or at least 500 total aircraft operations a year. Further, the critical aircraft reference code is that which represents the lowest maximum allowable crosswind.

TABLE 4-1 AIRCRAFT APPROACH CATEGORIES	
Category	**Approach Speed (knots)**
A	< 91
B	91 – 120
C	121 –140
D	141 – 166
E	≥ 166
Source: FAA AC 150/5300-13	

TABLE 4-2 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	

Facility Design Criteria

As previously identified in Chapter 2 of this Master Plan Update, the ARC is used to determine the standards and dimensions of the critical surface and separations of the airfield facilities. Based upon current aircraft operations which include aircraft such as the Citation II and the Super King Air 300, the current ARC at HEG is a B-II. A B-II category aircraft represents the most demanding aircraft or family of aircraft accounts for at least 500 total operations per year. Later in this analysis, anticipated changes in the GA fleet mix, including such aircraft as the Gulfstream II and III as well as Citation 10, in conjunction with the forecast increase in turbine operations may require the design criteria to increase from a B-II to a C-II designation. Therefore, by providing adequately sized facilities to accommodate the range of aircraft types projected to use HEG throughout the twenty-year planning period, the airport can exploit the benefits of maximizing airport services and their utilization.

AIRSPACE CAPACITY

Airspace capacity at an airport can be impacted when the flight paths of air traffic at nearby airports, or local navigational aids (NAVAIDS), interact to affect operations at the study airport. Additionally, obstructions near or in the approaches to an airport that require aircraft to alter flight paths to avoid the obstruction can limit the number of aircraft processed, and adversely affect airspace capacity. Therefore, a review of the obstructions, airports, special use airspace and associated approach procedures that surround HEG was completed to determine airspace capacity. **Figure 4-1** illustrates the overall airspace surrounding HEG as depicted in the FAA Jacksonville Sectional Aeronautical Chart.

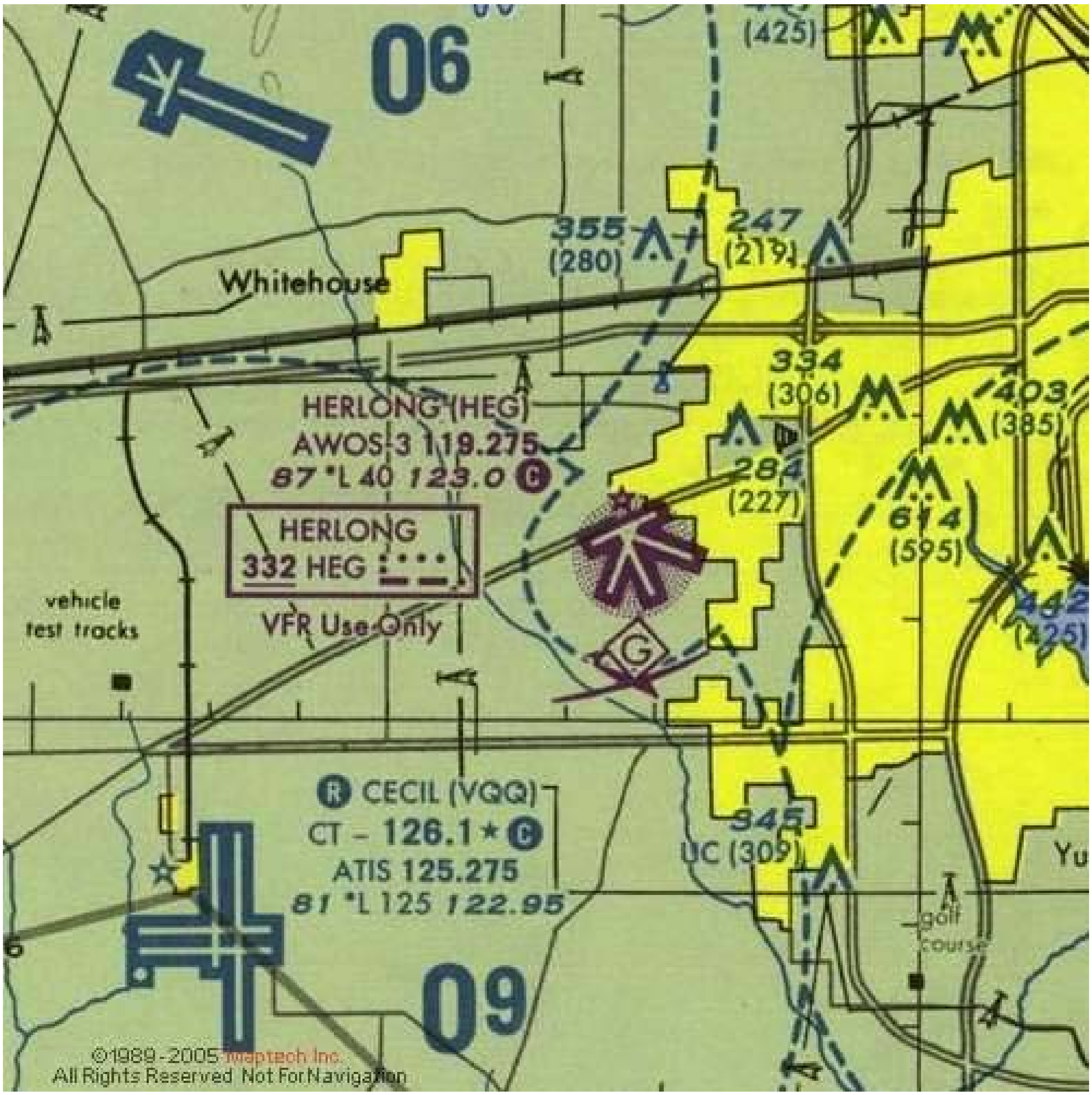
Airspace capacity is an essential element of any airport, especially with respect to maintaining existing and proposed operational characteristics. Since HEG does not have an operating control tower, the airfield is considered uncontrolled and operates within Class G and E airspace categories.

Class G airspace is a mantle of low lying airspace beginning at the surface. Class G is airspace that is completely uncontrolled and is limited to VFR operations. Class G airspace is a low lying blanket of uncontrolled airspace which only ends when it meets Class B, C, D or E airspace. At HEG, the ceiling of the Class G airspace is 700 feet AGL. As such, training aircraft and ultra-light activity may remain within the pattern without the need to maintain constant two-way radio communication with other aircraft in the area.

Above 700 feet AGL, the airspace is considered to be Class E airspace up to 18,000 MSL. Class E airspace is generally that controlled airspace that populates those sections of airspace between Class A, Class B, Class C, Class D, and Class G. There are Class E airspace areas that serve as extensions to Class B, Class C, and Class D surface areas designated for an airport. Such airspace provides controlled airspace to contain standard instrument approach procedures without imposing a communications requirement on pilots operating under VFR. Similarly to most non-towered airports, this type of Class E airspace surrounds HEG. It is important to note, however, that to the northwest, southwest and southeast, Class D airspace related to Cecil Field, NOLF Whitehouse and Jacksonville Naval Air Station surrounds HEG. Furthermore, northeast of the Airport is Class C airspace related to Jacksonville International Airport operations. Undoubtedly, the complex airspace requires careful planning especially if the roles of neighboring airports change.

Cecil Field, NOLF Whitehouse, and Jacksonville Naval Air Station all operate under Class D airspace. Class D airspace is controlled airspace that extends upward from the surface and continues to an elevation of 2,600 feet MSL. This ceiling, however, varies depending on the elevation of the airport. This airspace surrounds only those airports with an operational control tower, where pilots are required to establish and maintain two-way radio communications with the ATC facility providing air traffic control services prior to entering the airspace. No separation services are provided to pilots of VFR aircraft, and pilots operating under VFR must still use "see-and-avoid" procedures for aircraft separation.

Figure 4-1, Jacksonville Sectional

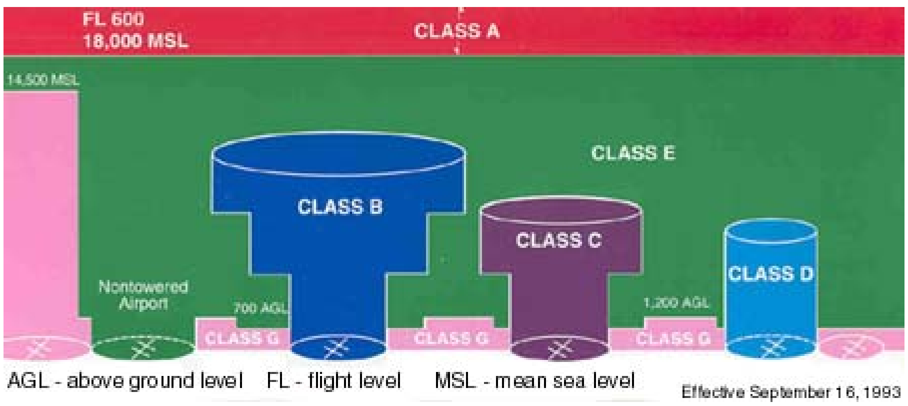


Source: Maptech Inc., 2005

HEG lies within the service area of the Jacksonville Approach/Departure Control facility and the Terminal Radar Approach Control (TRACON) which provides radar coverage within the vicinity. The Jacksonville Air Route Traffic Control Center (ARTCC) controls all air traffic enroute to or from the Jacksonville airspace area. Since the last master plan, the capacity of the airspace surrounding HEG has neither increased nor decreased significantly. Overall, the airspace for the airport is not currently impacted or constrained by any of the other airports in the region, except Cecil Field. This, however, does not remove the potential for some occasional airspace conflict associated with operations at the other facilities or associated obstructions. While none of these facilities have a severe direct airspace conflict, the potential application of additional instrument approaches will require careful planning.

Figure 4-2, *U.S. Airspace Classes*, outlines how the airspace classes relate.

Figure 4-2, U.S. Airspace Classes



Source: Federal Aviation Administration, Air Traffic Control Division, 2000

Though the airspace surrounding HEG is limited to some degree by military special use airspace (SUA) and commercial airspace associated with Jacksonville International Airport (JIA), it does not restrict the Airport's operating capacity. It was determined as part of this analysis that forecast increases in aircraft operations at HEG will not exceed the airspace capacity in its existing configuration. Continued coordination between ARTCC, JIA, Cecil Field (VQQ), Whitehouse NOLF (NEN), Jacksonville NAS Towers (NIP), and the other airports in the region will ensure that safe and efficient operations continue, while maintaining the smallest amount of delay possible. However, limitations to potential instrument approach operations at HEG do exist, and could potentially restrict development on existing Runways 7-25 and 11-29. Such an instrument operation would require significant analysis and coordination to ensure that conflicts with other operations within the area are avoided. This will be considered in a greater degree within **Chapter 6**, *Airport Alternatives*. However, based upon existing conditions, there is currently no hazard to air navigation affecting HEG.

AIRFIELD CAPACITY

As discussed earlier, airfield capacity consists of two types of demand: operational capacity and aircraft group category demand. Airfield operational capacity is defined as the number of aircraft that can be safely accommodated on the runway-taxiway system at a given point in time. Delay is the difference between "constrained" and "unconstrained" aircraft operating time, usually expressed in minutes. As demand approaches capacity, individual aircraft delay is increased. Successive hourly demands exceeding the hourly capacity will result in unacceptable delays. Aircraft delays can still occur even when the total hourly demand is less than hourly capacity if the demand during a portion of that hour exceeds the capacity during that hour.

Aircraft group category demand/capacity is based upon the type of aircraft group category that can safely use the Airport based upon available airport facilities and infrastructure. This type of demand evaluates capacity in relation to potential opportunity costs in order to determine if significant demand for infrastructure development exists. If limiting infrastructure exists, i.e. runway length inadequate to accommodate potential aircraft group or groups demand for facilities, then it is likely that the Airport will loose its competitive edge in the marketplace.

Airfield Operational Capacity

Operational demand and capacity analysis of airfield or airside systems and facilities, such as the Airport's runways and taxiways, results in calculated hourly capacities for Visual Flight Rules (VFR) and IFR conditions. Additionally, an ASV, which identifies the total number of aircraft operations that may be accommodated at the Airport without excessive delay, was also calculated.

An airport's hourly runway capacity is the maximum number of aircraft that can be accommodated under conditions of continuous demand during a one-hour period. It should be noted that generally this hourly capacity cannot be sustained over long periods without substantially increasing delays. The hourly runway capacity is influenced by a number of factors, which are described below.

Since the magnitude and scheduling of user demand is relatively uncontrollable, especially at a general aviation (GA) airport, reductions in aircraft delay can best be achieved by improving airfield facilities to increase overall capacity. Airfield capacity is quantified by two calculable factors:

- Weighted hourly capacity (Cw): The theoretical number of aircraft that can be accommodated by the Airport in an hour, considering all runway use configurations.
- ASV: The Airport's theoretical annual operational capacity.

To determine Cw and ASV and conduct the capacity analysis, a number of prime determinates specific to HEG must be identified. These include:

- Meteorological conditions
- Runway use configuration
- Aircraft mix (based upon existing aircraft group demand)

- Percent arrivals
- T&G operations
- Exit taxiways

The FAA defines operational capacity as a reasonable estimate of the Airport's annual capacity that would be encountered over a year's time. The parameters, assumptions, and calculations required for this analysis are included in the following sections.

Airfield Characteristics

Runway Configuration

The number of runways at an airport and how they are positioned in relation to one another determines how many arrivals and departures can occur within an hour. For example, if an airport has two runways that are oriented parallel to each other then it is generally possible to have arrivals and departures to both runways at the same time, which is most often referred to as runway independence. However, if the two runways intersect, an aircraft departing on one runway must wait for operations on the other to be completed prior to starting its takeoff, most often referred to as runway dependence. HEG has no runways that intersect, however the way in which they are aligned creates runway dependency if both runways are in operational use at the same time.

The airfield configuration for HEG includes four paved runways, two of which are in use and two of which are closed. The primary runway, Runway 7-25, has a generally northeast to southwest orientation whereas Runway 11-29 is aligned northwest to southeast. The two runways form an offset V-shaped configuration where the approach ends of Runway 25 and Runway 11 do not intersect, but are, however, within close proximity to one another.

All runways maintain standard right hand traffic patterns mainly because of the military operations that exist to the south of the airport within Cecil Field's Class D airspace. These patterns primarily keep traffic to the north and east of the airfield. Due to the runway configuration, runway length and related traffic patterns, HEG typically operates both runways at any given time. Therefore, the capacity calculations in this chapter treat the Airport as a dual runway environment.

Since aircraft takeoff and land into the wind, the FAA recommends that sufficient runways be provided to achieve 95 percent wind coverage. This is calculated by using a 10.5 knot crosswind component for the smaller and lighter aircraft, while a 13 knot and 16 knot crosswind component is utilized for the larger, heavier, and jet aircraft. FAA AC 150/5300-13, *Airport Design* suggests that weather for a period of at least ten years be used to determine the wind coverage of an airport. The inventory chapter of this study evaluated the wind coverage for different meteorological conditions at the Airport based on ten years worth of data, with a slight interruption during that time. Based upon our analysis, Runway 7-25 provides the appropriate wind coverage (greater than 95 percent) for all aircraft that currently utilize the airfield. This means that FAA will provide funding support for only this runway and supporting taxiway lighting and signage.

Taxiway Configuration

The number of taxiways impacts the hourly runway capacity by influencing when an arriving aircraft will be able to exit the runway after slowing to a safe taxi speed. The *Capacity* AC defines optimum ranges for the distance a taxiway should be from the runway arrival end.

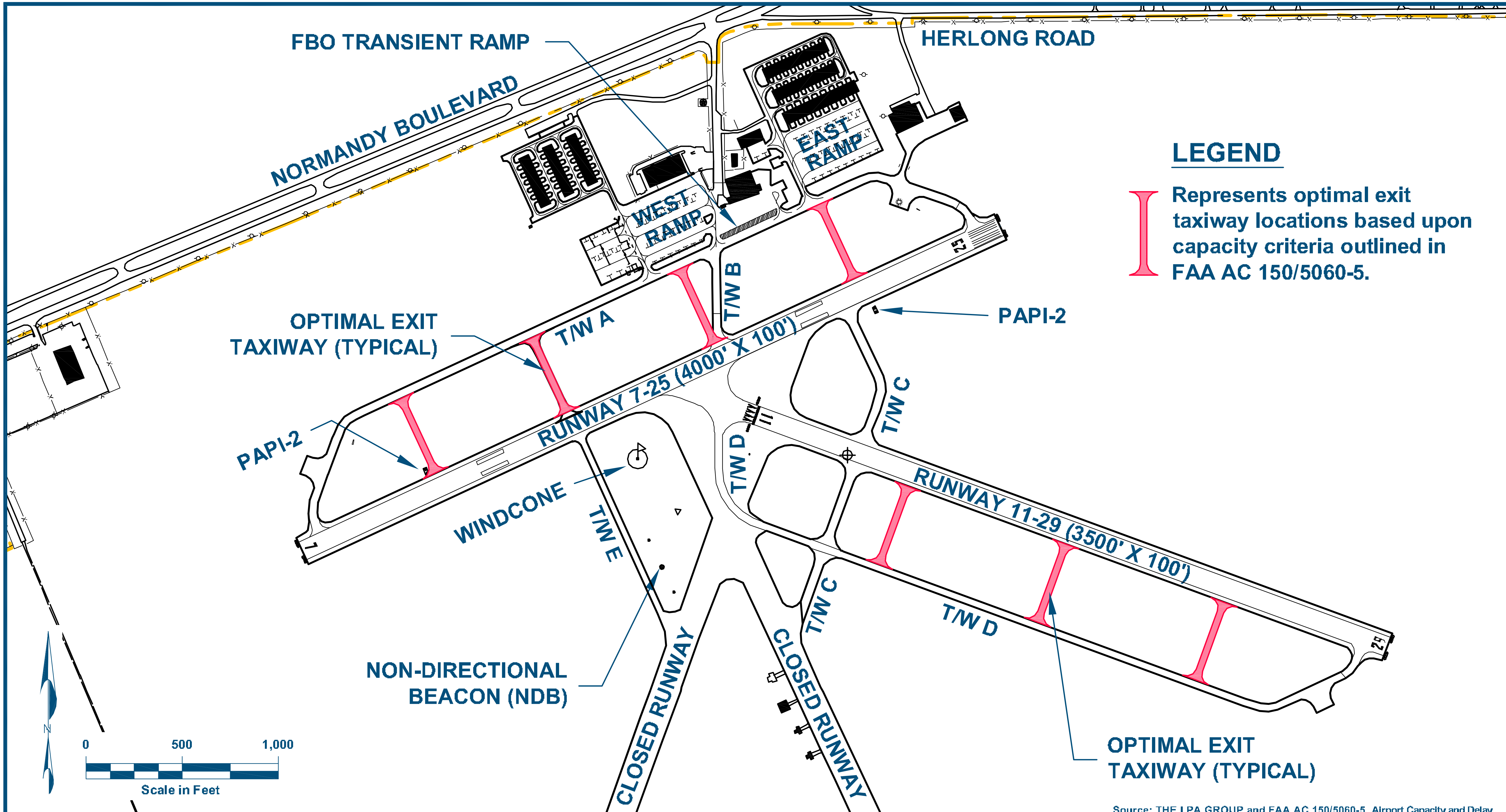
As mentioned in Chapter Two, both runways are equipped with full-length parallel taxiways, designated as Taxiways A and D. Taxiway A provides access from the thresholds of Runways 7 and 25 to both the West Ramp and East Ramp aprons of the airfield located on the north side. Taxiway D provides full access to Runway 11-29 as well as access to Runway 7-25 and Taxiway B. Both parallel taxiways have a runway-to-taxiway separation of 525 feet, which exceeds both the B-II (existing critical aircraft category) and C-II (anticipated critical aircraft category) separation requirements.

Taxiway B, connects the existing apron and terminal areas to Runway 7-25 and also provides access to and from Runway 11-29. Taxiway connector C provides access from the north side of the airfield, connecting Runway 7-25 to the 11-29 runway environments as well as Taxiway D and the south side of the airfield. There is a deficiency of exit taxiways on the runway system at HEG, and recommendations for the development of these taxiway components will be further discussed in the Alternatives chapter of this Master Plan Update. Existing exit taxiways are listed in **Table 4-3**, *Exit Taxiway Locations*, and correspond to the runways they serve.

To the south of the existing runways, former runway pavement exists that extend nearly 3,500 feet to the southwest and southeast. This pavement joins at a node where Taxiway D ends just south and east of the Runway 11 end. A closed taxiway connects the former runway pavements where substantial ultralight activity occurs.

Based upon demand and capacity requirements, exit taxiways provide a higher level of airport capacity since they limit the amount of time aircraft are required to remain on an active runway. Based on the FAA's criteria, the exit factor is maximized when a runway has four exit taxiways within a range determined by the operations using that runway. At HEG, this range is 2,000 feet to 4,000 feet from the landing threshold. Taxiway exit distances from the associated runway thresholds are shown in **Table 4-3**, *Airfield Diagram with Optimum Taxiway Ranges.*

Airfield Diagram with Optimum Taxiway Ranges



Source: THE LPA GROUP and FAA AC 150/5060-5, Airport Capacity and Delay

TABLE 4-3
EXIT TAXIWAY LOCATIONS

Exit Taxiway	From Runway 7 Threshold	From Runway 25 Threshold
B	2,380'	-
A	3,875'	3,875'
	From Runway 11 Threshold	**From Runway 29 Threshold**
D	3,371'	3,643'
C	-	2,922'

Source: The LPA Group, Inc. 2006

Aircraft Mix Index

In the *Capacity* AC, the FAA classifies aircraft at an airport based on their maximum certified operational weight. The mix index is a calculated ratio of the aircraft fleet based upon a weight classification system. As the number of heavier aircraft increases, so does the mix index. The hourly runway capacity decreases as the mix index increases because the FAA requires that heavier aircraft be spaced further apart from other aircraft for safety reasons. Over the planning period, a significant increase in larger and heavier jet operations is not expected, and thus the mix index will generally remain the same.

Knowing the operational fleet mix, it is possible to establish the mix index required to compute the airfield's capacity. The aircraft mix index is calculated based on the type or class of aircraft expected to serve an airfield. **Table 4-4** provides examples of typical aircraft for each of the FAA's four capacity classifications. The formula for finding the mix index is %(C + 3D), where C is the percentage of aircraft over 12,500 pounds, but less than 300,000 pounds and D is the percentage of aircraft over 300,000 pounds.

At HEG, the current aircraft mix includes only Class A and B aircraft. This trend is expected to continue over the entire planning period. The airport does see an increase in jet aircraft traffic in the latter part of the planning period. However, this increase in activity is likely limited to light jets associated with the Small Aircraft Transportation System (SATS) as well as light turboprop aircraft, both of which typically are less than 30,000 pounds. However, capacity constraints at Craig Airport and increased residential and business development in the area may cause Herlong to see the potential for a slight adjustment in its operational fleet mix. Nonetheless, since it is approximated that aircraft weighing over 12,500 pounds account for only 1 percent of total annual operations, the assumed fleet mix for HEG is calculated at 1 percent.

TABLE 4-4
FAA AIRCRAFT CLASSIFICATIONS

Aircraft Class	Max. Cert. Takeoff Weight (lb)	Number of Engines	Wake Turbulence Classification
A	12,500 or less	Single	Small (S)
B		Multi	
C	12,500 – 300,000	Multi	Large (L)
D	Over 300,000	Multi	Heavy (H)

Source: FAA AC 150/5300-13, Change 10

Runway Instrumentation
The capacity calculations for HEG include a main and secondary runway. The main runway, 07-25, provides GPS and NDB-A approach capabilities to Runway 25. Additionally, air traffic control (ATC) facilities, equipment, and services within the region are adequate to carry out operations in a radar and non-radar environment.

General Airspace Limitations
Herlong's role in the Jacksonville Aviation System is a VFR recreational, sport, flight training and light business aircraft general aviation airport. Its airspace is constrained by its proximity to Cecil Field, JIA, NAS Jacksonville and NOLF Whitehouse. The Airport is also not equipped with an air traffic control tower and has currently has only one instrument approach. These issues all reduce the airport's operational capabilities.

Operational Characteristics
Percentage of Aircraft Arrivals
The percentage of aircraft arrivals is the ratio of landing operations compared to the total number of operations at an airport for a specific period of time. This percentage is based upon the assumption that aircraft require more runway occupancy time for landing than takeoff. As a result, the 50 percent arrivals figure was determined using the FAA methodology for computing airfield capacity.

Sequencing of Aircraft Departures
Runways 7, 25, and 29 are equipped with dedicated run-up areas sufficient to allow for taxiing aircraft to pass simultaneously. Runway 11 has no dedicated area for aircraft run-ups. However sufficient pavement exists within the vicinity of the departure end of Runway 11 to allow aircraft run-ups, although this runway is not typically used the majority of the time. Since areas dedicated for run-up activity or a lack thereof cannot be modeled using the FAA's airfield capacity methodology, the airfield is considered to have no aircraft departure constraints.

Percentage of Touch-and-Go Operations
Touch-and-go operations play a significant role in the determination of overall airfield capacity. A touch-and-go is defined as two operations, a landing and takeoff performed consecutively are typically associated with flight training. FAA guidelines for calculating ASV require an estimate of

the percent of touch-and-go operations compared to total operations occurring at the airport. One touch-and-go maneuver typically takes less time than two operations conducted by two separate aircraft occupying a runway. Hence, airfields that have a higher percentage of touch-and-go operations typically have greater capacity than similar airports with a lower percentage of this type of maneuver. The number of touch-and-go operations normally decreases as the number of air carrier operations increases, demand for service and number of total operations approach runway capacity, and/or weather conditions deteriorate. Typically, touch-and-go operations are assumed to be between zero and 50 percent of total operations. Since no air traffic control service is provided at the airport, the previous master plan was consulted and reasonable assumptions were concluded from information obtained from airport management to estimate the number of touch-and-go operations at HEG. The previous master plan estimated that between 50 and 60 percent of total operations conducted at the airport are touch-and-go operations. This Master Plan Update assumes that this range is an accurate reflection of touch-and-go activity at HEG, and for the purposes of this study, 50 percent was used.

Meteorological Conditions

Meteorological conditions, i.e. wind, cloud ceiling and visibility, impact overall airfield capacity. Runway utilization is normally determined by wind conditions while the cloud ceiling and visibility dictates spacing requirements. Although Chapter Two, *Inventory of Existing Conditions*, provides a breakdown of the Jacksonville area wind characteristics, it was decided that since HEG does not have an operating ATCT, airport management and previous master planning efforts could reasonably estimate which runways accommodate most of the operational activity at the airport.

Based upon information obtained from the 2000 Master Plan Update report, 69 percent of operations occur on Runway 7-25 and 22 percent occur on Runway 11-29. The remaining nine percent refers to the times during which IFR conditions are in effect. Of this nine percent, based upon meteorological data obtained from National Climatic Data Center, a straight-in, non-precision instrument approach is flown to Runway 25 approximately five percent of the time. The remaining four percent refers to times when weather conditions exist below published minimums, and, therefore, the airport is closed. A breakdown of runway utilization is outlined in **Table 4-5**, *Runway End Utilization*.

Considering these various factors, the *Capacity* AC methodology was used to calculate the hourly capacities under both VFR and IFR conditions, as shown in **Table 4-6**. These two values were then used to calculate the weighted hourly runway capacity for each of the key study years. This weighted hourly runway capacity takes into account the percent of time each meteorological condition occurs. Over the planning period, there is no increase in the weighted hourly runway capacity. The judgment that supports this claim assumes that no significant increases or decreases in aircraft mix will occur at HEG over the planning period.

<table>
<tr><td colspan="3">TABLE 4-5
RUNWAY END UTILIZATION</td></tr>
<tr><th>Runway End</th><th>Runway Use</th><th>Runway End Utilization</th></tr>
<tr><td>7</td><td rowspan="2">74% of total</td><td>17% of total</td></tr>
<tr><td>25</td><td>57% of total</td></tr>
<tr><td>11</td><td rowspan="2">22% of total</td><td>5% of total</td></tr>
<tr><td>29</td><td>17% of total</td></tr>
<tr><td colspan="3">Weather conditions below published minimums occur approximately 4% of the time.</td></tr>
<tr><td colspan="3">Source: Airport Management and 2000 MPU, 2006.</td></tr>
</table>

The higher utilization of Runway 25 is attributed to the installation of a non-precision instrument approach system and its use by instrument and flight training operations. Likewise, the generally higher utilization of Runway 7-25 is perhaps best explained by its situational proximity to the aprons, T-hangar and storage facilities and fixed base operator (FBO) facilities. Longer taxi-times exist for aircraft that use Runway 11-29 since access to FBO facilities and apron parking requires aircraft to cross Runway 7-25.

There are three measures of cloud ceiling and visibility conditions recognized by the FAA in calculating the capacity of an airport. These include:

1. **Visual Flight Rules (VFR) –** Cloud ceiling is greater than 1,000 feet above ground level (AGL) and the visibility is at least three statute miles.

2. **Instrument Flight Rules (IFR) –** Cloud ceiling is at least 500 feet AGL but less than 1,000 feet AGL and/or the visibility is/are at least one statute mile but less than three statute miles.

3. **Poor Visibility and Ceiling (PVC)** – Cloud ceiling is less than 500 feet AGL and/or the visibility is/are less than one statute mile.

Essentially, each airport also has a fourth measure used to calculate the airport's capacity. That measure is based on the lowest minimum descent altitude, or decision height, and the minimum visibility published for an approach into the airport. HEG is equipped with a non-precision instrument approach to Runway 25. This approach is designed with a minimum descent altitude of 600 feet above ground level (AGL) and visibility minimum of one statute mile. However, when conditions are less than the published approach minima, the airport is closed to landing aircraft. Since this approach falls within the limits of the IFR category, the airport only has three measures: VFR, IFR, and below minimums (during which the airport is closed).

HEG experiences VFR conditions approximately 91.0 percent of the time, IFR conditions 5.0 percent of the time, and below the published approach minimums 4.0 percent of the time. These percentages are based on weather data collected for the Airport covering the most recent 10-year period.

Hourly Capacity of Runways

Hourly runway capacity measures the maximum number of aircraft operations that can be accommodated by the airport's runway configuration in one hour. Based on the FAA methodology, hourly capacity for runways is calculated by analyzing the appropriate VFR and IFR figures for the airport's runway configuration. From these figures, the aircraft mix index and percent of aircraft arrivals are utilized to calculate the hourly capacity base. A touch-and-go factor is also determined based on the percentage of touch-and-go operations combined with the aircraft mix index. These figures also consider a taxiway exit factor, which is determined by the aircraft mix index, percent of aircraft arrivals, and number of exit taxiways within the specified exit range.

For both VFR and IFR conditions, the hourly capacity for runways is calculated by multiplying the hourly capacity base, exit factor, and touch-and-go factor. This equation herein is detailed below:

$$\text{Hourly Capacity} = C^* \times T \times E$$

where:
- C^* = hourly capacity base
- T = touch-and-go factor
- E = exit factor

TABLE 4-6
CALCULATION OF HOURLY CAPACITY

Year	VFR Capacity Base (Operations/Hour)	IFR Capacity Base (Operations/Hour)	Weighted Hourly Capacity (C_w)
Base Year			
2005	158	59	116
Forecast			
2010	158	59	116
2015	158	59	116
2020	158	59	116
2025	158	59	116

Source: The LPA Group, Inc. 2006

An airport's mix index can substantially change the value of the hourly capacity base in the FAA capacity tables. However, since all of the planning years fall into the mix index range of 0 to 20 percent, there will be no change in the hourly capacities of the airport. A weighted hourly capacity for the airport is calculated by taking the VFR and IFR calculations and prorating them based upon Airport historical data. These hourly capacity values were calculated for Herlong Airport at key years within the planning period as shown in **Table 4-6**. The calculated weighted hourly capacity was determined to be 116 operations. This figure was used to calculate annual service volume (ASV) as detailed in the following section. **Table 4-7** tabulates the hourly runway capacity calculation components, applicable weight factors, as well as percentage of runway use to determine the ASV.

Annual Service Volume (ASV)

The FAA *Capacity* AC uses the calculated weighted hourly runway capacity to determine a theoretical annual airfield capacity, which the FAA has defined as the annual service volume (ASV). The ASV estimates the annual number of operations that the airfield configuration should be capable of handling with minimal delays over a one-year period. This methodology takes into account that a variety of conditions are experienced at an airport throughout a year, including some high-volume and low-volume activity periods. **Table 4-8** shows the results of the ASV calculations for the base year of 2005 as well as for each five-year increment over the twenty-year planning period. Additionally, this table, in conjunction with **Figure 4-3,** shows the comparison of the projected annual operational demand to the theoretical ASV. According to guidelines in **FAA Order 5090.3B**, *Field Formulation of the National Plan of Integrated Airport Systems*, once the actual demand exceeds 60 percent of the calculated ASV planning studies should be undertaken to increase the airfield capacity. Due to the length of time it takes to implement some types of airfield developments, early planning facilitates the construction of capacity enhancing facilities to meet the anticipated demand. Based on the operational forecasts developed in **Chapter 3**, HEG will neither exceed the Airport's calculated ASV nor the 60 percent planning threshold during the twenty-year planning period. Thus, future improvements to the airfield do not consider issues associated with ASV capacity; however, other issues related to capacity shortfalls are considered in the facilities requirements section of this chapter.

$$\text{Annual Service Volume} = C_W \text{ x } D \text{ x } H$$

Where: C_W = weighted hourly capacity for the runway component, calculated by,

$$C_W = \frac{(C_1 \text{ x } W_1 \text{ x } P_1) + (C_2 \text{ x } W_2 \text{ x } P_2)...+...(C_n \text{ x } W_n \text{ x } P_n)}{((W_1 \text{ x } P_1) + (W_2 \text{ x } P_2)...+...(W_n \text{ x } P_n))}$$

C_x = hourly capacity — D = average daily demand during peak month

W_x = weighted factor — H = average peak hour demand during peak month

P_x = percent runway use

TABLE 4-7
HOURLY CAPACITY OF RUNWAY COMPONENT CALCULATION MATRIX

Runway Use Condition	Hourly Capacity Base (C*)	Touch and Go Factor (T)	Exit Rating (E)	Hourly Capacity (C* x T x E)	Weight Factor (W)	Percentage Use VFR	Percentage Use IFR
Takeoff 07 Landing 07 VFR	158	1.00	.90	142.2	1	17%	
Takeoff 07 Landing 07 IFR	0	0	0	0	4		0%
Takeoff 25 Landing 25 VFR	158	1.00	.79	124.82	1	52%	
Takeoff 25 Landing 25 IFR	59	1.00	1.00	59	4		5%
Takeoff 11 Landing 11 VFR	158	1.00	.79	124.82	1	5%	
Takeoff 11 Landing 11 IFR	0	0	0	0	4		0%
Takeoff 29 Landing 29 VFR	158	1.00	.79	124.82	1	17%	
Takeoff 29 Landing 29 IFR	0	0	0	0	4		0%
Airport Closed	0	0	0	0	25		4%
TOTAL						**91%**	**9%**

Notes:
Maximum Hourly Capacity = 142.2
Hourly Capacity = (Column 2 x Column 3 x Column 4)
Weighted Hourly Capacity Cw=E (Column 5 x Column 6 x Column 7)/E(Column 6 x Column 7) = 116
Daily Demand Ratio (D) with Aircraft Mix Index of 0% to 20%
- *65,300/295 = 221.35*

Hourly Demand Ratio (H) with Aircraft Mix Index of 0% to 20%
- *278.3/35 = 7.95*

Annual Service Volume (Cw x D x H) = 204,128
The weight factor calculation for both IFR and VFR conditions is as outlined in the methodology found in FAA AC 150/5060-5, Airport Capacity and Delay, Table 3-
Since Runway 25 is equipped with GPS, the majority of IFR operations are performed on this runway

Source: The LPA Group Incorporated, 2006

Annual service volume is calculated by multiplying the weighted hourly capacity for each runway configuration, C_W, with average daily demand during the peak month, D, and average peak hour demand during the peak month, H. Weighted hourly runway capacity, C_W, is a function of hourly runway capacity (C_n), the weight applied to that capacity (W_n), and the percentage of time that runway is in use

(P_n). An eight variable function was used to determine C_W as each runway configuration schematic during both VFR and IFR was used in the calculation. As a result, the runway component hourly capacity considers all weather scenarios during times the airport is open to traffic. The calculated weighted hourly capacity for HEG is 116 operations.

Due to the integrated nature of the ASV calculation, precise methodologies were followed as outlined in FAA AC 150/5060-5, *Airport Capacity and Delay*, to obtain a theoretical airfield capacity of 204,128 annual operations. This number is representative of the published theoretical capacity of an airfield with a similar runway configuration for HEG, which is published in the Capacity AC as 260,000 operations. Although not exact, this estimation is based upon operational information obtained from the FAA TAF and may actually be slightly higher due to the variance in base year operations. Therefore, it is justified that the ASV calculation in this Master Plan Update best represents the capacity of the airfield at HEG. Accordingly, subsequent recommendations for facility requirements are based upon this calculation as well as those previously detailed in the forecast chapter.

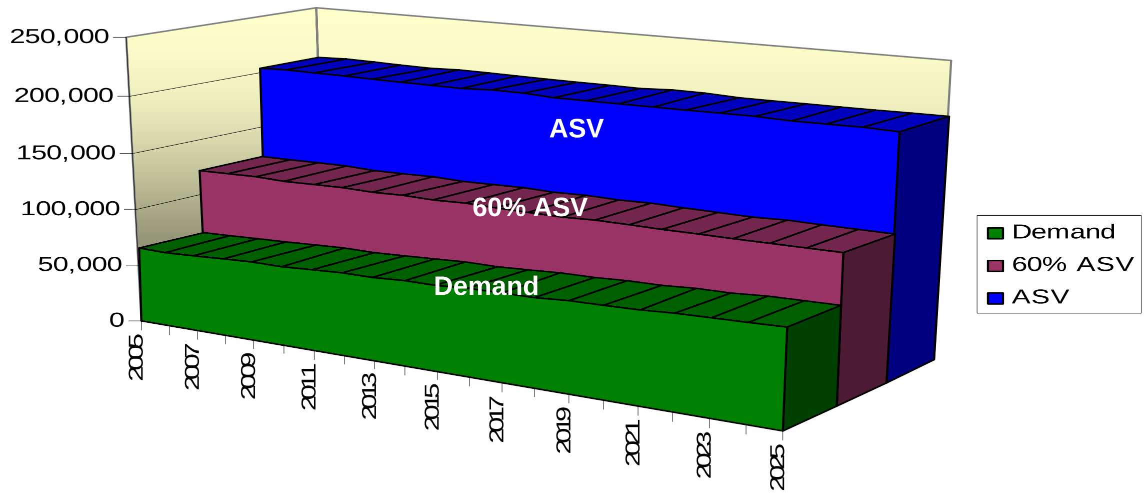
TABLE 4-8
ANNUAL AIRFIELD CAPACITY

Year	Annual Operations	Annual Service Volume	Capacity Level
Base Year			
2005	65,341	204,128	31.99%
Forecast			
2010	68,958	204,128	33.78%
2015	72,828	204,128	35.67%
2020	76,921	204,128	37.68%
2025	81,251	204,128	39.80%

Source: The LPA Group Incorporated, 2006

Table 4-8 depicts the forecast annual operations with the anticipated unchanging ASV. The airfield will marginally lose capacity throughout the planning horizon without additional capacity, representing a reduction in 24.45% in theoretical annual service volume by 2025. Important to note in this table is the consideration for growth in annual operations as determined in the forecast chapter. Whereas ASV is calculated to remain constant over the planning period, it is assumed that variability in the number of annual operations is inevitable. Therefore, capacity levels should be recomputed as final and accurate counts of total annual operations become available. As well, a new turf runway expected to accommodate the facility's ultralight and experimental aircraft thus increasing the airfield's ASV, albeit not as significantly as a paved runway. Accommodations should be reserved for this scenario as well.

FIGURE 4-4
CAPACITY LEVEL COMPARISON



Source: The LPA Group, Inc. 2005

Aircraft Group Capacity Demand

Based upon operational demand alone, HEG should not plan for additional runway capacity enhancing projects until beyond the end of the twenty-year planning period. However, based upon discussions with JAA/Herlong Aviation, the local fixed based operator (FBO), and JAA management, HEG's role is likely to evolve as a result of new technology and user demand, and, therefore, airfield facility improvements will likely be required in the mid- to long-term.

As a result, an aircraft group capacity demand analysis was performed. Aircraft group capacity demand is based upon a group or groups of aircraft that have or are anticipated to use HEG in the future if certain infrastructure improvements are made. According to the 2000 Airport Layout Plan, the existing ARC for HEG is Category B-II. However, use and demand for facilities by turbine aircraft, such as Learjet 24/25 and Gulfstream III, typically with an ARC of C-I and C-II is expected to increase over the planning period. Based upon current information received from JAA and JAA/Herlong Aviation, use of C-I and C-II category aircraft (such as the Lear 25 and Gulfstream II) has been irregular as a result of runway length constraints. However, using data provided by the FBO, observations and fuel flowage data, it was determined that approximately ten (10) percent of total operations, approximately 6,530 operations, are associated with turbine-engine aircraft. Of that ten percent, approximately four (4) percent (or 260 annual operations) may be attributed to C-I and C-II category aircraft. Based upon the **FAA Aerospace**

Forecast, 2006-2015, turbine aircraft use is expected to increase by at least 2.8 percent per year. Applying the FAA average annual growth rate to HEG would result in turbine aircraft demand of approximately 16.96 percent (13,782 operations) of which conservatively 6.78 percent (approximately 935 operations) would be attributed to C-I and C-II category aircraft by the year 2025. It is anticipated that operations of more sophisticated jet aircraft will increase as a result of local business activity and anticipated capacity constraints at Craig Airport. Operators of more sophisticated and larger aircraft have stated that they would use the Airport if facilities were in place to meet their needs. Thus, the percentage of turbine operations associated with corporate aircraft, fractional ownership aircraft, air taxi, turboprop and turbojet GA aircraft, and some special use aircraft would likely increase beyond the forecast 16.96 percent.

Smaller aircraft operators seem to prefer the environment and facilities provided by HEG rather than Cecil Field. As a result, some operators use HEG, such as the Dassault Falconjets, Grumman Gulfstreams, Beech King Air's, Gates Learjet's, Cessna Citations, etc., even when their operations require weight restricted take-offs and landings due to HEG's shorter runways. At the time of this writing, based upon discussions with existing and potential users, JAA/Herlong Aviation, tenants, and JAA management, the number of aircraft in the B-II, C-I and to a limited extent C-II aircraft group category would likely increase if adequate runway length was available. In order to determine the anticipated effect of this demand on HEG, an opportunity cost analyses for each potential user was determined as shown in **Table 4-9**, *GA Daily Opportunity Costs*.

Corporate and General Aviation

As a member of the Jacksonville Aviation System, HEG's primary sources of funding are fuel sales and hangar rentals. However, many smaller, regional airports within the state benefit from non-aviation revenue sources. It is recommended, as part of the airport's development and diversification strategy, to develop a commerce park within its boundaries to attract aviation and non-aviation tenants.

Businesses can and do, to some degree, attract aircraft operations. Historically, aircraft operations at HEG increase significantly during Spring and late Fall coinciding with a variety of local events. In addition, attendees often fly larger aircraft, such as the Jetstream 31 and Learjet 25. However, due to limited runway length and instrument approach capabilities, many users who would like to use the Airport are prohibited from doing so.

As a result, potential income associated with this and similar operations at HEG are lost, representing lost opportunities or opportunity costs. Based upon the anticipated growth of the light jet and turbine aircraft market over the twenty-year planning period, operations associated with these type of aircraft are expected to represent 10% of the operational fleet in the year 2025. Again this number is somewhat deceiving since it is merely based upon historical data and does not consider the number of aircraft that cannot use the Airport due to facility, especially runway length limitations. Airport Management has and is currently having active discussions with potential users. Based upon these discussions, letters of interest are being obtained and are provided in **Appendix F** of this report. Based upon these letters and discussions with Airport management, **Table 4-9** shows the type and estimated revenue generation from aircraft that could utilize the Airport if adequate runway length were available.

TABLE 4-9
GA DAILY OPPORTUNITY COSTS

Aircraft	ARC	MTOW	Passengers	Estimated Field Length[1] Required (ft)	Fuel Capacity (Gallons)	Estimated Fuel Revenue[2]	Estimated Daily Tie-Down Fees[2]	Estimated Nightly Hangar Rental Fees[2]
Learjet 28/29	B-I	15,000	6	4,201	1,800	$6,768	$10.00	$50.00
Citation Jet	B-I	11,850	7	3,615	600	$2,256	$10.00	$50.00
TBM 850	B-I	7,394	4	3,333	864	$3,249	$10.00	$50.00
SJ30-2	B-I	13,499	7	4,685	1,620	$6,091	$10.00	$50.00
Premier Jet	B-I	12,500	5	4,451	2,500	$9,400	$10.00	$50.00
Citation Excel	B-II	18,700	11	4,213	2,244	$8,437	$10.00	$50.00
Citation II	B-II	13,300	8	3,509	800	$3,008	$10.00	$50.00
Citation Ultra	B-II	16,300	11	3,732	1,450	$5,452	$10.00	$50.00
Jetstream 31	B-II	16,226	10	4,871	1376	$5,174	$10.00	$50.00
Beechjet 400	C-I	16,100	9	4,893	1,932	$7,264	$10.00	$50.00
Learjet 24	C-I	13,500	6	4,346	1,620	$6,091	$10.00	$50.00
Learjet 25	C-I	15,000	6	5,433	1,800	$6,768	$10.00	$50.00
Learjet 31A	C-I	17,000	8	4,002	2,040	$7,670	$10.00	$50.00
Gulfstream III	C-II	68,700	14	5,927	4193	$15,766	$10.00	$50.00
Falcon 900 EX	C-II	48,300	15	5,851	3134	$11,784	$10.00	$50.00
Citation X	C-II	36,100	13	6,033	1926	$7,242	$10.00	$50.00
Average				**4,568**		**$7,026**		

Note: Manufacturer Takeoff Length and Regional Guidance requirements adjusted for elevation, temperature and 50 foot obstacle using FAA Takeoff Length Model
2 Obtained from Airport: $3.76 per gallon Jet A; $10.00 tie-down fee and $50.00 hangar fee
Source: Aircraft Manufacturer data, FAA Runway Length Regional Guidance Letter, and The LPA Group Incorporated, 2006

Again, this table represents potential lost revenue to the Airport since the Airport will not obtain fuel sales, aircraft parking fees, aircraft storage fees, concession sales, etc. from these potential aircraft operations. The estimated field length requirement was calculated using aircraft manufacturer takeoff requirements at sea level and 59 degrees Fahrenheit adjusted for HEG's elevation, temperature on the hottest day (92° F) based upon National Climatic Data Center information over a 10-year period, and clearance over a 50-foot tall obstacle. Furthermore, based upon a new FAA Rule published in June 2006, a mandatory 15 percent landing distance safety margin is required for all Part 91K (fractional), 125, 121 and 135 jet operations.

As a result, in order for HEG to capitalize on this potential demand, either a 500-foot or greater extension to an existing runway or construction of a new runway would be required. The installation of a precision instrument approach on one or more runway end(s) would allow the Airport to support aircraft during inclement weather conditions. This is evaluated in more detail within **Chapter 6**, *Airport Alternatives Analysis*.

Gliders and Other Potential Turf Runway Users

HEG is home to the North Florida Soaring Society, an airport glider organization. According to airport management, 2,700 annual operations in 2006 were attributed to glider aircraft representing approximately 4 percent of total operations. Based upon forecast operations and fleet mix and the airport's current configuration, approximately 4,156 operations are likely to be attributed to glider activity in 2025.

Both older GA aircraft, such as warbirds, tail draggers and glider aircraft use turf runways since they decrease the amount of wear on the aircraft by providing a softer landing surface. Further, a turf runway can also be used by smaller, lighter powered aircraft when necessary. Since HEG is promoted as Jacksonville’s premier general aviation and sport flying airport, a turf runway may attract additional operations. Thus, at a minimum cost, the Airport could reap a variety of benefits associated with GA development including aircraft storage, hangar homes, etc. The development of a turf runway will also limit gliders from using Runways 7 and 25 and eliminate damage to runway and taxiway lighting as a result of low wing strikes by glider aircraft. Based upon discussions with existing and potential aircraft tenants and other GA users, a turf runway at HEG would be welcomed.

Turf runway alternative development is provided in Chapter 5, Airport Alternatives Analysis. As part of the analysis, preliminary cost estimates, operational benefits and revenue potential are identified. Thus, based upon successes at other airports and demand by current users at HEG, JAA will consider the cost and revenue potential associated with installing a turf runway *at HEG*. However, prior to design and construction, a cost-benefit analysis should be performed to identify potential on-airport and off-airport benefits related to the turf runway development.

Small Aircraft Transportation System (SATS)

According to research supported by the Federal Aviation Administration (FAA) and National Aeronautics and Space Administration (NASA), a significant need for a small aircraft transportation system currently exists. The Nation’s 30 major airports are overwhelmed with increased air traffic, thus leading to frequent delays and cancellations. The SATS system would utilize the over 5,000 small airports already in place across the country and would allow air service to smaller communities.

Very light jet aircraft (VLJ) provide another source of potential demand at HEG. These high-performance aircraft, however, require less takeoff field length than traditional turbine aircraft and are far quieter. As a result, aircraft demand associated with smaller GA aircraft and VLJ aircraft could be met on an optimal runway field length of approximately 3,500 feet. This demand can be accommodated by the Airport at its current runway length; however, any improvements to runway length would provide the airport greater flexibility in accommodating both the existing and future fleet mix. It is anticipated that the VLJs will come on line in the within the year while the SATS navigational program will be fully operational in the next 5 to 10 years.

ANNUAL AIRCRAFT DELAY

The average anticipated delay is based upon a ratio of the forecasted demand to the calculated ASV. This ratio is used as a guide for planning future airfield improvements. The FAA acknowledges in the *Capacity* AC that the level of delay that is acceptable to a particular airport may differ from the level deemed acceptable at a similar airport. It is important to note that it is not only the time delay that determines acceptability, but also the frequency of these delays.

Several methods exist for estimating anticipated delay levels. One method involves using a variety of charts in the *Capacity* AC to estimate the average delay per aircraft based upon the ratio of annual demand to ASV. This delay per aircraft would then be used to calculate the annual delay for all operations. Another method utilizes software developed by the FAA (*Airport Design Software*, *Version 4.2d*) to determine the projected delay values. For the efforts of this study after consulting with airport management and the type of operations that occur at HEG, delay is not considered a significant factor in the development of the airfield. Through 2025, the average delay per aircraft and total annual delay variables do not indicate that airport users will experience significant delays. It should be noted that this does not imply capacity related delays will not occur during times of peak activity.

SUMMARY OF AIRFIELD CAPACITY ANALYSIS

In estimating the capacity of the existing HEG operational areas, the primary elements of airfield capacity were examined to determine the Airport's ability to accommodate anticipated levels of aviation activity. The results indicate that:

- Airspace in the vicinity of the Airport does have limitations for additional instrument approach procedures, but will likely accommodate future aviation activity through coordination with local authorities.
- Additional IFR approach capabilities in a southeast-northwest orientation may be required to reduce existing approach minimums and improve IFR capacity.
- Runway orientation is adequate, based on existing and historical wind characteristics.

A summary of these results is given in **Table 4-10**. This analysis has shown that planning for an increase in airfield capacity based upon annual service volume is not required until demand approaches 60 percent. However, based upon the type and number of aircraft currently and expected to use the airfield over the twenty-year planning period, airfield facility improvements are justified. Based upon FAA Southern Region Guidance (as provided in Appendix C of this report) and Advisory Circular 150/5325-4A, Runway Length Requirements for Airport Design, the required runway length should be based upon the critical aircraft or group of aircraft expected to use the airport on a regular basis (approximately 500 operations annually). Therefore, based upon the FAA Takeoff and Landing

Requirements adjusted for elevation, temperature, runway slope and wet pavement conditions, the optimal length for Category B and C Business Jets is between 4,500 and 5,500 feet.

In addition, enhancements to the airfield that will improve safety, access, as well as airport function are addressed in the following section. It should be noted that if aviation activity exceeds that of the approved forecast, the need for airfield capacity and/or operational enhancements may be required. Facility improvements to address this potential shortfall, which could include additional taxiways or a new runway, are addressed in the next steps of this study. The following section, *Facility Requirements*, delineates the various facilities required to properly accommodate future operations levels. That information, in addition to the capacity analysis, provides the basis for formulating the alternative development scenarios for the airport, while ensuring that the new recommended development plan adequately accommodates long-term aviation requirements.

TABLE 4-10
SUMMARY OF AIRFIELD CAPACITY ANALYSIS

	2005	2010	2015	2020	2025
Hourly Runway Capacity					
VFR Capacity Base (Operations/Hour)	158	158	158	158	158
IFR Capacity Base (Operations/Hour)	59	59	59	59	59
Weighted Hourly Capacity	116	116	116	116	116
Annual Airfield Capacity					
Annual Operations	65,300	68,958	72,828	76,921	81,002
Annual Service Volume	204,128	204,128	204,128	204,128	204,128
Capacity Level	31.99%	33.78%	35.68%	37.68%	39.68%
Average Delay per Aircraft (Minutes)					
High	0	0	0	0	0
Low	0	0	0	0	0
Total Annual Operational Delay (Hours)					
High	0	0	0	0	0
Low	0	0	0	0	0

Source: The LPA Group, Incorporated. 2005

Capacity and demand requirements were determined for essentially all aspects of HEG's operations. These calculations, which are based on various components, should be regarded as generalized planning tools, which assume attainment of forecast levels as described in Chapter 3 as well as demand associated with various types of general aviation operations.

Should the forecasts prove conservative, proposed developments recommended as a result of the demand/capacity analysis should be advanced in schedule. Likewise, if traffic growth materializes at a slower rate than forecast, deferral of expansion would be prudent.

FACILITY REQUIREMENTS

During the facilities requirements phase of the master plan process, the major focal point is a comparison of the projected demand at HEG to the capacity of existing facilities to determine projected shortfalls. Doing so allows the airport to respond appropriately as demand grows over the 20 years covered in this study. Future facility improvements should not be driven by reaching the timeframe identified in the aviation forecasts, but rather by the actualization of the forecasted demand. Thus, future developments should not be undertaken until a certain demand level is reached. Doing so allows airport management to make the best use of their available limited resources.

Another focus of this facility requirements analysis is related to the various federal and state standards to which airports must comply. Many of these standards were developed to address safety and security issues so that aircraft can operate at the highest level of safety. Thus, as a part of this analysis, a review of existing facilities was completed to determine areas in which compliance shortfalls exist. Additionally, changes in any standard related to the projected change in aircraft fleet mix or other planned improvements were identified so that future development does not preclude another improvement at a later date. For example, the placement of aircraft storage hangars should consider not only the existing, but also the future, runway approach minimums to avoid penetration into the planned approach surfaces. Facility shortfalls were identified using a variety of sources, with the main source being the current version of Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13, *Airport Design*. Furthermore, additional improvements were identified upon the physical inspection of facilities during the inventory phase of this project. The existing facilities were compared with these standards, and facilities not in compliance are subsequently identified and discussed.

Furthermore, changes in aviation activity can create additional facility needs. As discussed in the Aviation Forecasts section of this report, HEG is expected to experience growth in both the number of based aircraft and the annual level of aircraft operations, as well as changes in the proportion of ultralight aircraft relative to other, larger aircraft. Over the 20-year planning period, the airport is projected to see an approximate 31 percent increase in based aircraft and almost 25 percent growth in operations. Discussion of the pertinent improvements related to these issues occurs throughout this chapter.

Yet, another factor in developing these facility requirements is the consideration of the ultimate development of HEG even looking past the 20-year planning period. This was needed to preserve areas for future airport development and to encourage local authorities to consider the ultimate development expected at HEG when making decisions regarding local land use. This is critical since land use around an airport does not remain stagnant and many airports, including HEG, are faced with a limited expansion capability due to encroaching residential developments. In some cases, this has been avoided by properly protecting future airport development needs through the planning process, which is one goal of this study.

The following discussion provides a systematic review of current and future conditions at HEG, upon which a development program was shaped. Where appropriate, future requirements were identified at five-year intervals (milestone years). The information provided by this facility requirements analysis was incorporated into the formulation of future airport development alternatives, which is the focus of the next chapter. Thus, detailed solutions to the identified shortfalls are not the focus of this present discussion; however, when appropriate, this discussion does highlight potential ways in which the need can be met.

Airport Role and Service Level

HEG is included in the National Plan of Integrated Airport System (NPIAS), which is published by the U.S. Department of Transportation. In the NPIAS, the FAA establishes the role of those public airports defined as essential to meet the needs of civil aviation and to support the Department of Defense and Postal Service. Each airport's role is identified as one of five basic service levels: Commercial Service-Primary, Commercial Service – Non-Primary, Reliever, Transport, and General Aviation (GA). These levels describe the type of service that the airport is expected to provide to the community during the NPIAS five-year planning period. It also represents the funding categories set up by Congress to assist in airport development. HEG is categorized as a General Aviation (GA) Reliever Airport, based on data collected and transmitted to Congress by the Secretary of Transportation for the 2007-2011 planning period, the most recent edition of the NPIAS.

In addition to its role as a GA reliever airport within the Jacksonville metropolitan statistical area (MSA), HEG is also identified within the Jacksonville Aviation System as a GA recreational and sport flying airport. Based upon discussions with Jacksonville Aviation Authority (JAA), it is anticipated that its role within the JAA system will continue throughout the 20-year planning period. The assertion that HEG will continue to attract this kind of activity determined the facility needs for the airport during the short and long-term planning horizons. As previously established in the capacity analysis section of this chapter, the airport's specific requirements focus primarily on the development of GA facilities to accommodate anticipated demand at HEG.

AIRFIELD FACILITIES REQUIREMENTS

Runway Requirements

As the primary airfield component, the available runway(s) should meet the necessary criteria for those aircraft operating at the airport throughout the planning period. Based upon AC 150/5300-13, *Airport Design*, and AC 150/5325-4A, *Runway Length Requirements for Airport Design*, runway length and separation requirements were evaluated based upon projected operations and critical aircraft. Prior to discussing the outcome of the runway requirements analysis, it is important to define several safety-related standards. The goal of the following defined areas is to provide the safest operating environment for aircraft operators and the surrounding community:

- **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 undershoot, 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 10**, *Airport Design*. Airports are required to maintain control of each runway's RPZ. Such control includes keeping the area clear of incompatible objects and activities. This control is much easier to achieve and maintain through the acquisition of sufficient property interests in the RPZs.

In the past, the FAA would allow airports to have modifications to these standards. However, due to recent incidents, airports must adhere to these safety clearance and grading standards in order to obtain funding. In fact, several years ago, the FAA undertook a national program to bring all RSAs into compliance with the published standards. At HEG, the dimensions of these runway safety areas are quite different from those that would be required for an airfield that accommodates larger aircraft operations. The land that surrounds the extended runway centerlines adequately provides for sufficient areas of clearance should an aircraft be involved in a runway undershoot, overshoot, or excursion.

Configuration

As previously mentioned in **Chapter 2**, *Existing Conditions*, the two runways at HEG are oriented in an offset "open-v" configuration. As a result, the runway protection zone on the arrival end of Runway 11 extends over and above Runway 7-25, a portion of Taxiway A, and out into an open field adjacent to the FBO apron. Although the runways do not cross, this overlapping arrangement of the RPZ inhibits runway operational independency.

A review of the wind coverage percentages at HEG, previously presented in **Table 2-2**, show that Runway 7-25 alone meets the required 95 percent coverage for crosswinds of 10.5, 13, 16, and 20 knots, for any weather condition. This assessment applies for all-weather, visual, and instrument conditions. As such, if Runway 7-25, which is considered the primary runway, were the only option available at HEG, aircraft falling within an ARC classification of A-I through B-II could safely operate 100 percent of the time. These aircraft types constitute the majority of the based aircraft fleet and operate routinely at the airport.

However, although the data dictates that the primary runway is sufficient to provide coverage during all weather conditions, the functional use of 11-29 will be evaluated in the future development of the airfield. For this analysis, based upon forecast increases in operational activity, consideration was given to the use of Runway 11-29 throughout the planning horizon of this study.

As previously assessed in **Chapter 2**, *Existing Conditions*, the wind coverage crosswind component compared to aircraft crosswind capability is a key component of runway development. For HEG, wind coverage for the 10.5-knot and 13-knot crosswind component is summarized in **Table 4-11** by weather condition.

TABLE 4-11
WIND COVERAGE PERCENTAGES

Airfield Configuration	**Crosswind Component**			
	10.5-knots (12 mph)	**13-knots (15 mph)**	**16-knots (18 mph)**	**20-knots (23 mph)**
All-Weather Conditions				
Runway 7-25	96.99%	98.67%	99.77%	99.91%
Runway 11-29	95.71%	97.84%	99.59%	99.91%
All Runways	98.73%	99.59%	99.93%	99.99%
VFR Conditions ***(Ceiling > 1000'; Visibility > 3.0 statute mile)***				
Runway 7-25	97.08%	98.70%	99.78%	99.97%
Runway 11-29	95.92%	97.99%	99.61%	99.92%
All Runways	98.87%	99.64%	99.94%	99.99%
IFR Conditions ***(Ceiling between 250' and 1000'; Visibility between 0.75 and 3.0 statute mile)***				
Runway 7-25	96.25%	98.35%	99.68%	99.95%
Runway 11-29	93.97%	96.55%	99.42%	99.89%
All Runways	97.41%	99.11%	99.85%	99.99%

Source: National Climatic Data Center, 1989-1998, Cecil Field, and The LPA Group Incorporated, 2005

Runway Pavement Condition

As stated in **Chapter 2**, Herlong Airport was constructed by the U.S. Navy and U.S. Army Air Corps in 1940 as a pilot training facility for World War II pilots. Based upon physical observations and the Pavement Rating Matrix, **Figure 4-4**, both Runways 7-25 and 11-29 are in fair condition since both runways will require minor patching and/or surface overlay within the next five years. Limited historical pavement data was available, but according to available documentation provided by JAA:

- 1997- Runways 7-25 and 11-29 were resealed;
- 1997 - Approximately 2000 feet of runway pavement on Runway 7-25 was milled and overlaid;
- 1983 - Runway 11-29 was overlaid and remarked;
- 1980-81- Runway 7-25 was overlaid and remarked; and
- 1980-81 - Two stabilized 100 x 500 foot overruns were constructed.

Further, there is no record of any improvements to the closed runways which show severe and widespread cracking and pavement distortion. Therefore, according to the FDOT Pavement Rating Matrix, this pavement has failed and will require reconstruction. Since limited pavement construction and rehabilitation data is available, it is recommended that JAA authorize a pavement condition report and create a pavement status database in order to determine when pavement rehabilitation and overlays may be required at HEG.

Turf Runway

As shown in **Table 4-11**, 74 percent of airport operations, including powered and non-powered aircraft, use Runway 7-25. At the time of this writing, non-powered aircraft either use Runway 7-25 or the parallel grassy area between Taxiway A and Runway 7-25. Based upon observations and data obtained from airport management, average non-powered aircraft operations at HEG which use Runway 7-25 represent approximately 25 percent of local operations or 8,700 operations per year. Therefore, it is recommended in order to de-conflict powered and non-powered operations on Runway 7-25 as well as eliminate the use of the grassy area located between Runway 7-25 and Taxiway A that a turf runway be developed.

The anticipated increase in the number of based aircraft at HEG categorized as ultralight or otherwise dictates that the current runway operating environment may not accommodate these flight activities throughout the twenty year planning period. Further, structurally and instrumentally, ultralight and experimental aircraft do not require precision approach or otherwise instrumentally-equipped runways to operate. Moreover, a large amount of these aircraft operate only during VFR weather and most are not outfitted with the advanced instrumentation needed for operation on a paved runway environment during inclement weather. Slower moving and less heavy, these aircraft typically prefer the use of a grass strip as it minimizes aircraft tire abrasion during touchdown. Aircraft operational safety is the main purpose for recommending a turf runway, thus imparting a clear separation of aircraft activity on the airfield to achieve this goal.

A turf runway that provides exclusive access to gliders, ultra lights, and small experimental aircraft could alleviate ultralight activity from both Runways 7-25 and 11-29. This proposal seeks to isolate these aircraft since they are not required to provide radio confirmation of their position and are typically slower moving compared to traditional aircraft. Further, the separation of aircraft is likely to increase capacity on Runway 7-25.

The construction of a Turf runway requires the same elements as a traditional paved runway surface including grading, orientation, dimensional and separation requirements, and safety guidance criteria. Turf runway lengths and configurations are discussed in more detail in **Chapter 6**, *Airport Alternatives*.

It is important to segregate this type of aircraft activity at HEG since non-powered or ultralight aircraft are not required to comply with the same aircraft instrumentation and/or flight operational requirements as most powered aircraft due to their weight classification and absence of FAA certification. Discriminating between aircraft type and operational capability will ensure that safety, both on the ground and in the air, can be maximized by isolating those aircraft that may interfere with the regulated/procedural nature of heavier, certificated aircraft.

Taxiway Requirements

A number of taxiways exist at HEG as identified during the inventory phase of this study. These taxiways serve as routes for aircraft to maneuver to and from various portions of the airfield. FAA taxiway design standards are determined by the aircraft wingspan and wheel configurations for the critical aircraft routinely using the taxiway. These standards allow an appropriate safety margin beyond the maximum wingspan for the Airplane Design Group. Each of the following sections discusses the major taxiways and their related connector taxiways available for use at HEG. It should be noted that other taxiway improvements are identified in the alternatives analysis to provide appropriate access to proposed development areas.

As previously discussed in **Chapter 2**, *Existing Conditions*, the taxiway system connecting the apron and the runways at HEG are sufficient in their capacity to minimize delay and maximize access. However, a main initiative of this chapter is to recommend the development of the southern portion of the airfield and integrate the two closed runways into the taxiway system. Regarding future development within the vicinity of these pavement areas, it is suggested that the benefit of existing structures be utilized to expand the functional areas of the airport and to make use of the land available within HEG's property boundary. In doing so, the inactive runway pavement can provide sufficient space and access to the development of a southern apron and turf runway for glider, ultralight, and experimental aircraft as well as potential corporate development.

Taxiway A

Taxiway A is the parallel taxiway located to the north side of Runway 7-25. Taxiway A was constructed to provide access to the north design apron and Runway 7-25, and, therefore, should be designed and constructed to meet the existing and future critical aircraft requirements. Taxiway A complies and in some cases exceeds the FAA published design criteria for a B-II aircraft. Suggested modifications include surface rehabilitation and maintenance repair to protect from surface deterioration. As the primary taxiway for Runway 7-25, projects associated with Taxiway A, including pavement sealing and resurfacing, are eligible for federal funding.

Taxiway B

Taxiway B is a stub taxiway connecting Runway 7-25 with parallel Taxiway A. Other than the Taxiway A stub taxiways located at the thresholds of Runways 7 and 25, Taxiway B provides the only other exit taxiway from Runway 7-25 to the FBO transient apron. Taxiway B extends past Runway 7-25 to provide access to Runway 11-29 and Taxiway D, and it complies with all dimensional standards serving B-II aircraft. Suggested modifications for Taxiway B include surface rehabilitation and maintenance repair to protect from further surface deterioration.

Taxiway C

Taxiway C is a connector taxiway that directly connects Runways 7-25 and 11-29. Taxiway C has a width of 50 feet, exceeding the minimum requirement to support the safe movement of B-II aircraft. Taxiway C complies with dimensional standards stipulated by FAA AC 150/5300-13, *Airport Design*, and serves as a point of egress from Runway 11-29.

It should be noted that Taxiway C does not connect to the north GA apron area. Therefore, aircraft landing on Runway 29 and exiting via Taxiway C will have to clear Runway 7-25 traffic to access either the terminal apron or FBO Apron via Taxiways A-1 or B. However, this requires aircraft to taxi along Runway 7-25. As a result, it is recommended that the portion of Taxiway C which connects Runway 7-25 to Runway 11-29 be closed.

Taxiway D

Taxiway D is a parallel taxiway to Runway 11-29 and connects Taxiway B, Taxiway C, and serves as an access point to the closed runway pavement to the south of the airfield. The width of Taxiway D is 40 feet, which provides sufficient wing-tip clearance to the type of aircraft using HEG. Runway centerline to taxiway centerline separation is 526 feet, which exceeds the minimum requirement for taxiway separation clearance for airports serving B-II aircraft. Suggested modifications for Taxiway D include surface rehabilitation and maintenance repair to protect from further surface deterioration.

Taxiway E

Taxiway E provides access from Runway 7-25 to the southwest closed runway. In order to provide access to general aviation development to the northwest of the airfield, JAA intended to rehabilitate the existing pavement and extend Taxiway E to connect with the existing Taxiway A. The existing width and the proposed extension of Taxiway E is 40 feet, which will serve B-II aircraft.

At the time of this writing, the extension of Taxiway E was delayed as a result of issues relating to ultra light and glider aircraft. Since the majority of non-powered aircraft land in the grassy area between Runway 7-25 and Taxiway A, the extension of Taxiway E with or without lighting would impact their operations. It is recommended that a Turf Runway be constructed to alleviate this issue and allow for the extension of Taxiway E to coincide with North GA development.

Future Taxiways

As noted previously, the inactive runways to the south of the operational runways provide access to the south portion of the airfield. The width of these pavement areas is approximately 150 feet. It is suggested that these pavement areas be resurfaced to a width of 35 feet to accommodate existing and anticipated development on the south side of the airfield. Small hangars already exist adjacent to one closed runway, thereby supporting the reuse of the closed runways as taxiways. In addition, paved taxi areas should be equipped with MITLs to provide better visual guidance to pilots at night and during poor visibility conditions.

Taxiway Pavement Condition

The condition of the taxiway pavement at HEG varies from taxiway to taxiway. A forthcoming study by the Florida Department of Transportation (FDOT) will evaluate airfield pavements and conditions for all airports within the State of Florida. This effort details the magnitude of deterioration or wear of the pavement at HEG as well as other airports around the state. Until that report is published, the condition of the airport's pavement structures was identified via visual inspection as denoted in Chapter 2, *Existing Conditions, and based upon historical pavement data provided by JAA*. Most taxiway structures at HEG are in fair to good condition. According to **FAA AC 150/5320-17**, a method of pavement rating and surface condition is established that characterizes the surface rating scales into numerical form, with a rating of 5 as "excellent" and a rating of 1 as "failed". This scale is shown in **Figure 4-5**. As previously cited, most taxiway pavement at HEG is either noted with a rating of 3 or 4, which correspond to "good" and "fair", respectively.

FIGURE 4-5
PAVEMENT RATING MATRIX

Surface rating	*Visible distress**	*General condition/ treatment measures*
5 Excellent	None, or initial thermal cracks, all narrow (less than 1/8")	New pavement less than 5 years old. No maintenance or isolated crack sealing required.
4 Good	Additional thermal cracking. Cracks generally spaced more than 50' apart. Less than 10% of cracks and joints need sealing. Minimal or slight raveling. No distortion. Patches in good condition.	Recent sealcoat or pavement over 5 years old. Seal open cracks or joints and replace sealant where needed.
3 Fair	Moderate raveling. Thermal cracks and joints generally spaced less than 50' apart. Crack sealing or repair of sealant needed on 10%-25% of cracks or joints. Edge cracks along 10% or less of pavement edges. Block crack pattern with cracks 6'-10' apart. Isolated alligator cracking and poor patches. Minor distortion or crack settlement less than 1".	Seal open cracks and joints. Replace failed sealant. Apply new surface treatment or thin overlay. Minor patching and joint repair.
2 Poor	Frequent thermal cracks. Wide cracks and joints with raveling in cracks. Deterioration along more than 25% of cracks. Edge cracks on up to 25% of pavement edges. Block cracks spaced 5' apart or less. Alligator cracking or poor patches cover up to 20% of surface area. Distortion or settlement 1"-2".	Needs significant crack sealing plus patching and repair on up to 25% of pavement surface. Overlay entire area with structural overlay.
1 Failed	Widespread, severe cracking with raveling and deterioration. Alligator cracking and potholes over 20% of the area. Distortion over 2".	Condition may be limiting service. Needs reconstruction.

Source: Pavement Surface Evaluation and Rating (PASER) Manual, FAA AC 150/5320-17, Airfield Pavement Surface Evaluation and Rating Manuals, 2005.

According to historical data, maintenance and pavement improvements from 1980 through 1997 include the following:

- 1980-81 - 40 x 4,262 foot overlay of Taxiway A
- 1983 - Overlay of Taxiway D and portion of Taxiway C
- 1996 - North Apron T-Hangar Taxi lane Construction
- 1997 - Overlay of Taxiways A, B and D, and
- 1999 - Construction of runway holding pads on Taxiways A, B and C

Taxiway pavements at HEG have signs of visible distress, and the closed runways need significant maintenance and re-surfacing. Raveling, a progressive loss of pavement material from the surface downward caused by stripping of the bituminous film from the aggregate, and thermal cracking, caused by fluctuations in temperature and the hardening of aging asphalt, are the main types of surface deterioration. It is recommended that taxiway pavement designated as “fair” be sealed to replace failed sealant or resurfaced to repair open cracks and joints. Pavement condition identified as “good” generally requires minor sealing maintenance to repair.

As a general guideline, taxiway pavement should be resurfaced every ten years, depending on relative condition and degree to which the pavement inhibits the safe and expeditious movement of aircraft across the airfield. Most pavement structure failings are likely caused by the variation in temperature during the seasons, as well as poor design and drainage issues caused by rain.

Airfield Lighting

Both runways at the Airport have Medium Intensity Runway Lights (MIRLs) and threshold lighting. Taxiway A is equipped with Medium Intensity Taxiway Lights (MITLs) which were installed in 1980, whereas Taxiways B, C, and D are not illuminated. Taxiway B, a stub taxiway, and Taxiway C, a connector taxiway, do not require this type of illumination system; however, since a dual runway environment is considered in the evaluation of the airfield, it is suggested that Taxiway D—a full-length parallel taxiway adjacent to Runway 11-29—should include a MITL system to provide better guidance for pilots and offer increased visibility during night conditions. Although Runway 11-29 is considered a crosswind runway, Runway 7-25 provides over 95 percent wind coverage. Therefore, FAA will not participate on any work associated with Runway 11-29.

A recurring problem for HEG is the effect of thunderstorm activity, particularly lightning, that has repeatedly short-circuited the airfield's PAPI equipment. The PAPI system was installed within the last 3 to 5 years to replace the older VASI system. At the time of this writing, JAA Engineering and the lighting manufacturer have been trying to resolve this problem. It appears that the system becomes overloaded during thunderstorms. As of yet, this problem has not been resolved. Since airfield lighting is critical to the use of a runway especially during low visibility conditions, a prompt resolution of this issue is recommended and expected in the short-term.

Proposed T-hangar development as outlined in the last master plan update is hampered by the current location of the electrical vault. The vault is located within the taxi lane safety area associated with the new T-hangar development. Therefore, the vault will need to be relocated to another location on the airfield. JAA is assessing alternatives to address this issue, and potential location and anticipated costs associated with the potential electrical vault relocation were evaluated in **Chapter 5**, *Alternatives Analysis*, and **Chapter 7**, *Implementation Plan*.

Another foremost issue regarding airfield lighting is the ability to provide power to the southern portion of the airfield. This master plan update proposes that the closed runways south of the existing runway structures be transformed into taxiways and equipped with the appropriate lighting to facilitate the safe movement of aircraft to this portion of the airfield. Problematic is the unresolved issue of connecting lines of power via underground conduits from the remote electrical vault located adjacent to the apron north of Runway 7-25.

Airfield Signage

The Airport is equipped with runway and taxiway signage; the purpose of which is to provide directional guidance to pilots on the airfield. Required airfield signage based upon AC 150/5340-18D includes:

- Holding Position Signs
- Taxiway Location Signs
- Exit signs for both runway directions and at each runway threshold
- Direction Signs
- Location Signs, and
- Outbound destination signs on either end of the Runway.

The airport is equipped with some signage, including three (3) taxiway guidance signs that were installed adjacent to Runway 7-25 in 1981, but requires additional taxiway signage, direction signs, and outbound destinations signs on both Runways 7-25 and 11-29. However, due to lightning and aircraft strikes in addition to general deterioration, existing signage is limited. Therefore, based upon the requirements outlined in AC 150/5340 and anticipated demand, a new signage plan, including additional signage and improvements to existing airfield signage is recommended in conjunction with any runway or taxiway improvements.

In addition to location and directional signage, distance remaining signage should be considered for installation to the designated primary runway, 7-25. While this may not be a long runway, it would provide pilots with a better awareness of the remaining runway length available. Also, throughout the planning period, existing signage should be maintained in proper working order. Additionally, as other airfield pavement projects are conducted, new signage should be installed and existing signage should be upgraded to meet FAA design criteria. The types and number of new signs that are likely to be required during the planning period depend upon the selected development alternatives.

It is important to note, however, that federal funding will likely be available for the airfield signage plan and signage improvement related to Runway 7-25. However, it is anticipated that federal participation on projects related to Runway 11-29 will not occur.

Pavement Markings

Runway 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 approach phase of flight. There are three standard sets of makings 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 strips, and side stripes indicating the extent of the full strength pavement.

Depending on the type of aircraft activity and physical characteristics of 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 enhance safety. Runway pavement markings are painted white and taxiway pavement is painted yellow. The FAA provides guidance for pavement marking in **AC 150/5340-1J**.

Only the 25 end of Runway 7-25 is marked as a non-precision runway. An inspection of Runway 7-25 revealed that the runway markings are in good condition. However, periodic re-marking should be considered to enhance the safety of aircraft movement during low visibility conditions. Runway 11-29 is marked as a visual runway with basic markings. An inspection revealed that the Runway 11-29 marking is in good condition, but future re-marking should be incorporated into the planning horizon.

The inactive runway pavement is in critical need of resurfacing and re-marking to bring the pavements up to standards and to remark the centerline and edge of pavement as outlined in **AC 150/5300-13**. Periodic re-marking of all airfield markings should be conducted. Pavement markings are critical to provide visual guidance to aprons, runways, and other areas of the airport. Deterioration of these markings can cause conflicts during inclement weather and can create general confusion to pilots who navigate on the ground. Even more critical are the taxiway and runway hold bar markings that tell pilots where to stop to avoid runway incursions or to remain clear of NAVAID critical areas. While not required for an airport the size of HEG, runway hold bar markings are highly recommended especially in conjunction with the possible installation of a precision approach.

Weather Instruments

Weather instruments provide invaluable meteorological data for pilots operating at the airport. There are two weather instruments at HEG: a windsock and an AWOS.

Windsock

A windsock or wind cone visually provides surface wind direction to pilots and must be visible from all runway ends. Further, wind direction indicators must be lighted, and should include a segmented circle to denote the traffic pattern to each runway since the airport is not equipped with an ATCT.

At HEG, the wind cone and segmented circle, which were re-cabled, wired and lighted in 1980, are located in the midfield, and is visible from all runway thresholds. However, if an extension of either Runway 7-25 or 11-29 is warranted, then relocation of the wind cone and segmented circle will be required.

Automated Weather Observation System (AWOS)

Automated Weather Observation System (AWOS) is a suite of sensors, which measures, collects and broadcasts weather data to help meteorologists, pilots and flight dispatchers prepare and monitor weather forecasts, plan flight routes, and provide necessary information for correct takeoffs and landings. The AWOS at HEG, which was installed in 1981, automatically broadcasts weather information using 119.275 MHZ. AWOS units provide a minute-to-minute updates to pilots by VHF radio or non-directional beacon. Each hour, data is available to off-site users by means of long-line telephone communication or satellite uplink, which include precipitation, visibility, barometric pressure, wind speed and direction and temperature. No changes are currently recommended for this equipment.

Automated Surface Observing System (ASOS)

In addition to the AWOS currently located at HEG, Pilots may use ASOS systems currently located at Cecil Field (VQQ), Jacksonville International (JAX) and Craig Municipal (CRG) airports. The ASOS System is sponsored by the FAA, Department of Defense (DOD) and National Weather Service (NWS). An ASOS provides weather observations including: temperature, dew point, wind, altimeter setting, visibility, sky condition, and precipitation, and provide pilot and other users critical weather data. The ASOS routinely provides computer generated voice data directly to aircraft within the vicinity of the airport. The overall purpose of the ASOS system is to improve the safety and efficiency of aviation operations.

GENERAL AVIATION REQUIREMENTS

The majority of activity at HEG now and throughout the planning period is comprised of general aviation (GA) operations. As such, a variety of facilities should be planned to meet the projected GA demand as outlined in the Aviation Forecasts. This section addresses the needs of both based and transient users related to aircraft storage, fuel facilities, terminal space, and automobile parking demand.

Hangar Demand

Based aircraft are routinely stored at airports in a variety of hangar types. The type of hangar used is determined by aircraft size and type as well as by existing availability. Currently, the following types of hangars are in general use at HEG:

- *T-hangar units* – a full-enclosed building having individual stalls, each capable of storing one aircraft, typically a single-engine or a light multi-engine aircraft. Variations of this hangar type include dome hangars.

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

- *Conventional 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.

A review of the current hangars available at HEG revealed that there are: 72 T-hangars, two bulk storage facilities, and one 26,493 SF maintenance facility. T-hangar facilities are located in two distinct portions of the airfield. Approximately 48 T-hangar units are co-located within three buildings just north of the east apron. An additional 24 units are contained within two structures that are positioned west of the west apron. At the time of this writing, 14 additional T-hangars are being constructed west of the 24 units discussed above. **Table 4-12,** *Based Aircraft Demand***,** outlines the based aircraft fleet mix for HEG through the year 2025.

TABLE 4-12
BASED AIRCRAFT DEMAND

Year	Single-Engine	Multi-Engine	Turbine/Jet	Rotor	VLJ	Other*	Total
Base year							
2005	128	15	5	4	0	18	170
Forecast							
2010	130	15	6	4	0	24	179
2015	131	15	7	4	1	33	190
2020	133	15	9	5	2	43	205
2025	134	14	11	5	4	60	224

**Note: "Other" includes light sport aircraft, ultra lights, blimps, gliders, etc.*
Source: THE LPA GROUP INCORPORATED, 2006

Based upon existing demand for hangar space within the Jacksonville Aviation System, it is anticipated that by the year 2025 75 percent of based piston aircraft and 100 percent of turboprop, turbojet and rotorcraft will reside in aircraft storage facilities. Currently gliders, tail draggers, ultra lights and other non-powered aircraft are not stored in any existing hangar facilities. However, based upon discussions with the North Florida Glider Club as well as interest from several blimp operators, it is anticipated that at least 50 percent of "Other" aircraft will require some sort of aircraft shelter or storage facility on the airport.

Hangar and apron facility requirements were determined based upon the number and size of aircraft based at the airport. Representative general aviation aircraft used in this analysis were:

- Piston engine aircraft (Design Group I) – Beech Baron (Wingspan = 38 feet, Length = 30 Feet)
- Turboprop and Jet Aircraft (Design Group II) – Grumman Gulfstream I (Wingspan = 78.3 feet, Length = 75.3 feet)

The methodology used to determine hangar space requirements is based upon the following assumptions:

- Each T-Hangar Unit accommodates one aircraft
- Each Conventional Hangar Unit accommodates three (3) aircraft
- Each Corporate Hangar Unit accommodates two (2) aircraft
- Approximately 70 percent of Single-Engine Aircraft are in T-Hangars
- Approximately 40 percent of Multi-Engine Aircraft are housed in T-Hangars
- 100 percent of based turbine, jet and rotorcraft are housed in conventional and corporate hangar facilities,
- 100 percent of VLJs will be housed in aircraft storage facilities with approximately 50% housed in corporate or conventional hangars and the remaining 50 percent housed in T-Hangars, and
- Approximately 50 percent of "Other" category aircraft, such as gliders, tail draggers, experimental aircraft and blimps will be housed in aircraft storage facilities. Based upon this assumption, blimps will be housed in a conventional hangar facility, experimental aircraft in T-Hangars, and gliders in shade hangars or other similar facilities.

TABLE 4-13
FORECAST PERCENT OF BASED AIRCRAFT DEMAND

	Hangars					
Aircraft Type	**Conventional**	**Corporate**	**T-Hangar**	**Shade Hangars**	**Apron**	**Total**
Jet	50%	50%	0%	0%	0%	100%
Multi-Engine	10%	50%	40%	0%	0%	100%
Single Engine	0%	0%	70%	0%	30%	100%
Helicopter	70%	20%	0%	0%	10%	100%
Very Light Jets	25%	25%	50%	0%	0%	100%
Other	4%	0%	21%	25%	50%	100%

Source: The LPA Group Incorporated, 2006

Applying the storage requirements for based aircraft to the forecast of based aircraft resulted in the following demand as shown in **Table 4-14**, *Hangar Storage Demand*, over the twenty-year planning period.

TABLE 4-14
HANGAR STORAGE DEMAND (2005-2025)

	Hangar Storage Demand					
Aircraft Type	**Conventional**	**Corporate**	**T-Hangar***	**Shade Hangars or Other Facilities**	**Apron**	**Total**
Year 2005						
Jet	3	2	0	0	0	5
Multi-Engine	1	8	6	0	0	15
Single Engine	0	0	90	0	38	128
Helicopter	3	1	0	0	0	4
Very Light Jets	0	0	0	0	0	0
Other	0	0	3	5	10	18
TOTAL 2005	**7**	**11**	**99**	**5**	**48**	**170**
Year 2010						
Jet	3	3	0	0	0	6
Multi-Engine	2	7	6	0	0	15
Single Engine	0	0	91	0	39	130
Helicopter	3	1	0	0	0	4
Very Light Jets	0	0	0	0	0	0
Other	1	0	5	6	12	24
TOTAL 2010	**9**	**11**	**102**	**6**	**51**	**179**
Year 2015						
Jet	3	3	0	0	0	6
Multi-Engine	1	8	6	0	0	15
Single Engine	0	0	92	0	39	131
Helicopter	3	1	0	0	0	4
Very Light Jets	0	1	0	0	0	1
Other	1	0	7	8	17	33
TOTAL 2015	**8**	**13**	**105**	**8**	**56**	**190**

Source: The LPA Group Incorporated, 2006

TABLE 4-14 (CON'T) HANGAR STORAGE DEMAND (2005-2025)						
	Hangar Storage Demand					
Aircraft Type	Conventional	Corporate	T-Hangar*	Shade Hangars or Other Facilities	Apron	Total
Year 2020						
Jet	4	3	0	0	0	7
Multi-Engine	1	8	6	0	0	15
Single Engine	0	0	93	0	40	133
Helicopter	2	1	0	0	1	4
Very Light Jets	1	1	0	0	0	2
Other	2	0	9	11	22	44
TOTAL 2020	**10**	**13**	**108**	**11**	**63**	**205**
Year 2025						
Jet	4	3	0	0	0	7
Multi-Engine	1	7	6	0	0	14
Single Engine	0	0	94	0	40	134
Helicopter	4	1	0	0	0	5
Very Light Jets	1	1	2	0	0	4
Other	2	0	13	15	30	60
TOTAL 2025	**12**	**12**	**115**	**15**	**70**	**224**

**Note: Herlong Airport currently has a T-Hangar Waiting List of 40 aircraft*
Source: The LPA Group Incorporated, 2006

Given anticipated growth in the micro or very light jet market, the need for additional hangar space is significant since demand trends indicate that hangar space is optimum for these types of aircraft.

Based upon anticipated based aircraft and associated fleet mix over the twenty-year planning period, additional hangar space, whether T-hangars, conventional, corporate or shade hangars, is required. Current aircraft storage limitations require interested parties to place their name on a waiting list until such time as either new facilities are constructed or vacated by an existing tenant. At the time of this writing, 40 people were on the HEG aircraft storage waiting list. Consequently lack of hangar facilities will inevitably lead to a stagnation of based aircraft growth.

Table 4-15, *Hangar Storage Requirements***,** highlights the required hangar space based upon forecast demand as determined by the method outlined previously and delineates the specific needs of T-hangar and conventional hangar space requirements to accommodate anticipated growth in hangar demand.

TABLE 4-15
HANGAR DEMAND (2005-2025)

	2005	2010	2015	2020	2025
Existing Conventional Hangars	2	2	2	2	2
Conventional Hangar Demand	2	3	3	4	4
(Shortage)/Surplus	**0**	**(1)**	**(1)**	**(2)**	**(2)**
Existing Corporate Hangars	0	0	0	0	0
Corporate Hangar Demand	6	6	6	6	6
(Shortage)/Surplus	**(6)**	**(6)**	**(6)**	**(6)**	**(6)**
Existing T-Hangars	72	100*	100*	100*	100*
T-Hangar Demand*	99	102	105	108	114
(Shortage)/Surplus	**(27)**	**(2)**	**(5)**	**(8)**	**(14)**
Existing Shade Hangars	0	0	0	0	0
Shade Hangar Demand	5	6	8	11	15
(Shortage)/Surplus	**(5)**	**(6)**	**(8)**	**(11)**	**(15)**

*Note: *Refers to the addition of T-Hangar facilities planned and under construction*
Source: The LPA Group Incorporated, 2006

Currently, 48 T-hangars located adjacent to the east apron and 24 T-hangars situated next to the west apron supply the needs of the single and multi-engine aircraft based on the airfield. However, at the time of this writing, JAA has finished constructing one of two 14-unit T-hangar facilities perpendicular to the to the west apron area. Construction of the other 14-unit T-hangar is planned for the near future. In the short-term, demand for T-hangar facilities are likely to continue since the Airport has an existing waiting list for aircraft storage facilities. However, in the mid- to long-term period, demand for aircraft storage, including conventional, corporate, T-hangar and shade hangar facilities, is anticipated to be based upon demand by new small aircraft, such as the Eclipse 3000, TBM 850, Cessna Mustang, etc. as well as the growth in the light sport aircraft market.

It should be noted that these numbers reflect information presented by the aviation activity forecast, but do not reflect the demand defined by the number of people on the HEG waiting list for hangar space. The numbers also neglect to represent the addition of larger, more sophisticated aircraft, which typically accompany commercial and corporate activities. It should also be noted that although corporate hangars do not currently exist at HEG, corporate hangars and additional conventional hangars would likely be used to meet the storage hangar requirements. However, consideration must be given to the number and size of aircraft stored in each hangar in order to provide adequate storage facilities.

Thus, based upon current demand for facilities as well as demand based upon forecast data, it is likely that the number of T-hangars required could be significantly greater than that predicted in **Table 4-15** based upon issues of space, funding availability, and demand surges. For planning purposes, the implementation of hangar development projects should be aligned with the actualization of demand rather than a particular time period.

Larger hangar needs at HEG were also considered based upon discussions with existing tenants, the existing and future fleet mix as well as recent changes in technology. At the time of this writing, there is already demand for conventional hangar facilities from some existing tenants. In addition, airport management has been approached by several parties who wish to construct conventional or corporate hangar facilities related to their operations. Thus, based upon this information and the data provided in **Table 4-15** approximately five conventional (two (2) additional to accommodate demand and three (3) based upon user interest) and six corporate hangar facilities are recommended to accommodate anticipated demand by the year 2025.

Hangar space demand is based upon anticipated changes in fleet mix based upon national and statewide trends. However, hangar space development should be planned to accommodate future contingencies that may occur within the Jacksonville Aviation System, including the increased use of HEG as a general aviation reliever facility and/or flight training facility. HEG is unique since it accommodates a mix of operations. Therefore, aircraft storage requirements must consider existing tenants and user demand while planning to accommodate potential contingencies or changes occurring within the Jacksonville Aviation System.

Aircraft Parking Apron

HEG has three aprons, but two are used primarily for based and itinerant aircraft parking. These two aprons located east and west of the Airport Terminal building have a total square footage of approximately 29,000 primarily utilized for aircraft parking. The FBO Apron located on the west side of the entrance road was initially constructed in 1980 and consists of 4,840 SY of pavement. The East apron, which is approximately 15,000 square yards (SY), was constructed in 1990 and is marked to accommodate a total of 53 aircraft tie-down parking positions. The West apron, which is approximately 14,000 SY, is marked to accommodate a total of 39 aircraft tie-downs. The third apron that is located south of the terminal facility has a total square footage of approximately 3,100 SF. This apron is used for the temporary parking of transient aircraft and can simultaneously accommodate an estimated 10 aircraft.

Located east of the airport police officer's residence is RAA, Inc. (Building 6). This tenant maintains an exclusive 1,200 SY of apron space that is located south of its hangar facility. Similarly, the Mercair facility has a small personal use apron of 3,000 SY associated with its hangar.

Based on current conditions, it is estimated that 35 percent of non-hangared based aircraft and one half of the busy-hour itinerant aircraft will require tie-down space at any one time. By applying this formula, approximately six (6) based aircraft and 21 itinerant aircraft currently require parking space for the year 2004. Forecasts of aircraft operations and parking demand are provided in Chapter 3 and 4, respectively.

Conventional and Corporate Hangar Apron

As part of continued hangar development, it is necessary for an airport to provide sufficient corporate and conventional hangar apron space for parking and maneuvering of aircraft around a hangar facility. According to **FAA AC 150/5300-13, Change 10**, conventional hangar apron area should equal the amount of storage space located within the hangar itself. Currently, HEG hosts approximately 21,820 square feet of conventional (bulk) hangar space, 26,493 square feet of maintenance hangar space, and 29,000 square yards of apron area which accommodates both based aircraft tie-downs and neighboring hangar facilities. As hangar needs increase, so does the need for more conventional apron area. Utilizing FAA guidance, each conventional hangar required 20,000 square feet (approximately 2,222 square yards) of apron and 10,000 square feet (approximately 1,111 square yards (SY)) of apron for each corporate hangar. **Table 4-16,** *Conventional and Corporate Hangar Apron Requirements***,** outlines estimated hangar apron demand anticipated for the twenty year planning period.

TABLE 4-16 CONVENTIONAL AND CORPORATE HANGAR APRON REQUIREMENTS (BASED UPON EXISTING AND ANTICIPATED DEMAND)					
Facilities	**2005**	**2010**	**2015**	**2020**	**2025**
Conventional Hangar Facilities (SY)					
Existing Conventional Hangars	2	2	2	2	2
Existing Conventional Hangar Apron (SY)	29,000	29,000	29,000	29,000	29,000
Additional Conventional Hangars Required*	**3**	**4**	**4**	**5**	**5**
Total Hangar Apron Required (SY)	35,666	37,888	37,888	40,110	40,110
Corporate Hangar Facilities (SY)					
Existing Corporate Hangars	0	0	0	0	0
Existing Corporate Hangar Apron (SY)	0	0	0	0	0
Additional Corporate Hangars Required	0	3	3	5	6
Additional Corporate Hangar Apron Required (SY)	0	3,333	3,333	5,555	6,666

**Note: Based upon storage demand and interest from existing and potential tenants*

New Apron space required per conventional hangar = 2,222 SY; Corporate hangar apron demand = 1,111 SY

Source: FAA AC 150/5300-13, Change 10 and The LPA Group Incorporated, 2006

The calculations show current conventional apron areas are inadequate to meet demand throughout the course of the planning period. However, it is important to remember that these calculations only consider raw numbers. Location and condition of the apron space is not factored into this equation. Site visits to HEG revealed inadequacies in the pavement condition and access to apron from some hangar facilities. Improvements are suggested in the following chapter.

Aircraft Tie-Down Apron

Since 75 percent of based aircraft are estimated to require hangar space in 2025, tie-downs should be planned to accommodate 25 percent of all based aircraft, and one-half of the busy-hour itinerant aircraft. The existing GA aircraft tie-down apron space available at HEG is approximately 32,100 square yards of which 3,100 is designated for transient aircraft adjacent to the terminal building and the remaining 29,000 SY is located on the East and West Ramps providing parking for both based and transient aircraft. Sizing criteria for tie-down positions vary according to aircraft size, including space for circulation and fueling. **FAA AC 150/5300-13** recommends 300 SY for based aircraft tie-downs and 360 SY for itinerant aircraft tie-downs. However, in order to assure flexibility for configuring tie-down areas, all tie-downs were sized around the Design Group II (Gulfstream I) sample aircraft.

It is important to mention that HEG does not officially designate apron areas for conventional, based aircraft tie-down, or transient tie-down apron. Much of the apron included in the tie-down totals is underutilized. The majority of transient aircraft park on the GA apron adjacent to the FBO terminal facilities. Combined, the east and west aprons can accommodate parking for approximately 81 aircraft, whereas the FBO apron can accommodate 14 aircraft at any given time. Currently, there are, in total, 95 tie-downs associated with the GA apron—43 on the east apron, 38 spaces on the west apron, and 14 spaces adjacent to the FBO terminal. In its current configuration, the east and west aprons can accommodate the forecast increase in based aircraft requiring tie-down facilities until 2025, during which time expansion of based aircraft apron space may be required.

Based upon City of Jacksonville Concurrency requirements required by Florida Growth Management Laws, Normandy Boulevard at Herlong has limited vehicle traffic capacity. Based on this determination, JAA has been forced to reduce tie-down capacity every time a new T-Hangar is constructed. JAA is continuing to work with City of Jacksonville to remove this restriction to future growth. Suggestions for improving utilization of the apron facilities are provided in Chapter 6-*Airport Alternative Analysis*.

Transient Aircraft Apron Requirements

A determination of the total amount of apron area needed cannot be developed by formula or empirical relationship since local conditions often vary. However, enough tie-down locations should be available to accommodate the peak number of aircraft at any given time. Using guidelines provided in **FAA AC 150/5300-13**, the following methods were used to estimate the transient apron space required:

- 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 with the corresponding local/itinerant split.
- Add 10 percent to the above value to find peak day itinerant operations.
- Find the total number of peak day transient aircraft. This is half of the peak day itinerant operations since it is assumed that each aircraft will make two operations.

- Assume that 10 percent of the total number of peak day transient aircraft will need to be accommodated at one time.
- 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 transient aircraft parking spaces. In order to determine the amount of parking apron required, the fleet mix for the transient aircraft must first be determined. The transient aircraft fleet mix was determined using the growth rate outlined in **Chapter 4**, *Aviation Activity Forecasts*. **Table 4-17** denotes transient peak hour demand.

TABLE 4-17
TRANSIENT PEAK DEMAND

Years	Total Itinerant Operations	Peak Month	Peak Day	Total Number of Peak Day Transient Aircraft	Peak Day Demand	Peak Day Demand + 10%
Base Year						
2005	30,560	425	15	8	4	4
Forecast Years						
2010	33,336	464	17	8	4	4
2015	35,147	489	18	9	4	5
2020	37,063	516	19	9	5	6
2025	39,089	544	20	10	5	6

Source: The LPA Group Incorporated, 2005

The results for the transient aircraft space demand are shown in **Table 4-18**.

TABLE 4-18
TRANSIENT AIRCRAFT PARKING SPACE DEMAND

Year	Single-Engine	Multi-Engine	Rotor	Multi-Engine Turbine/Jets	Other*	Total Transient Parking Spaces
Base Year						
2005	3	1	0	0	0	4
Forecast						
2010	3	1	0	0	0	4
2015	3	1	0	1	0	5
2020	3	1	0	1	1	6
2025	3	0	0	1	2	6

Note: Other includes new light sport aircraft (i.e. SATS)

Source: THE LPA GROUP INCORPORATED, 2006

To determine the amount of apron space required, the amount of space is converted into square yards. The *Airport Design* AC suggests that a minimum of 360 square yards per transient aircraft be used. **Table 4-19** reflects the results of these calculations.

TABLE 4-19
PEAK HOUR TRANSIENT AIRCRAFT APRON AREA REQUIREMENTS

Year	Total Transient Parking Demand	Total Transient Aircraft Apron Area Required (SY)	Total Transient Aircraft Apron Recommended (SY)
Base Year			
2005	4	1,440	1,800
Forecast			
2010	4	1,440	1,800
2015	5	1,800	2,160
2020	6	2,160	2,520
2025	6	2,160	2,520

Source: THE LPA GROUP INCORPORATED, 2006

Following the guidelines set forth in **AC 150/5300-13**, existing airport apron space accommodates both existing and forecast Transient Aircraft apron demand. Recommended parking demand is based upon average annual transient aircraft growth. This allows the airport to react to unplanned increases in transient demand and/or changes to aircraft fleet mix over the twenty-year planning period.

Based Aircraft Apron Requirements

At many airports, a certain percentage of based aircraft is stored on the apron or a grassy area adjacent to the apron area. Since this area is generally open and unprotected, it is used primarily to store smaller aircraft, such as single-engine and a few multi-engine piston aircraft. As mentioned earlier, airports within the Jacksonville Aviation System usually accommodate 75 percent of based aircraft stored in hangar space and 25 percent on tie down space. As of 2006, approximately *54 percent* of all based aircraft at HEG are stored in hangars, whereas *46 percent* are stored on the apron or grassy area. However, it was determined that over the planning period, the percentage of aircraft stored on the apron will decrease from 46 percent to approximately 32 percent total in 2025.

Using the data calculated in **Table 4-14**, based apron parking requirements were determined. The *Airport Design* AC suggests that a minimum area of 300 square yards be used for planning purposes. This area is considered large enough for these aircraft to maneuver. **Table 4-20** shows the amount of apron area that will be needed to accommodate the remaining based aircraft.

TABLE 4-20 BASED AIRCRAFT APRON REQUIREMENTS			
Year	**Based Aircraft**	**Based Aircraft Apron Demand**	**Total Based Aircraft Apron Demand (SY)**
Base Year			
2005	170	48	14,400
Forecast			
2010	179	51	15,300
2015	190	56	16,800
2020	206	62	18,600
2025	224	71	21,300
Source: THE LPA GROUP INCORPORATED, 2006			

Table 4-20 demonstrates that the need for apron space to accommodate future levels of based aircraft decreases as the ratio of hangar space to apron space increases. Traditionally, demand for hangar space used for aircraft storage is greater than demand for tie-down space. The benefits of hangar space over non-enclosed apron tie-down space are numerous, especially with regards to light aircraft that are expected to populate the based aircraft inventory at HEG over the planning period. Ultralight and other aircraft meeting A-I design standard criteria are more susceptible to inclement weather than heavier aircraft. The summer months in Florida often see strong thunderstorm activity, coupled with occasional hail and heavy winds. Thus, potential damage to light aircraft is increased during the summer months when they are exposed to these elements. The hobby-like nature of ultralight and glider aircraft, as well, often require these aircraft owners to have space available where structural modifications or other work can be completed. Consequently, apron space demand for based aircraft, given the growth forecast among light aircraft, will be limited, whereas demand for shade, T-hangar and conventional hangar facilities will increase over the planning period at HEG.

Total Aircraft Parking Apron Requirements

Table 4-21 provides a summary of the total apron requirements for transient and based aircraft at HEG. This table also includes the amount of new apron required to accommodate anticipated demand.

TABLE 4-21 TOTAL TIE-DOWN APRON REQUIREMENTS					
	2005	**2010**	**2015**	**2020**	**2025**
Existing Based Aircraft Tie-Down Apron (SY)	29,000	29,000	29,000	29,000	29,000
Forecast Based Aircraft Requiring Tie-Down	48	51	56	62	71
Based Aircraft Apron Requirements (SY)	14,400	15,300	16,800	18,600	21,300
Surplus/(Deficiency)	14,600	13,700	12,200	10,400	7,700
Existing Itinerant Tie-Down Apron (SF)	3,100	3,100	3,100	3,100	3,100
Busy Hour Itinerant Aircraft	4	4	5	6	6
Total Itinerant Tie-Down Apron Recommended (SY)	1,800	1,800	2,160	2,520	2,520
Surplus/(Deficiency)	1,300	1,300	940	580	580
Total Existing Tie-Down Apron (SY)	32,100	32,100	32,100	32,100	32,100
Total Required Tie-Down Apron (SY)	16,200	17,100	18,960	21,120	23,820
Surplus/(Deficiency)	15,900	15,000	13,140	10,980	8,280
Source: The LPA Group Incorporated, 2006					

Although it appears that no additional apron space is required to accommodate based and transient aircraft parking demand, it is recommended that new apron areas dedicated to light aircraft activity as well as transient aircraft operations be developed near the north of Taxiway A, adjacent to the proposed turf runway and possibly near the closed runways due to the location, condition and access limitations of existing facilities.

AIRPORT ACCESS

Airport access is an important component of the development of an airfield. Although not directly contributing to the aviation activity at airports, surface access provides a means by which airport users can access those facilities and services that airports provide. The future development of roads and other infrastructure related to airport access at HEG primarily concerns the need to simplify traffic patterns, relieve congestion, and provide security for the airport that limits access to certain portions of the airfield to authorized users.

The airport entrance is situated at a node where Normandy Boulevard and Herlong Road intersect. However, this intersection is awkward because the angle at which Herlong Road meets Normandy Boulevard creates problems for merging traffic. As such, the airport entrance is located adjacent to this intersection and potentially creates a hazard for drivers trying to turn into the airport via Normandy Boulevard southbound. Additionally, residential development is already in progress just north of the airport on the north side of Normandy Boulevard. The entrance to this residential subdivision, situated directly across the access road that leads into the airport, creates a junction whereby residential, airport, and through traffic converge. Currently, there is no traffic light to accommodate the flow of this traffic, and the Florida Department of Transportation (FDOT) has limited the alteration of this area. Therefore, the addition of a new traffic signal in addition to the realignment of the entrance road on airport property could alleviate congestion related to egress of traffic and automobile parking. Further analysis of access road requirements as well as possible alternatives will be provided in **Chapter 5**, *Alternatives Analysis*.

AIRPORT SUPPORT FACILITIES

Electrical Vault

The electrical vault is currently located on the northern side of the airport to the west of the west apron in an open field. According to JAA engineering documentation, the electrical vault was originally constructed and installed in 1981. This vault houses the power and control equipment for the airfield lighting, signage and navigational aids. The electrical vault is small and contains some non-compliant equipment. While some additional equipment was installed in 1999 as part of the PAPI project, the electrical vault currently cannot support the expansion of the southern portion of the airfield from its current location. Based upon the last master plan, the vault is located in a future taxiway safety area associated with T-hangar development. Thus, due to capacity limitations and location, it is recommended that a new airport electrical vault be situated midfield to provide for these components and satisfy the needs of the development plan.

Aircraft Fuel Storage

The airport fuel farm is located immediately west of the FBO terminal facility, adjacent to the main entrance. Fuel distribution is provided by JAA through the use of two fuel trucks with the following capacities: 1,500 gallon Avgas and 2,200 gallon Jet A. Two 15,000 gallon underground fuel storage tanks (one Avgas and one Jet A) are located under the north apron facilities. A self-service fuel facility was constructed in 2002 between the East Apron and FBO Transient Apron. This station provides Avgas only, and consists of a 1,500 gallon above ground storage tank located beyond the Taxiway A object free area.

As stated in **Chapter 2**, JAA operates and manages the only fixed base operator at HEG. Aviation 100LL and Jet A fuels are available and sold to based and transient aircraft operators. Sales of aviation fuel generally peak in May for Avgas and July for Jet A. Due to the number of piston operations that occur at HEG, the month of May is the most active. 2004 and 2005 fuel sales receipts were provided by airport management and are shown in **Table 4-22.**

TABLE 4-22
FUEL SALE SUMMARY

	Jet A		Avgas	
	2004	2005	2004	2005
Month	Gallons	Gallons	Gallons	Gallons
Jan	4,378	3,589	13,721	12,409
Feb	6,070	9,390	9,523	11,558
Mar	4,357	6,378	16,182	11,636
Apr	6,094	4,941	16,123	12,871
May	6,707	5,869	19,036	13,602
Jun	5,817	5,646	17,055	11,220
Jul	7,369	4,075	13,560	11,948
Aug	5,449	6,013	13,560	9,611
Sep	4,323	2,492	7,370	11,592
Oct	5,109	4,494	16,708	11,657
Nov	6,761	2,466	12,675	12,118
Dec	4,788	3,192	13,272	10,656
Total	**67,222**	**58,095**	**168,785**	**140,427**

Source: Airport Management, 2005 and 2006

Fuel consumption information was provided by JAA and was used to calculate an average ratio of fuel used to the annual number of operations. This analysis yields a ratio of 2.43 gallons per operation for Avgas operations and 7.66 gallons per operation for Jet A. Jet A operations are based upon the sum of designated transient military and 15 percent of transient GA operations. Increases in fuel capacity were determined using these historic ratios per operation. However, it is anticipated that the percentage of turbine aircraft especially with the introduction of very light jets that the percentage of Jet A demand will increase. As operations requiring Jet A fuel increase at HEG, fuel storage requirements will increase to ensure an adequate level of Jet A capacity is provided.

In addition to increases in storage capacity, the level at which fuel is required to be delivered is expected to increase. This is mainly due to the forecast increase in operations, larger fuel requirements, and anticipated development. To meet this demand, either the airport will need to increase overall capacity or increase fuel delivery per month. **Table 4-23** illustrates the monthly fuel storage requirements at HEG.

TABLE 4-23
FUEL STORAGE REQUIREMENTS

	2005	2010	2015	2020	2025
Avgas Demand:					
Average Month Demand	11,702	11,909	12,361	12,933	13,530
Forecast Capacity (Gallons) (1)	13,500	13,700	14,300	14,900	15,600
Fuel Tank Requirement (2)	1	1	1	1	1
Fuel Truck Requirement (3)	1	1	1	1	2
Jet A Demand:					
Average Month Demand	4,841	6,526	7,573	8,387	9,269
Forecast Capacity (Gallons) (1)	5,600	7,600	8,800	9,700	10,700
Fuel Tank Requirement(2)	1	1	1	1	1
Fuel Truck Requirement (4)	1	1	1	1	1
Fuel Farm Area (SF) (5)	1,680	1,680	1,680	1680	1,680

Source: The LPA Group Incorporated, 2006
Note
(1) Based upon 110% capacity of forecast demand
(2) Based upon 15,000 gallon tank
(3) Based upon 8,000 fuel truck
(4) Based upon 1200 Jet A Fuel Truck
(5) Based on average area of 840 SF per tank for safety and operational areas

In order to accommodate fuel demand as well as new environmental regulatory requirements, JAA intends to remove the two older underground fuel tanks and replace with two larger (approximately 12,000 gallons each) above ground fuel tanks east of the existing terminal facilities. As a result, the apron east and south of the terminal is planned for expansion to accommodate existing and anticipated demand.

FBO Terminal Building

A building condition survey performed in October 2000, determined that the Herlong Terminal Facility were in fair to good condition. Since the existing terminal facilities were renovated in 2001 to add more pilot amenities, the building is now in excellent condition and was expanded to approximately 2,000 SF.

The Terminal Building provides a pilot lounge, two conference rooms, restrooms, kitchen, and office facilities for Airport and Fixed Based Operator (FBO) staff. JAA serves as the Fixed Base Operator at Herlong, and provides the airport terminal, hangar space, tie-down areas, and fueling facilities at the airport. In addition, the FBO staff, including airport management, is responsible for airport inspection and maintenance, security, and overall operational control.

Appendix 5 of FAA AC 150/5300-13 provides guidelines for small airport buildings, including GA terminals. The primary consideration is that the facility be capable of handling the amount of passengers, pilots and visitors associated with peak hour operations. GA facility sizing can vary from 50 to 75 square feet per peak hour passenger. Therefore, a planning guide of 62.5 square feet per busy hour passenger is typically used to size GA terminal facilities.

Utilizing the above referenced sizing criteria and based upon the current and forecast level of demand, a 1,723 square foot FBO/GA Terminal will be required sometime after 2025. **Table 4-24** outlines the FBO/GA terminal building requirements over the planning period.

TABLE 4-24
FBO/GA TERMINAL BUILDING REQUIREMENTS

Year	Peak hr Local	Local Pax	Peak Hour Itinerant	Itinerant Pax	Pilot	Total Area
2005	5	4	4	13	5	1,387
2006	5	4	4	13	5	1,387
2010	5	5	5	14	5	1,455
2015	5	5	5	15	5	1,544
2020	6	5	5	15	5	1,634
2025	6	6	5	16	6	1,723

Source: The LPA Group Incorporated, 2006

Based upon this mathematical calculation, it appears that adequate facilities exist to accommodate demand. However, based upon the existing configuration and discussions with airport management and users, an addition to the terminal facilities, including additional maintenance equipment storage is recommended. Further analysis of this demand is evaluated in **Chapter 5**, *Alternatives Analysis*, Support Facilities.

Automobile Parking Requirements

Public parking at the Airport includes parking areas located along the east and west edges of the airport entrance road, adjacent to the new bulk hangar to the west of the entrance road and another parking area to the north of the new T-Hangar facilities along the northwest side of the airfield. Access to all of these parking facilities is through the main access road along Normandy Boulevard. Most automobile parking is located outside the perimeter fence line. However, there are five parking spaces located within the perimeter fence adjacent to the terminal facility.

The 28 parking spaces along the east edge of the Airport Road and seven spaces along the west edge of the entrance road serve as the primary parking area for many of the airport's tenants and visitors. Due to the location of parking spaces in relation to the main entrance road and airfield gate, vehicles entering or exiting the secure area via Gate 1 are often times delayed as a result of visitors either entering or leaving the parking areas located on the east and west side of the entrance road. Vehicles are typically not delayed more than a minute or two, but on busy days, specifically Saturdays and Sundays, parking along the entrance road increases the congestion to and from the airfield facilities. As a result, it is recommended that parking especially along the east side of the entrance road be removed and relocated to an alternate location. This will be discussed in more detail as part of the *Alternative Analysis*, Support Facilities discussion, in **Chapter 5** of this report.

During peak days of the week (usually Saturday) and special events, parking both inside and outside the perimeter fence is inadequate. Airport users who have automobile access to the airfield often park on the ramp and above the underground fuel tanks due to lack of available spaces.

However, during visits to the Airport, the parking facilities, adjacent to the T-Hangars, are not used to any significant degree. This may be due to the fact that many T-hangar users often park their vehicles inside their hangar. An evaluation of automobile parking including the location and the number of facilities needed is evaluated in greater detail in the Alternatives Analysis section of this report. An approximate number of parking spaces available are listed in **Table 4-25**, *Existing Automobile Facilities*.

TABLE 4-25
EXISTING MARKED AUTOMOBILE FACILITIES
(Airport Related Only)

Location	Number of Spaces
Outside Perimeter Fence line	
West Side of Entrance Road	7
East Side of Entrance Road	28
North of new T-hangar Facilities	25
Adjacent to Bulk Hangar	46
Inside Perimeter Fence line	
Adjacent to Terminal Facilities	5
TOTAL	**111**

SOURCE: JAA AND THE LPA GROUP INCORPORATED, 2005

In addition to parking facilities outlined in **Table 4-25**, individual airport tenants and airport buildings, such as White Line Trucking and the Accessory Overhaul Group, which are not located near the Terminal Building have their own individual parking facilities.

GA PASSENGERS AND AUTOMOBILE PARKING

GA Passengers

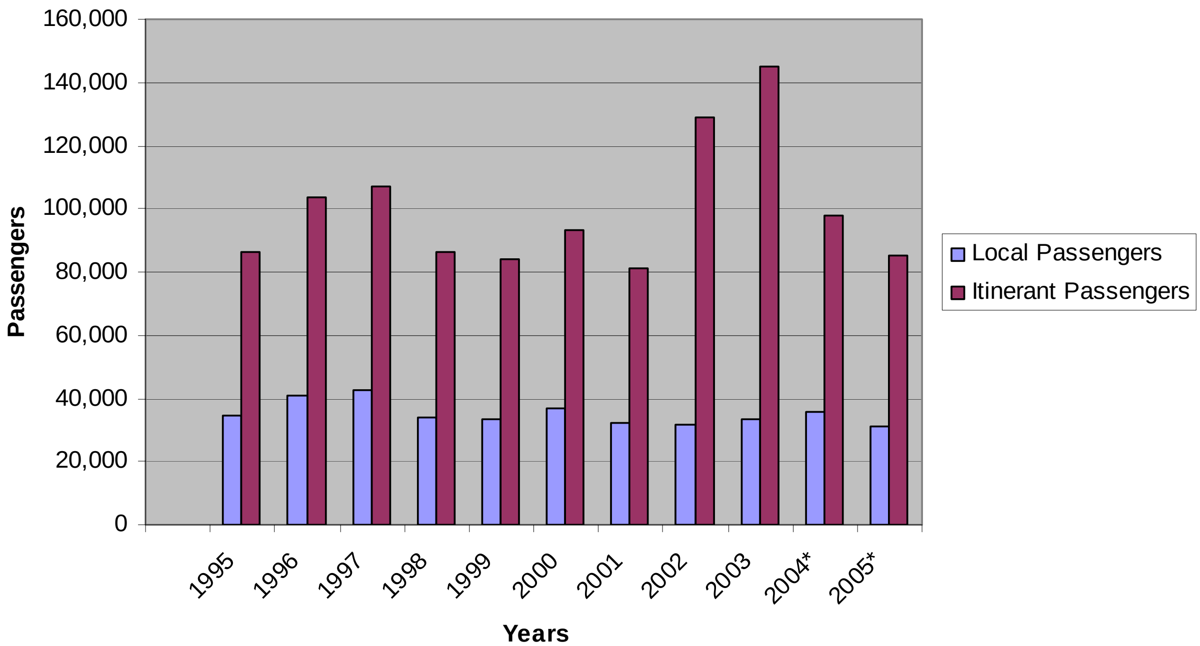
A historical record of GA passengers for HEG does not exist and therefore, required an estimate of the current level of passengers based upon the level of GA operations. This task was accomplished utilizing the typical load carried by the GA fleet as published in the aviation economic guidelines by the FAA's "Estimating the Economic Impact of Airports". Standards set forth in this document establish an estimate of three passengers per itinerant operation and 0.9 passengers per local operation in addition to the pilot. This information is presented in **Table 4-26** and **Figure 4-4.**

TABLE 4-26
GENERAL AVIATION PASSENGERS

Year	Local Operations	Local Passengers	Itinerant Operations	Itinerant Passengers	Total Passengers
1995	38,190	34,371	28,810	86,430	120,801
1996	45,657	41,091	34,443	103,329	144,420
1997	47,218	42,496	35,621	106,863	149,359
1998	38,034	34,230	28,692	86,076	120,306
1999	37,050	33,345	27,950	83,850	117,195
2000	41,154	37,039	31,046	93,138	130,177
2001	35,910	32,319	27,090	81,270	113,589
2002	35,000	31,500	43,000	129,000	160,500
2003	37,410	33,669	48,290	144,870	178,539
2004*	39,900	35,910	32,528	97,583	133,493
2005*	34,761	31,285	28,340	85,020	116,305

Source: HEG Airport Management, FASP 2005, FAA TAF and LPA Group (2005)
*Note: Determined from Airport Records 5010

FIGURE 4-6
GENERAL AVIATION PASSENGERS



Automobile Parking

General public automobile parking at HEG is offered at several locations. At the terminal facility, approximately 28 parking spaces are provided along the eastern edge of the airport entrance road and seven parking spaces along the western edge. A total of 46 parking spaces are provided adjacent to Hangar 5 west of the terminal building, and 25 parking spaces are located north of the T-Hangar facilities along the west side of the airport. This provides a total of 111 spaces. However, these spaces are not located to meet the demand for parking.

Respective tenants, such as Mercair, Royal Atlantic, Acme Barricades and Advanced Disposal exclusively use their parking spaces and were not considered as part of this analysis. Access to the T-hangar units is provided via Normandy Boulevard from the west and Herlong Avenue from the east. Parking spaces are available at the FBO facility, but it is an accepted practice that based aircraft owners normally prefer to park their vehicles inside or close to their leased hangar space.

Discussions with Airport Management and site visits revealed several automobile parking issues specifically related to overcrowding and lack of access to the terminal facilities. Using the annual GA passenger data previously discussed and a planning factor of 1.5 parking spaces per existing busy hour passenger, it was estimated that at a minimum 40 parking spaces would be required to accommodate peak hour demand adjacent to the terminal facilities.

In order to accommodate anticipated demand, GA pilots, passengers, and visitors use the parking areas at HEG. Future GA parking requirements use a planning factor of 1.3 parking spaces per busy hour GA passenger and pilot and 44 square yards per parking space, which accounts for parking and circulation. Thus, approximately 37 parking spaces and 1,634 square yards of pavement area will be required in 2025. The forecast requirements for the FBO parking area over the planning period are listed in **Table 4-27**. The planning factors used in this section for GA parking are based upon suggested ratios from the "FAA Aviation Demand and Airport Facility Requirement Forecasts for Medium Air Transportation Hubs". The space requirements identified should accommodate the forecast levels of GA pilot, passenger, customer, visitor and employee parking demand.

TABLE 4-27
TERMINAL AREA AUTOMOBILE PARKING REQUIREMENTS

Year	Busy Hour Passengers and Employees	Required Parking Spaces	Required Parking Area (SY)
Base Year			
2005	23	30	1,327
Forecast Years			
2006	23	30	1,327
2010	24	32	1,388
2015	26	33	1,470
2020	27	35	1,552
2025	29	37	1,634

Note: One employee is required for each 30 busy hour passengers
Source: The LPA Group Incorporated, 2006

At the time of this writing, automobile parking adjacent to the terminal building, both inside and outside of the perimeter fence, consisted of 40 spaces which adequately accommodates peak hour demand. However, based upon discussions with airport management and observations, the location of the terminal parking, especially adjacent to the perimeter fence line along the entrance road should be reconfigured to alleviate congestion in and around the access road and access gate. Alternative automobile parking is discussed in more detail within following chapter under Support Facilities.

Security Fencing

Despite increased and extensive airport security measures with which commercial service airports have been required to comply, GA airports, historically, have not been subject to Federal rules regarding airport security. Prior to the creation of the Transportation Security Administration (TSA) in 2001, the Federal Government's role in airport security was focused exclusively on airports serving scheduled operations. Vulnerabilities exist throughout the transportation system, especially within general aviation. The TSA has not officially required GA airports to implement security measures, although there have been several efforts to establish a standard security program that would govern the entirety of the GA industry. It is, however, precisely the diversity and extent to which the industry is vulnerable that suggests a one-size security program is not suitable. The security needs and susceptibility of a privately owned rural airport is vastly different from that of a large GA facility located near a major metropolitan area. A security program should instead focus on managing the risk associated with GA airports, recognizing the characteristics that define each facility.

The types of threats that exist for GA airports that do not have a security presence are numerous. Specifically, illicit actions related with aircraft theft, drug smuggling, illegal immigration, as well as vandalism have been problematic in the State of Florida. Small airports generally outside the scope of security found at larger airports, especially those that are not Part 139 certified, are particularly vulnerable to these types of threats.

As a result, the Florida Department of Transportation not only recommends perimeter fencing, but also the development and implementation of a security operations plan, the use of airfield and perimeter lighting, security signage and even physical and electronic surveillance as warranted by the amount and type of operations as well as the potential threat level. In addition, FDOT in conjunction with the AAAE and NBAA are in the process of testing new GA security procedures and equipment at various size airports around the state. The intent of this program is to limit the theft of equipment, including aircraft, as well as vandalism.

While the majority of the airfield is enclosed with a six foot security fence, a large section of the property south of the airfield is not due to heavy vegetation and trees. It is recommended that security fencing remain a priority throughout the planning horizon, especially with the development of the southern portion of the airfield. Based upon the types of threat, level of proposed development as well as FAA and FDOT requirements, several security recommendations are discussed in **Chapter 5** as part of the alternatives analysis.

SUMMARY OF FACILITY REQUIREMENTS

Table 4-28 provides a summary of the facility requirements based upon anticipated demand necessary to satisfy the forecasts of aviation demand presented earlier in this study. The order in which these improvements are listed is not meant to imply a priority or phasing of these projects. Essentially, this table includes the minimum facility requirements over the 20-year planning period based on the projected demand. During the alternatives analysis, the full development potential of areas at HEG will be considered even if it exceeds the minimum levels identified in this analysis. This will be considered the ultimate development scenario. Looking beyond these minimum requirements should provide airport management with information in order to make appropriate decisions if growth in one activity area increases faster than projected.

TABLE 4-28 SUMMARY OF FACILITY REQUIREMENTS	
Runways and Taxiways	1. Conduct routine pavement maintenance on all runways and taxiways. 2. Add signage at intersection of 11-29 and closed runways to limit runway incursions as well as add signage adjacent to Taxiway A and Runway 7-25 in conjunction with airfield improvements, such as distance to go and additional taxiway exit signs. Also, replace any old or damage signs as part of signage program. 3. Extend Runway 7-25 to accommodate anticipated demand. 4. Extend Taxiway A to provide full-parallel to Runway 7-25 and additional MITL. 5. Refurbish crosswind runway, 11-29 6. Re-surface and remark closed runways as taxiways 7. Install MITL on closed runways 8. Construct new turf runway to support light aircraft movements. 9. Rehabilitate pavement on Taxiways C and D.
General Aviation	1. Construct at least 27 T-hangar units 2. Construct 6 Corporate Hangars 3. Construct 8 Conventional Hangars 4. Construct at least 24,442 SY of additional aircraft storage apron
Airport Support Facilities	1. Relocate electrical vault. 2. Upgrade security fencing, and incorporate FDOT Security Requirements. 3. Relocated/reconfigure automobile parking spaces adjacent to Airport Entrance Road. 4. Close underground fuel tanks and replace with 12,000 gallon above ground fuel tanks.
Documentation	1. Develop Pavement Condition Report 2. Develop Airport Signage Plan 3. Update GA Airport Security and Contingency Plan per FDOT/FAA Requirements