A. INTRODUCTION

The purpose of this chapter is to determine the airport's capacity in relation to the forecast of aviation demand presented in Chapter Two and then identify the facility requirements necessary to accommodate the existing and 20-year forecasted demand. An analysis of the forecast presented in Chapter Two indicates an increase in all but one segment of activity at the Sussex County Airport. The exception is multi-engine piston aircraft, which are projected to decline in total fleet number and operations. Total general aviation operations are projected to increase by more than 29 percent, and based aircraft are projected to increase by more than 45 percent. Airport improvements and/or facility developments will be necessary to meet the growing demand.

The methodology used to determine facility requirements begins with an examination of the airport system's major components: airspace, airfield, buildings, and surface access. All of these components must be balanced to achieve system optimization. Any deficiencies in the facilities that serve these four (4) elements will be identified based upon standards presented in Federal Aviation Administration (FAA) Advisory Circular 150/5300-13, "Airport Design", which includes changes 1 through 9. Recommended improvements to facilities will be noted as required.

B. CRITERIA FOR PLANNING

From a planning perspective, airports, with their associated runways and taxiways, are evaluated for the most demanding aircraft (critical aircraft) currently using or projected to use the facility on a regular basis. The weight, wingspan, and performance characteristics of these aircraft under site-specific conditions, will ultimately determine the airport's geometry in terms of runway/taxiway configurations, lengths, and separations. The types of approach aids, lighting, and navigational equipment required at an airport are determined primarily by the level of annual activity, weather, terrain characteristics, and the role of the airport in the national system of airports. Finally, apron size requirements and other airport service requirements, both airside and landside, are evaluated based on the activity forecasts established in Chapter Two.

1. Fundamental Airfield Development

FAA Order 5090.3C, "Field Formulation of the NPIAS", provides guidelines for fundamental airfield development. Fundamental development is considered to be the basic configuration recommended for an airport in the national system. The development is affected by the type of activity the airport serves. It includes, but is not limited to, land acquisition, aircraft movement areas, landing and navigation aids, and aircraft parking areas. Fundamental development should be recommended in accordance with the standards and criteria contained in all appropriate Advisory Circulars and Orders.

The Order indicates that all runways should have a parallel taxiway to service those aircraft utilizing the runway. Currently, Runway 13-31 does not have a parallel taxiway. Prior Master Plan efforts and a 1999 Preliminary Study on the reopening of Runway 10-28 have discussed the need for making Runway 13-31 meet FAA design guidelines. Details of the feasibility of improving Runway 13-31 will be provided throughout this chapter as appropriate, as well as further evaluation regarding the rehabilitation of Runway 10-28 as the alternative crosswind runway.

Currently, the distance from the centerline of Runway 4-22 to the centerline of the parallel taxiway is 700 feet. FAA Advisory Circular 150/5300-13 requires a minimum distance of 240 feet for a B-II runway. The additional distance between the runway and taxiway places the taxiway very near the existing terminal facilities and apron parking area for general aviation aircraft. This location prevents the use of the taxiway by ARC C-III aircraft, which currently use Runway 4-22, requiring the aircraft to back-taxi to Taxiway C when landing on Runway 22. Additional evaluation of this concern will be presented later in this chapter.

The Order also indicates that the airport should have perimeter fencing. The airport currently has only limited perimeter fencing, and thus recommendations will be made consistent with the guidance of the Order.

2. Aircraft Fleet Mix

The aircraft fleet at the Sussex County Airport exclusively consists of general aviation aircraft. There is an unusually diverse general aviation fleet that currently uses the airport. The more sophisticated portion of the fleet includes turbojet aircraft such as the Cessna Citation II, the Gulfstream Series III and IV, the Raytheon Hawker 700 and 800, and the Boeing Business Jet (BBJ). As presented in Chapter Two, Forecast of Aviation Demand, these aircraft are expected to remain an integral part of the general aviation fleet throughout the 20-year planning period, with growth projected for both based turbojet aircraft and transient turbojet operations.

3. Existing and Future Airport Role

Sussex County Airport (GED) is a general aviation airport serving a broad business and personal aviation community. The airport currently has 55 based aircraft and serves approximately 47,000 civilian and military aircraft operations annually. These operations include single-engine and twin-engine aircraft used for business, pleasure, and flight training, as well as significant jet traffic including Boeing Business Jets (BBJ). Sussex County Airport is one of only two public-use airports in Sussex County and the only publicly owned airport in the county.

As presented in Chapter Two, the critical family of aircraft for the Sussex County Airport during the current planning period (2002-2021) is the medium business jet, such as the Hawker HS125, Lear 35, and Gulfstream III type aircraft. These three aircraft all represent approach category C aircraft, and the total of their forecast operations represents approximately 50 percent of all forecast turbojet operations at GED during the planning period. More than half of the operations by these aircraft also represent Group

II wingspan characteristics. An analysis of other business jet aircraft in the GED operational fleet, such as the Citation V, Falcon 20, and Challenger 601, revealed that approximately 65 percent of the total business jet fleet is comprised of aircraft with Group II wingspan characteristics. Although the Boeing Business Jet (ARC C-III) frequently operates into the airport, there are currently less than 500 annual itinerant operations of this or similar type aircraft. Significant growth of ARC C-III operations are anticipated during the planning period.

Given the above information, **airfield development for the Sussex County Airport should be planned based on an Airport Reference Code (ARC) C-II.** However, due to the continued growth of Boeing Business Jet operations (B-737) it is recommended the airport ultimately be planned based on an ARC C-III. Such an airport design is capable of accommodating large aircraft with the following characteristics:

- Approach Category C Aircraft – Approach speeds of 121 knots or more, but less than 141 knots, and
- Design Group II Aircraft – Wingspans from 49 feet up to, but not including, 79 feet.
- Design Group III Aircraft – Wingspans from 79 feet up to, but not including 118 feet.

Although ARC C-II should be the basis for immediate airfield planning, there are key elements of the airfield development that should be constructed with consideration of the ultimate ARC C-III aircraft operations. The elements include Runway 4-22 and associated parallel taxiway, as well as taxiways providing access to the larger general aviation hangars in the northeast corner of the airfield.

The crosswind runway should be developed to service smaller general aviation aircraft using the airport, but not remain restricted to small aircraft exclusively. As presented in Chapter Two, **it is recommended that the crosswind runway be developed based on**

an Airport Reference Code (ARC) B-II. Such a design is capable of accommodating aircraft with the following characteristics:

- Approach Category B Aircraft – Approach speeds of 91 knots or more, but less than 121 knots, and
- Design Group II Aircraft – Wingspans from 49 feet up to, but not including, 79 feet.

C. AIRFIELD CAPACITY

In general, airport capacity is a function of the number of runways, the runway and taxiway configuration, and the mix of aircraft using the airport. Capacity is quantified by two principle terms: annual service volume (ASV) and hourly capacities, under Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) weather conditions. Sussex County Airport has two active runways, Runway 4-22 and Runway 13-31.

The capacity of any runway is finite with respect to the number of hourly and annual operations. Primarily, airfield capacity is determined by the following:

- Weather
- Runway Configurations (length, width, strength, orientation)
- Mix of aircraft
- Percent of touch-and-go operations
- Taxiway exit configurations

These variables are used to provide a quantitative breakdown of the ASV and hourly capabilities (VFR & IFR). The procedures used for this analysis are detailed in FAA Advisory Circular 150/5060-5, "Aircraft Capacity and Delay", and FAA Airport Design program, version 4.2D.

1. Runway Capacity

Runway capacity is defined as a measure of the maximum number of aircraft operations that can be accommodated by the airport on an hourly and/or annual basis without compromising the safety of aircraft operations. These estimates account for differences in runway use, aircraft mix, and weather that may be encountered over the span of a typical year.

The Airport's primary Runway 4-22, currently categorized on the approved ALP as ARC B-II, is 5,000 feet long by 150 feet wide. The crosswind Runway 13-31, categorized as an ARC A-I runway restricted to small aircraft exclusively, is 2,330 feet long by 50 feet wide.

A runway's ability to accommodate aircraft is largely determined by an aircraft's speed and weight. General aviation aircraft (lighter aircraft) typically have lower approach-to-landing speeds, which equates to a lower runway occupancy time. Conversely, larger and heavier aircraft typically operate at higher approach-to-landing speeds, which require more deceleration time. This increased deceleration time results in a longer runway occupancy time, which decreases runway capacity.

Another distinction between lighter and heavier aircraft that affects runway capacity is wake turbulence. This phenomena results from aircraft operations on the ground and in the air. The term *wake turbulence* includes vortices, thrust stream turbulence, jet blast, and propeller wash. Wake turbulence generated from one aircraft can greatly affect the safe operation of another. Wake turbulence necessitates increased aircraft separation distances on the ground and in the air. Heavier aircraft generate more wake turbulence than lighter aircraft. Depending on the types of aircraft following each other during approach-to-landing operations, a typical separation distance of 4 to 6 miles is required. Appropriate time and distance intervals are also required for aircraft departing a runway. Like aircraft approach-to-landing speeds discussed earlier, heavy aircraft departures decrease a runway's capacity as opposed to lighter aircraft departures. Wake turbulence is of particular concern to small aircraft operating at the Sussex County Airport, given the operations of the Boeing Business Jet, a derivative of the Boeing 737-700/800, and the perpendicular crosswind runway configuration for use by smaller general aviation aircraft.

In order to measure an airport's runway capacity, the FAA developed an aircraft wake turbulence classification system based upon a particular aircraft's weight and number of engines. **Table 3-1** presents the FAA Aircraft Classification System used in determining aircraft mix. The wake turbulence alphabetical classification is different from the aircraft approach speed alphabetical classification system associated with the airport reference code system. A representative sample of aircraft and their respective wake turbulence classification is presented in **Table 3-2.**

Table 3-1
Sussex County Airport
Aircraft Classification

Aircraft Classification	Description[1]
Class A	Small single-engine aircraft weighing 12,500 pounds or less
Class B	Small twin-engine aircraft weighing 12,500 pounds or less
Class C	Large aircraft weighing more that 12,500 pounds, but less than 300,000 pounds
Class D	Heavy aircraft weighing more than 300,000 pounds

Source: FAA AC 150/5060-5 "Airport Capacity and Delay," 1983
[1] Weights refer to maximum certificated take-off weight.

Table 3-2
Sussex County Airport
Representative Aircraft

Aircraft	Classification	Weight (lbs.)	Engines
Cessna 150	A	1,600	Single
Cessna 172	A	2,658	Single
Beech Bonanza F33A	A	3,400	Single
Piper Navajo	B	6,200	Multi
Beech Baron 58P	B	6,200	Multi
Cessna Conquest 441	B	9,925	Multi
Cessna Citation I	B	11,850	Multi
Super King Air B-200	B	12,500	Multi
Cessna Citation II	C	13,300	Multi
HS-125 Series 700	C	24,200	Multi
Dassault Falcon 20	C	28,660	Multi
Boeing 737 (BBJ)	C	171,000	Multi

Sources: FAA 150/5300-13 "Airport Design," 1989
FAA 150/5060-5 "Airport Capacity and Delay," 1983

The fleet mix for the Sussex County Airport was developed from the approved aviation forecast presented in Chapter Two. **Table 3-3** presents a sample aircraft fleet mix with their wake turbulence classification. Based on discussions with the Fixed Base Operator (FBO), it was assumed that military and air taxi operations ranged from Class B to Class C aircraft at the Airport. Accordingly, military and air taxi operations were distributed in classifications B and C to reflect the total number of operations as discussed in Chapter Two. All rotorcraft operations were considered to be Class A.

Table 3-3
Sussex County Airport
Aircraft Fleet Mix

Aircraft Class	Description	Operations	Percentage
2002			
A	Single-Engine Aircraft < 12,500 lbs	28,950	61%
B	Twin-Engine Aircraft < 12,500 lbs.	10,975	23%
C	Aircraft > 12,500 lbs. but < 300,000 lbs.	7,199	16%
D	Aircraft > 300,000 lbs.	0	0%
	Total	47,124	100%
2021			
A	Single-Engine Aircraft < 12,500 lbs.	34,459	57%
B	Twin-Engine Aircraft < 12,500 lbs.	15,679	26%
C	Aircraft > 12,500 lbs. but < 300,000 lbs.	10,743	17%
D	Aircraft > 300,000 lbs.	0	0%
	Total	60,881	100%

Source: FAA AC 150/5060-5 "Airport Capacity and Delay", 1983
Delta Airport Consultants, Inc. Analysis

a. Existing Runway Capacity Analysis

Both VFR and IFR hourly runway capacities and the ASV were calculated for the existing runway system at the Sussex County Airport. The following discussion adheres to the guidelines contained in the FAA Advisory Circular 150/5060-5, "Airport Capacity and Delay," and FAA Airport Design computer program, version 4.2D. These resources provide the basis for computing a reasonable estimate of the Airport's hourly and annual runway capacity. These estimates are then compared to the approved forecast to determine if the capacity of the runway is sufficient.

To determine an airport's runway capacity, a mix index must first be calculated. The mix index is a mathematical formula and is expressed as a percentage of the wake turbulence of class C aircraft plus 3 times the percent of that of class D aircraft (C+3D). The aircraft mix contained in Table 3-3 was used in calculating the index mix for the Sussex County Airport.

Both hourly and annual runway capacities were calculated using the FAA Airport Design computer program, version 4.2D. The existing and future capacities were predicated on the existing runway system and operating characteristics. **Table 3-4** presents a comparison of existing demand versus existing capacity. As indicated, the Sussex County Airport is operating at approximately 20 percent of its total available annual capacity.

Table 3-4
Sussex County Airport
Existing (2002) Demand versus Existing Capacity

Demand		**Capacity**		
Peak Hour Operations	**Total Operations**	**Hourly VFR**	**Hourly IFR**	**Annual Service Volume**
22	47,124	98	59	230,000

Source: FAA Design Program, Version 4.2D
Delta Airport Consultants, Inc.

b. Future Runway Capacity Analysis

The future runway capacity was calculated using the same procedure as previously described. Based on the mix index formula, **Table 3-5** presents the forecasted demand versus the future capacity, representing an increase to 26 percent of its total available annual capacity.

Table 3-5
Sussex County Airport
Future (2021) Demand versus Existing Capacity

Demand		**Capacity**		
Peak Hour Operations	**Total Operations**	**Hourly VFR**	**Hourly IFR**	**Annual Service Volume**
28	60,881	98	59	230,000

Source: FAA Design Program, Version 4.2D
Delta Airport Consultants, Inc.

FAA guidelines recommend that runway capacity improvements be considered when actual operations reach 60 percent of the theoretical ASV. Operations at GED are not forecast to reach that level within the 20-year planning period.

2. Taxiway Capacity

The location of exit taxiways can also affect the overall capacity of an airport and contribute to the overall efficiency of aircraft circulation. The location of exit taxiways depends a great deal on the mix of aircraft, approach and touchdown speeds, point of touchdown, exit speed, rate of deceleration, condition of the pavement surface (i.e., wet or dry), and the number of exits. General design practices recommend placing exit taxiways at intervals of 1,500 feet to 2,000 feet for airports that handle a wide variety of aircraft.

a. Runway 4-22

Runway 4-22 has a dual-use entrance/exit taxiway located at each end of the runway and a one exit taxiway connecting to parallel Taxiway A at the midpoint of the runway. The existing exit taxiway is an extension of Runway 13-31. This single exit taxiway requires virtually all aircraft landing on either Runway 4 or 22 to taxi to the far end of the runway before exiting. As local FBO reports and wind analysis indicates, Runway 4 is the runway of preference approximately 60 percent of the time. As such, **an exit taxiway should be considered 1,000 feet from the approach end of Runway 22, and ultimately the same distance from the approach to Runway 4, to ensure efficient flow of aircraft on the ground.**

b. Runway 13-31

Runway 13-31 has no standard entrance/exit taxiways. Aircraft departing on Runway 13 must cross Runway 4-22 at its midpoint via Taxiway B. Aircraft departing on Runway 31 access the runway in the same manner, but must taxi the full length of the runway and perform a 180-degree turn around to be in position for takeoff. **The 1999 Preliminary Study for the development of Runway 10-28 recommended that Runway 13-31 be closed or used for a taxiway, and Runway 10-28 be rehabilitated as the Airport's crosswind runway. This**

recommendation will be further evaluated in the next chapter as development alternatives are presented.

D. AIRSPACE CAPACITY

The FAA issued a notice of proposal rule making in September 1989 to change airspace names to letter designations. The final rule was issued on December 17, 1992 and went into effect on September 16, 1993. The letter designation system brings the United States into conformance with International Civil Aviation Organization (ICAO) Standards. The new system also results in less complex airspace structure for pilot certifications, aircraft equipment requirements, and air traffic control services. **Table 3-6** presents the airspace classification, as well as the former classifications. Please refer to Chapter One, Exhibit 1-13, for a graphical depiction of the new airspace.

Table 3-6
Sussex County Airport
Airspace Classification

Airspace Classes	Former Airspace Equivalents	Changes
A	Positive Control Area (PCA)	None
B	Terminal Control Area (TCA)	VFR: Clear of Clouds
C	Airport Radar Service Area (ARSA)	None
D	Airport Traffic Area (ATA) and Control Zone (CZ)	Upper limits 2,500' AGL
E	General Controlled Airspace	None
G	Uncontrolled Airspace	None

Source: FAA; U.S. Department of Commerce

The airport is surrounded by Class G and E airspace. Class G airspace is uncontrolled airspace. The Class E controlled airspace around the Airport starts at 700 feet Above Ground Level (AGL) and extends vertically to 14,500 feet Mean Sea Level (MSL) when it reaches Class A airspace. Class E airspace is a controlled area that includes airspace corridors identified as federal airways, or that accommodate jet traffic at low altitudes. High speed and transport air traffic operate from military bases in the region, including Dover Air Force Base to the north and Patuxent Naval Air Station (NAS) to the southwest. There is also restricted airspace associated with Patuxent NAS within 25 miles of the airfield; however, no such restrictions currently exist or are anticipated for the airspace immediately surrounding GED. Subsequent sections in this chapter will discuss NAVAID improvements for the Airport.

E. AIRPORT FACILITY REQUIREMENTS

This section establishes general facility requirements for future development of the Airport. Chapter One of this study presented an inventory of the existing infrastructure at the Sussex County Airport. Existing and forecast aviation demand for the 20-year planning horizon (2002-2021) was presented in Chapter Two. These two chapters serve as the basis for developing existing and future Airport Facility Requirements. The Airport Facility Requirements are based upon FAA Advisory Circular 150/5300-13, “Airport Design,” as it relates to the current and future critical aircraft. As discussed in Chapter Two, the critical aircraft determines the Airport Reference Code from which the airside geometrics are evaluated.

Aside from the FAA criteria, the runway system must be developed to accommodate the aircraft that use, or are anticipated to use, the facility on a routine basis. The weight, wingspan, and performance characteristics of these aircraft, under specific conditions, ultimately determine the airport’s geometry in terms of runway/taxiway configurations, lengths, and separations. The types of approach aids, lighting, and navigational equipment required at an airport are determined primarily by the level of annual activity, weather, terrain characteristics, and the role of the airport in the national system of airports. Finally, apron size and parking requirements, as well as other airport service requirements, both airside and landside, are determined based on the unconstrained aviation demand forecasts contained in Chapter Two of this study.

Airside facilities include the runway and taxiways, their orientation, layout, length, and strength. Factors considered include aircraft fleet mix, operations, wind, weather, and runway capacity. Airside facilities also include parking aprons and other areas in which aircraft operate.

1. Runway Analysis

This section evaluates the runway lengths, widths, safety areas, and object free areas in relation to the existing and future aircraft expected to use this facility. Using FAA advisory circulars and specific manufacturers' aircraft performance data, recommendations for the development of the Sussex County Airport runway system were made.

a. Runway Length

Required runway length is a function of an airport's elevation, mean maximum temperature of the hottest month, aircraft take off weight, aircraft engine performance, runway gradient, and wet or dry pavement surfaces. All of these variables affect the runway take off and landing length. Runway length can be determined by using the FAA Airport Design computer program and procedures outlined in FAA Advisory Circular 150/5300-13, "Airport Design," and/or by using the respective manufacturer's performance curves for the critical aircraft.

Table 3-7 presents the runway length requirements using the FAA Airport Design software, version 4.2D. Using the mean maximum temperature of 89 degrees for the hottest month, and an airport elevation of 50 feet mean sea level (MSL), the required runway lengths were determined for the families of aircraft shown in the table.

Table 3-7
Sussex County Airport
Recommended Runway Lengths

Airport and Runway Data		
Airport elevation		50 feet
Mean daily maximum temperature of the hottest month (July)		89.00 F
Maximum difference in runway centerline elevation		0 feet
Stage length for airplanes of more than 60,000 pounds		1,000 miles
Runway Lengths Recommended for Airport Design	**DRY**	**WET**
Small airplanes with fewer than 10 passenger seats		
75 percent of these small airplanes	2,510 feet	2,510 feet
95 percent of these small airplanes	3,070 feet	3,070 feet
100 percent of these small airplanes	3,640 feet	3,640 feet
Small airplanes with 10 or more passenger seats	4,250 feet	4,250 feet
Large airplanes of 60,000 pounds or less		
75 percent of these large airplanes at 60 percent useful load	4,670 feet	5,350 feet
75 percent of these large airplanes at 90 percent useful load	6,650 feet	7,000 feet
100 percent of these large airplanes at 60 percent useful load	5,400 feet	5,500 feet
100 percent of these large airplanes at 90 percent useful load	8,240 feet	8,240 feet
Airplanes of more than 60,000 pounds	5,970 feet	5,970 feet

Source: FAA Airport Design Computer Program, Version 4.2D
Delta Airport Consultants, Inc. Analysis

Based on the Airport Design Computer Program tabulations, a runway length of 5,350 feet is required to serve 75 percent of large aircraft of 60,000 pounds or less given the Airport's mean maximum daily temperature and field elevation, and assuming the aircraft is operating at 60 percent useful load with wet and slippery runway conditions.

Performance curves for the Raytheon HS125-700/800 and the Boeing Business Jet (BBJ) were also reviewed to determine primary runway length requirements for the Sussex County Airport. These aircraft represent the highest performance aircraft based at the field and those that use the field regularly as a maintenance base. The combined operations of these aircraft types exceed the 500 annual itinerant operations level as established by the FAA to define regular use. The HS125 is one of the representative aircraft of the medium business jet family identified as the critical aircraft for GED. Example performance curves for both the HS125 and the BBJ aircraft operating at the Airport are presented in **Appendix B. Table 3-8** displays the recommended runway lengths based on Sussex County field conditions.

HS125

Table 3-8
Sussex County Airport
Runway Length Analysis

Aircraft	MGTW (lbs)	Desired TOW (lbs)	Runway Length (ft) Required	
HS 125-700	25,500	24,800	7,000	
HS 125-800	27,400	27,060	6,700	
				Wet
BBJ	171,000	155,000	5,300	5,900
BBJ2	174,200	160,000	6,300	6,500

Source: Raytheon HS125-700/800 Performance Charts
Amerijets, Inc. Flight Operations
Boeing Airplane Characteristics Manual for Airport Planning
Boeing Commercial Airplanes Group, Flight Operations Engineering & Performance Data Group
Delta Airport Consultants, Inc. Analysis

Notes: HS125 calculations based on operating weight plus maximum fuel & 60% cabin load.
BBJ calculations based on Operating Empty Weight plus Useable Fuel; assuming mid-range additional auxiliary tanks and no cargo load.
Aircraft performance based on Standard Day temperature plus 27 degrees Fahrenheit.
Flap setting at optimum take off performance.
Assumes zero wind and zero runway gradient.
MGTW = Max gross take off weight
TOW = Take off weight

As illustrated in Table 3-8, the existing primary runway length of 5,000 feet is not adequate to fully serve the airport's critical aircraft, and further, it precludes any departure operation of the BBJ assuming the field's mean max daily temperature of 89 degrees Fahrenheit with wet runway conditions. Although the runway length requirements depicted in Table 3-8 highlight aircraft and conditions requiring greater length than 6,000 feet, preliminary reviews indicate railroad, roadway, and legal political issues that may limit the feasibility of an extension beyond 6,000 feet. **Therefore, it is recommended that Runway 4-22 be extended to provide a useable length of 6,000 feet. The extension will better serve the entire range of medium-size business jet aircraft currently operating at the Sussex County Airport, as well as the aircraft types specifically mentioned earlier.**

As noted previously, a preliminary study was conducted in 1999 to evaluate the feasibility of rehabilitating Runway 10-28 as the crosswind runway for GED. The study identified several limitations associated with improving Runway 13-31, including the point that the existing 2,330-foot length limits its use to mostly single-engine and some light twin-engine aircraft. The study also noted that extension of the runway was cost-prohibitive. A review of the 1999 study was conducted in conjunction with this Master Plan Update and **the recommendation remains that Runway 10-28 should be considered as the primary alternative to providing an extended crosswind runway to serve a greater share of the general aviation aircraft operating at the Sussex County Airport.**

FAA Advisory Circular (AC) 150/5325-4A, "Runway Length Requirements for Airport Design," recommends that a crosswind runway have a length of at least 80 percent that of the primary runway. Given the existing and proposed primary runway length, this guideline would result in a crosswind runway length of approximately 4,000 feet. The data presented in Table 3-7 supports this approach, indicating that a crosswind runway should be between 3,070 feet and 4,250 feet in length to serve the majority of the general aviation aircraft fleet. **It is recommended that Runway 10-28 be reopened and rehabilitated to a length of approximately 3,500 feet.**

b. Runway Width

FAA design criteria specify runway width based on aircraft approach category and design group, and the associated visibility minimums for the given runway if within Category A or B. Runway 4-22 development is recommended to be to ARC C-II design specifications and thus requires a runway width of 100 feet. The existing runway width is 150 feet and is therefore adequate for the critical aircraft using GED. Due to the established maintenance base serving the Boeing Business Jet, an ARC C-III aircraft, **it is recommended that the 150-foot width be maintained.**

Runway 13-31 is currently categorized as an ARC A-I runway and has an existing width of 50 feet. The existing width does not meet the FAA design standard of 60 feet for ARC A-I. **It is recommended that Runway 13-31 be closed or rehabilitated for use as a taxiway only. It is further recommended that Runway 10-28 be reopened and rehabilitated to a 75-foot width consistent with the design standard for an ARC B-II runway.**

c. Runway Safety Areas (RSA)

FAA Advisory Circular 150/5300-13, "Airport Design," designates a minimum Runway Safety Area (RSA) based on the airport reference code of the runway. A runway safety area is defined as a surface surrounding the runway that is suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. The RSA is required to be clear of objects except for objects mounted on frangible (low-impact resistant) supports whose location is fixed by function (e.g., approach lighting, navigational aids).

RSA standards cannot be modified or waived as is the case with many other airport design standards. The dimensional standards remain in effect regardless of the presence of natural or man-made objects or surface conditions that might create a hazard to aircraft that may leave the runway surface. Should a substandard RSA be identified, a continuous evaluation of all practicable alternatives for improving each substandard condition is required until all standards have been met. As discussed previously, Runway 4-22 should be classified as ARC C-II and Runway 10-28 as ARC B-II.

For ARC C-II runways, the standard RSA width is 500 feet centered on the runway and extending 1,000 feet beyond each runway end. The RSAs for Runway 4-22 meet the existing ARC B-II standards (150 feet wide and 300 feet beyond each runway end), but would be marginal if the runway is upgraded to ARC C-II . **The RSAs should be improved to meet ARC C-II standards**.

The RSAs for existing Runway 13-31 meet the existing ARC A-I standards, 120 feet wide and 240 feet beyond each runway end. For ARC B-II, as recommended for the future crosswind runway, the standard RSA width is 150 feet centered on the runway and extending 300 feet beyond each runway end. **The standard RSAs should be constructed during the rehabilitation of the crosswind runway.**

d. Obstacle Free Zone

The clearing standard for the OFZ precludes taxiing and parked airplanes and object penetrations, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function. The NAVAIDs located in the OFZ are fixed by function, in order to provide clearance protection for aircraft landing or taking off from the runway, and for missed approaches, where applicable. The OFZ is subdivided as follows:

> Runway OFZ (ROFZ) – The defined volume of airspace above the runway surface centered on the runway centerline. The ROFZ is the airspace above a surface whose elevation at any point is the

same as the elevation of the nearest point on the runway centerline. The ROFZ extends 200 feet beyond each runway end. The width of the ROFZ for Runway 4-22 is 400 feet as it serves large airplanes. The width of the ROFZ for Runway 13-31 is 250 feet. Currently, there are no objects violating the runway OFZs at the airport. The ROFZ for the proposed ARC B-II crosswind runway will be 400 feet.

Inner-Approach OFZ – A defined volume of airspace centered on the approach area that applies only to runways with an approach lighting system. Neither runway at GED currently has an approach lighting system (ALS), therefore, the inner-approach OFZ does not apply. **Installation of an Instrument Landing System (ILS) is recommended and the inner-approach OFZ will be defined in association with the ALS installation.**

Inner-Transitional OFZ – A defined volume of airspace along the sides of the runway OFZ and the inner-approach OFZ that applies only to runways with approach visibility minimums lower than 3/4-statute mile approach visibility minimums. No runway at the Sussex County Airport currently has approach minimums lower than 3/4-statute mile. **The inner-transitional OFZ will be defined as necessary in association with the ILS instrument approach procedure.**

e. Runway Object Free Area (ROFA)

The Runway Object Free Area (ROFA) is an area centered on the runway centerline and defined based on runway approach category, design group, and approach visibility minimums. It is provided to enhance the safety of aircraft operations by having the area free of objects except for those 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. Runway Object Free Areas are illustrated on **Exhibit 3-1.**

For ARC C-II runways, the standard ROFA width is 800 feet centered on the runway and extending 1,000 feet beyond each runway end. The established ROFA for Runway 4-22 meets the existing ARC B-II standards (500 feet wide and 300 feet beyond each runway end), but would extend beyond airport property to the north and south if the runway is upgraded to ARC C-II . The ROFA would penetrate a railroad right-of-way to the north and a public road right-of-way to the south. **Shifting the runway 22 threshold 300 feet to the southwest, in conjunction with the recommended runway extension, will provide a standard ROFA to ARC C-II standards.**

The ROFA for existing Runway 13-31 meets the ARC A-I "small airplanes exclusively" standard; 250 feet wide and 240 feet beyond each runway end. For ARC B-II, as recommended for the future crosswind runway, the standard ROFA width is 500 feet centered on the runway and extending 300 feet beyond each runway end. **The standard ROFA should be constructed during the rehabilitation of the crosswind runway.**

Exhibit 3-1

ROFA

f. Runway Protection Zones

Runway protection zones (RPZ) are trapezoidal in shape, centered about the extended runway centerline, and begin 200 feet beyond the end of the usable pavement for take-off and landing. The size of an RPZ is determined by the critical aircraft approach category and the visibility minimums associated with the approach end of the runway. Their function is to enhance the protection of people and property on the ground. This is achieved through airport owner control over RPZs. Such control includes clearing RPZ areas (and maintaining them clear) of incompatible objects and activities. Control is preferably exercised through the acquisition of sufficient property interest in the RPZ. Runway protection zones are illustrated in Exhibit 3-1, on the previous page.

The dimensions of the existing RPZs for Runways 4 and 22, as depicted on the approved Airport Layout Plan (ALP), are 500 feet (inner width) by 1,010 feet (outer width) by 1,700 feet (length). The county holds fee simple title to the property within the RPZs with the exception of approximately two acres to the south of the Runway 4 approach and approximately 12 acres north of the Runway 22 approach. An avigation easement acquired in 1944 provides the County the right to clear standing timber or brush which constitutes a menace or hazard to persons using the Airport, and to prevent the recurrence of such objects for as long as the Airport is in operation. **It is recommended that the County acquire in fee simple interest the property necessary to secure control of the Runway 4 and 22 RPZs.**

Installation of the precision approach and ILS as recommended will result in the further increase of the Runway 4 RPZ dimensions to 1,000 feet by 1,750 feet by 2,500 feet. This requirement, combined with the recommended 1,000-foot extension to Runway 4, will require additional property to the south to secure the Runway 4 RPZ. **It is recommended that the County acquire in fee simple**

interest the property necessary to secure control of the Runway 4 RPZ as it is enlarged for the ILS installation.

The dimensions of the existing RPZs for Runways 13 and 31 (ARC A-I, small airplanes exclusively) are 250 feet (inner width) by 450 feet (outer width) by 1,000 feet (length). Both RPZs are entirely within the existing airport property boundary. The RPZ dimensions for the recommended crosswind runway are 500 feet by 700 feet by 1,000 feet and will extend beyond the existing airport property boundary. **It is recommended that the property necessary acquired in fee simple interest to ensure control of the Runway 28 RPZ**.

g. Pavement Strength and Condition

The original runways at the Sussex County Airport were World War II-era pavement constructed in the early 1940s, and much of the original portland cement concrete surfaces remain exposed on crosswind Runway 13-31 and the currently closed Runway 10-28. The PCI (Pavement Condition Index) is accepted by the FAA to determine the present condition of pavement in terms of apparent structural integrity and operational surface condition, as well as to compare the condition and performance of pavements at all airports, as detailed in Advisory Circular 150/5380-6, "Guidelines and Procedures for Maintenance of Airport Pavements."

Runway 4-22 was rehabilitated following a 1993 pavement evaluation conducted in conjunction with the Master Plan effort at that time. The runway pavement design strength is currently 70,000 lbs. dual-wheel loading based on the medium to large general aviation jet aircraft the airport serves. The critical family of Aircraft for the planning period as presented in Chapter 2 includes the Gulfstream G-III with a maximum gross take-off weight of 69,700 pounds. This pavement strength is appropriate to accommodate the projected traffic during the planning period. **It is recommended that the pavement strength be maintained to**

70,000 lbs. dual-wheel loading during the construction of the runway extension, and that consideration be given to a maintenance overlay during the extension project.

The pavement of Runway 13-31 was also evaluated in 1993 and recommended for rehabilitation; however, no such work occurred, pending a decision on the best way to provide an improved crosswind runway. The 1993 report noted that the runway was structurally adequate for the 12,500-lb. aircraft that typically use it, but that the 50-year- old concrete is severely distressed and potentially creating a Foreign Object Debris (FOD) hazard. **It is recommended that Runway 13-31 be closed or rehabilitated for use as a taxiway only.**

Runway 13-31

The 1999 Runway 10-28 Preliminary Study recommended that it be reopened as the crosswind runway following pavement rehabilitation. Pavement core samples of Runway 10-28, from a pavement evaluation conducted during October 2002, indicated PCI values of 35 and zero within various pavement sections. The PCI value scale from FAA Advisory Circular 150/5380-6, "Guidelines and Procedures for Maintenance of Airport Pavements," defines these value ranges as "poor" and "failed" respectively. The pavement evaluation report, prepared by Applied Pavement Technology, Inc., indicated that although pavement rehabilitation may be an alternative, full reconstruction may still be the most cost-effective. **It is recommended that Runway 10-28 be rehabilitated in order to provide minimum pavement strength of 12,500 lbs. single-wheel loading. The recommended runway improvements will provide adequate pavement strength for aircraft currently operating at the Airport, including the Beechcraft Super King Air B-200.**

h. Runway Gradient

FAA Advisory Circular 150/5300-13, "Airport Design," defines runway gradient standards based on the airport reference code of the runway. The maximum longitudinal grade for aircraft approach categories A and B are plus or minus 2 percent, while for category C, it is plus or minus 1-1/2 percent; however, the first and last quarter of the length of an ARC C-II runway should not exceed 0.8 percent gradient. After reviewing airport topography mapping and the runway elevations based on aerial surveys, it was determined that all runway gradients are well within the maximum design standard. **It is recommended that any extension to Runway 4-22 and rehabilitation of the crosswind runway be constructed within the FAA design standards.**

i. Runway Lighting and Markings

Runways 4-22 and 13-31 are equipped with medium intensity runway lights (MIRLs). As reported in Chapter One, the MIRLs are in good condition and should be maintained to ensure their useful life. **However, due to the increased number of jet operations at Sussex County Airport, high intensity runway lighting (HIRL) is recommended for Runway 4-22 during the planning period to complement the proposed Instrument Landing System (ILS).**

Runway 4-22 is marked with nonprecision markings that are in good condition. **It is recommended that the runway markings be maintained as nonprecision until installation of the precision instrument approach equipment and procedure. When Runway 4-22 instrumentation is upgraded with the ILS, precision markings should be included with the project.**

Runway 13-31 is marked as a basic visual runway, and the existing markings are faded and need to be repainted. **It is recommended that the visual markings be**

maintained to promote safe operations until such time that this runway is closed.

It is recommended that markings for Runway 10-28 be established as basic visual initially, and then upgraded as appropriate following installation of any NAVAID or navigational system that may provide an instrument approach procedure for the crosswind runway.

2. Taxiways

Additions or improvements to an airport taxiway system are typically undertaken to increase airport capacity and operational efficiency, and to enhance safety. An efficient runway/taxiway system will increase an airport's ability to handle arriving and departing aircraft, as well as expedite ground movement between the runway and terminal areas.

Runway 4-22 has a full-length parallel taxiway (Taxiway A) with dual use entrance/exit taxiways at each end of the runway and a single exit taxiway (Taxiway B) at the midpoint of the runway. Both taxiways are 50 feet in width. Taxiway C serves as an exit taxiway to the larger corporate hangars at the northeast corner of the airfield. This taxiway was repaved to a width of 70 feet, and extends approximately 2,000 feet to the southeast, from the approach end of Runway 22, to support larger corporate aircraft such as the Boeing Business Jet (BBJ) and Boeing 727s that are maintained in the hangars.

FAA Advisory Circular 150/5300-13 requires a minimum separation distance of 240 feet between the runway and parallel taxiway centerlines for a B-II runway. The existing parallel taxiway (A) is separated 700 feet from the runway. As a result, the taxiway's proximity to the terminal area facilities and aircraft parking apron prevents use of the taxiway by the ARC C-III aircraft. Therefore, Boeing Business Jets and similar aircraft landing on Runway 22 are required to back-taxi to Taxiway C. **It is recommended that a new parallel taxiway for Runway 4-22 be constructed at the standard 400-foot**

separation consistent with ARC C-III design criteria. Development alternatives for the location of the proposed taxiway will be presented in the next chapter.

As mentioned previously, FAA Order 5090.3C, "Field Formulation of the NPIAS," indicates that all runways should have a parallel taxiway to service those aircraft utilizing the runway. Currently, crosswind Runway 13-31 does not have a parallel taxiway, however, the runway is recommended to be closed. **It is recommended that a parallel taxiway for Runway 10-28 be constructed. The use of runway 13-31 as a transitional taxiway to Runway 10-28 has been considered, however the existing pavement on Runway 13-31 is in very poor condition and provides limited access to Runway 10-28. The 1999 Runway 10-28 Preliminary Study estimated the costs to rehabilitate Runway 13-31 as a taxiway to be greater than construction of a parallel taxiway in conjunction with the rehabilitation of Runway 10-28. Given the airports operational level and projected growth during the 20-year planning period, the parallel taxiway should be pursued as an element of fundamental airfield development. Development alternatives for the location of this proposed taxiway will be presented in the next chapter.**

As the new parallel taxiways are developed, additional exit taxiways should be constructed to provide improved efficiency of ground traffic flow to and from the terminal and corporate hangar aprons. Development alternatives for strategically located exit taxiways will be presented in the next chapter.

3. Navigational Aids (NAVAIDs) – Instrument Approach Procedures

Navigational Aids (NAVAIDs) are a system of electronic and visual aids that help pilots to navigate their aircraft in a safe and orderly manner during takeoff, approach, and landing. NAVAIDs may be physically located on the airport property or at a remote location, and may be intended to assist the pilot in generally locating the landing environment or to assist the pilot in aligning the aircraft with a specific runway for landing.

In Chapter One, a description of the existing NAVAIDs at the Sussex County Airport was provided. Historically, because electronic navigational aids have been expensive to install and maintain, they were primarily found only at commercial service airports or very large general aviation airports. With the advent of the Global Positioning System (GPS), air navigation now has an economic and efficient system that can allow many smaller general aviation airports to provide a level of electronic navigational assistance to user pilots. The FAA is currently working to establish local area and wide area augmentation systems that will enhance GPS operations to the level of the current Instrument Landing System (ILS) installations.

The rotating beacon is an example of a visual NAVAID intended to assist the pilot in identifying the airfield landing environment. The existing rotating beacon at Sussex County Airport is mounted atop the FBO hangar near the middle of the terminal area. Pilot comments received from the tenant/user survey and from individual interviews indicate the beacon is difficult to see when approaching from the north. The beacon has been relocated to a tower structure west of the County Emergency Operation Center.

The following are runway-specific recommendations for visual and electronic NAVAIDs, as well as instrument approach procedures at the Sussex County Airport.

a. Runway 4-22

As presented in Chapter One, Runways 4 and 22 currently have RNAV (GPS) and VOR nonprecision approach procedures established. Both runways are also equipped with Precision Approach Path Indicators (PAPIs) and Runway End Identifier Lights (REILs).

Based on the wind data presented in Chapter 1, Runway 4 is the runway of choice more than 60 percent of the time during instrument meteorological conditions (IMC). **Therefore, it is recommended that Runway 4 be designated as the airport's primary precision instrument approach and be equipped with a**

Instrument Landing System (ILS). The ILS glideslope and localizer should be complemented by a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). This system will achieve the recommended approach visibility minimum of one-half statute mile, a significant reduction from the existing 1-1/4 statute mile for Category C aircraft. It is also anticipated that the current minimum descent altitude (MDA) of 480 feet MSL will be reduced as the new instrument approach procedure is established. Installation requirements for the MALSR system will be dependent on final design of the runway extension; development alternatives will be presented in the next chapter.

b. Runway 13-31

Runway 13-31 is a visual runway only and is not currently equipped with any of the NAVAIDs discussed in section a. **It is recommended that Runway 13-31 not be used as a runway, after Runway 10-28 is rehabilitated and therefore, no such NAVAIDs are required.**

c. Runway 10-28

Runway 10-28 is currently closed, but has been recommended to be reopened as the crosswind runway. **It is recommended that Runway 10-28 be reopened with visual approaches and consideration for a non-precision approach in the future as operational activity warrants. Additionally, Precision Approach Path Indicators (PAPIs) be installed on Runways 10 and 28. Consideration during the planning period should also be given to the installation of REILs as the use of the runway increases and should a nonprecision instrument approach procedure be established.**

Table 3-9 lists the existing (E) and proposed (P) ground-based visual and electronic NAVAIDs specific to each runway.

Table 3-9
Sussex County Airport
Visual and Electronic NAVAIDs

Navigational Aids	Runway		Runway		Runway	
	4	22	13	31	10	28
Visual Approach Slope Indicator (VASI)	E	E				
Runway End Identifier Lights (REIL)	E	E			P	P
Precision Approach Path Indicator (PAPI)	P	P			P	P
ILS Components						
Approach Lighting System (MALSR)	P					
Glide Slope (GS)	P					
Localizer (LOC)	P					
GPS Local Area Augmentation System (LAAS)	P	P			P	P

Note: E = Existing / P = Proposed
Source: Delta Airport Consultants, Inc.

4. Aircraft Apron and Tie-Downs

Aircraft parking requirements can vary widely from airport to airport. The need for space depends on the percentage of itinerant aircraft using the airport and the number of based aircraft owners who choose to tie down their aircraft on the ramp, in lieu of leasing available hangar space. General aviation airport tie-down areas typically offer a greater number of Group I than Group II tie-down positions, and thus should an unexpected volume of Group II aircraft need to be accommodated on the apron, significant inefficiency in space allocation may occur. A single Group II aircraft may require the same space as three or more Group I aircraft. For this reason it is important to plan accommodations for both groups of aircraft and segregate the parking areas whenever possible. The Sussex County Airport serves Group II transient aircraft on a routine basis and has recently received Group III transient aircraft, which may require the same space as five or more Group I aircraft.

This section analyzes the number of tie-down or parking positions needed for both Group I and Group II aircraft, as well as a total area of apron for the 20-year planning period. A typical general aviation apron layout is illustrated in **Exhibit 3-2**.

Exhibit 3-2

Apron Layout

a. Transient Aircraft Apron

Aircraft parking requirements typically make up the largest demand for apron space requirements and are most likely to generate unexpected Group II or III demand. Aircraft arrive from outside, or depart, the local traffic pattern as defined in Chapter Two. For the purpose of this analysis, peak day itinerant operations from the forecast chapter were used to determine apron space requirements for the 20-year planning period.

The existing apron provides approximately 15,500 square yards of parking area and is located directly in front of the terminal building and FBO hangars. There are nine paved tie-down positions for Group I aircraft in front of and near the primary FBO hangar. Tie-down anchors are positioned in front of the terminal building to maximize the use of space. The area is set to accommodate approximately 20 Group I aircraft or 10-12 Group II aircraft.

Itinerant Apron

For purposes of this analysis it is assumed, as specified in Advisory Circular 150/5300-13, that 50 percent of daily operations are aircraft that will be on the apron simultaneously during a busy day. **Table 3-10** details the itinerant aircraft activity for the planning period.

Table 3-10
Sussex County Airport
Itinerant Aircraft Activity

	2002	2007	2012	2021
Itinerant OPS / Busy Day	**32**	**34**	**37**	**41**
Itinerant Aircraft / Busy Day	16	17	19	22
Single Engine	11	11	12	13
Multi-Engine	2	2	3	4
Business Jet	1	2	2	3
Rotorcraft	2	2	2	2

Source: Delta Airport Consultants, Inc. Analysis
Itinerant Aircraft mix is based on Table 2-7.

Planning allocations for these aircraft types are 500 square yards for single-engine aircraft, 700 square yards for multi-engine (piston)/multi-engine (turbine) aircraft, 900 square yards for business jet aircraft, and 200 square yards for other aircraft (rotorcraft). These planning allocations were prepared by Delta Airport Consultants, Inc. and provide space for aircraft movement and circulation area, as well as actual parking positions. They are based on guidance provided in FAA AC 150/5300-13. **Table 3-11** presents the apron requirements for itinerant aircraft for the 20-year planning horizon.

Table 3-11
Sussex County Airport
Itinerant Aircraft Apron Requirements

Aircraft Types	2002 SY (# a/c)	2007 SY (# a/c)	2012 SY (# a/c)	2021 SY (# a/c)
Single Engine	5,500 (11)	5,500 (11)	6,000 (12)	6,500 (13)
Multi-Engine	1,400 (2)	1,400 (2)	2,100 (3)	2,800 (4)
Business Jet	900 (1)	1,800 (2)	1,800 (2)	2,700 (3)
Rotorcraft	400 (2)	400 (2)	400 (2)	400 (2)
Total Requirements	**8,200**	**9,100**	**10,300**	**12,400**

Source: Delta Airport Consultants, Inc. Analysis
(0) = Number of aircraft spaces.

b. Based Aircraft Apron

Based aircraft, as opposed to itinerant aircraft, are permanently stored at the airport. FAA guidelines recommend that tie-down spaces be provided for all based aircraft not stored in hangar facilities. Historically, aircraft types that are routinely stored or parked on the apron are the less expensive Group I single-engine aircraft types. The larger and more expensive aircraft, such as the multi-engine aircraft types (typically Group II), are normally stored in hangars.

The Airport currently has approximately 12,500 square yards of apron committed to the parking of based aircraft. This area provides 27 paved tie-downs located southwest of the terminal building, and 18 grass tie downs located directly in front of the FBO hangars.

Based aircraft -grass tie downs

The based tie-down areas are approximately 75 percent occupied. All other aircraft based at the Sussex County Airport are stored in T-hangars or conventional hangars. Based on information from the FBO and from on-site observations, it is estimated that 30 percent of single-engine, Group I, aircraft based at GED will require apron parking during the planning period. The percentage of any other types of aircraft to be stored on the apron is expected to remain constant at zero for the planning period.

The square yard (SY) space allocated per based aircraft is the same as the itinerant aircraft formula. These space allocations include areas for aircraft positioning and circulation. **Table 3-12** presents the forecasted based tie-down area requirements for the 20-year planning horizon.

Table 3-12
Sussex County Airport
Based Aircraft Apron Tie-Down Requirements

	2002	2007	2012	2021
Single Engine (Group I)	14	14	15	17
Tie Down Requirements (SY)	7,000	7,000	7,500	8,500

Source: Delta Airport Consultants, Inc. Analysis
Apron parking demand calculated based on 30% of single-engine based aircraft as per Table 2-2.

c. Total Apron Space Requirements

The preceding discussions have identified the total demand for apron space for the planning period. Apron size requirements have been established for both based and itinerant aircraft. Planning allocations for these aircraft types were 500 square yards for single-engine aircraft, 700 square yards for multi-engine (piston)/multi-engine (turbine) aircraft, 900 square yards for business jet aircraft and 200 square yards for other aircraft (Rotorcraft). **Table 3-13** presents a summary of apron requirements for the planning period.

Table 3-13
Sussex County Airport
Aircraft Apron Requirements

Aircraft Types		2002 (SY)	2007 (SY)	2012 (SY)	2021 (SY)
Itinerant Aircraft					
Single Engine		5,500 (11)	5,500 (11)	6,000 (12)	6,500 (13)
Multi-Engine		1,400 (2)	1,400 (2)	2,100 (3)	2,800 (4)
Business Jet		900 (1)	1,800 (2)	1,800 (2)	2,700 (3)
Rotorcraft		400 (2)	400 (2)	400 (2)	400 (2)
	Sub-Total	8,200	9,100	10,300	12,400
Based Aircraft					
Single Engine		7,000 (14)	7,000 (14)	7,500 (15)	8,500 (17)
Total Apron Requirements		**15,200**	**16,100**	**17,800**	**20,900**
Existing Useable Pavement		**28,000**	**28,000**	**28,000**	**28,000**
Deficiencies (-)/Capacity (+)		**+12,800**	**+11,900**	**+10,200**	**+7,100**

Source: Delta Airport Consultants, Inc. Analysis
(0) = Number of aircraft spaces.

As shown in Table 3-13, there is sufficient apron space to meet the needs of the existing and future general aviation activity demand. Although the calculated requirements indicate capacity available, additional apron may be required as based versus itinerant demand develops during the planning period. The linear layout of the existing apron area and available development space will be further evaluated in the next chapter, Alternatives.

5. Hangar Requirements

a. Conventional Hangars

Conventional hangars typically provide storage for multiple aircraft of various sizes and types. There are currently fourteen conventional hangars at Sussex County Airport ranging in size from 2,500 square feet to over 48,000 square feet. As noted in Chapter One, eleven of the hangars are intended to serve the storage needs of small and large aircraft up to the medium business jet. This type of hangar represents 25 percent of the existing conventional capacity at GED offering approximately 40,000 square feet available for public storage. Another 14,000 square feet of conventional hangar space exists, but is either committed to aircraft maintenance or in service by the Delaware State Police. All of these facilities are located along the parallel taxiway to Runway 4-22, northwest of the terminal area, each with its own direct access to the taxiway.

The remaining three conventional hangars total 160,000 square feet and are designed for much larger aircraft such as the Boeing 727 and 737. The larger facilities are located remotely from the terminal area along Nanticoke Avenue adjacent to the industrial park. Access to the hangars is via the 70-foot-wide Taxiway C from the approach end of Runway 22. Approximately 105,000 square feet of this type of space is committed to Boeing Business Jet maintenance operations in two hangars owned and operated by the PATS/DeCrane corporation. The third large hangar, 54,600 square feet, is currently available for lease or sale. This type of facility is unique for a general aviation airport such as Sussex County due to the significant cost to lease These large hangars are typically leased by specialty operators and are not generally used for based aircraft storage. As such, the large facility has been removed from the hangar requirement calculations highlighted in this Chapter.

b. T-Hangars

T-hangars are individually nested multiple unit structures that are capable of accommodating one aircraft per unit. T-hangars are capable of accommodating single-engine and small twin-engine aircraft only, while larger aircraft are generally stored in conventional hangars. Currently, there are four T-hangar facilities at the airport: two single aircraft units, one 6-unit structure and one 10-unit structure, providing a total of 18 individual storage units. The T-hangars are located along the parallel taxiway to Runway 4-22 and adjacent apron areas. The T-hangars are currently full, with more than 20 aircraft owners on a county waiting list for a space.

c. Hangar Requirements

Hangar space requirements include demand generated by based aircraft, normal fixed base operations, and corporate use. The following assumptions were made to determine hangar space requirements for based aircraft at the Sussex County Airport:

- 70% of all single engine aircraft will require hangar space
- 100% of all multi-engine aircraft will require hangar space
- 100% of all turbojet aircraft will require hangar space
- 100% of all others (i.e., rotorcraft) will require hangar space

Planning ratios for each type of aircraft were based on discussions with the FBO and the county and are illustrated in **Table 3-14.**

Table 3-14
Sussex County Airport
Hangar Planning Ratios

Aircraft Types	Conventional Hangars	T-Hangars
Single Engine	5%	90%
Multi-Engine Piston	70%	30%
Multi-Engine Turbine	100%	0%
Business Jet	100%	0%
Rotorcraft	100%	0%

Source: Delta Airport Consultants, Inc.

The conventional hangar space standards that were used for each aircraft type to determine the required hangar space are shown in **Table 3-15.** These dimensions represent the optimum space required to provide ample hangar space for aircraft to be maneuvered in and out. They do not include any additional spacing required for related hangar operations or aircraft circulation.

Table 3-15
Sussex County Airport
Hangar Space Standards

Aircraft Types	Conventional Hangars
Single Engine	1,200 sq. feet
Multi-Engine	1,400 sq. feet
Business Jet	3,000 sq. feet
Rotorcraft	1,200 sq. feet

Source: Delta Airport Consultants, Inc.

The total hangar requirements are highlighted in **Table 3-16.** As indicated, the airport has an existing deficit of 13 T-hangar units currently, and an additional eight more units for based aircraft by the end of the planning period. This projected demand is substantiated by the existing waiting list for T-hangar units. **It is recommended that additional T-hangars be constructed to meet existing and future demand.**

Table 3-16 also presents the number of aircraft and associated square feet of conventional hangar space required during the planning period. The analysis indicates there is adequate conventional hangar space to accommodate both existing and future demand. However, it is important to note that conventional hangar facilities may be constructed by private firms with sufficient capacity to meet their individual future demand and the companies may be reluctant to offer existing surplus hangar space for sub-lease. Virtually all of the conventional hangars at Sussex County are privately or corporately owned, and current interest in additional conventional hangar space indicates that demand may grow at a faster pace than projected. **As a matter of local and regional economic development, it is recommended that Sussex County continue to work with interested parties to construct additional conventional hangar facilities.**

Table 3-16
Sussex County Airport
Total Hangar Requirements

Hangar Type	2002	2007	2012	2021
T-Hangar Units				
Single Engine	30	31	33	38
Multi-Engine	1	1	1	1
Total Required	31	32	34	39
Existing	18	18	18	18
Deficiency (-)/Capacity (+) (SF)	**-13**	**-14**	**-16**	**-21**
Conventional Hangar Area[1]				
Single Engine	2	2	2	2
Multi-Engine	4	5	6	8
Business Jet	3	5	6	9
Rotorcraft	2	2	3	4
Total Required (SF)	18,400	25,800	31,400	44,400
Existing (SF)	53,850	53,850	53,850	53,850
Deficiency (-)/Capacity (+) (SF)	**35,450**	**28,050**	**22,450**	**9,450**

Source: Delta Airport Consultants, Inc. Analysis; 2002
[1]SE = 1,200 SF; Multi = 1,400 SF; Business Jet = 3,000 SF; and Rotor = 1,200 SF

F. LANDSIDE FACILITY REQUIREMENTS

Landside facilities include the general aviation terminal, fencing, airport access, and automobile parking. The landside facility requirements were developed from a review of the Inventory and Forecast chapters of this study. FAA and industry guidelines were used in the preparation of these landside facility requirements.

1. Terminal Building

The terminal building is centrally located along Taxiway A near the intersection of Taxiway B and is approximately 6,150 square feet. The terminal building construction was completed in 2002 and it is in excellent condition. Similar to air carrier terminal buildings, the size of a general aviation terminal building is predicated on the total peak hour operations/passengers. Total peak hour general aviation operations for the Sussex County Airport were forecast to be from 22 in 2002 to 28 by the end of the planning period. The number of peak hour pilots and passengers is forecasted to range from 24 in 2002 to 32 by the end of the planning period. For planning purposes, arrivals and departures are assumed to be equal. A gross area of 100 square feet per peak hour passenger was used in developing the total terminal building area requirements. This includes space for airport management offices, FBO operations, pilot and public waiting lounges, restrooms, concessions, and utility and storage areas. The area requirements are presented in **Table 3-17**.

Table 3-17
Sussex County Airport
Terminal Building Area Requirements

	2002	2007	2012	2021
Peak Hour Operations	22	23	25	28
Peak Hour Pilots and Passengers	55	58	63	70
Recommended Area (SF)	5,500	5,800	6,300	7,000
Existing Area (SF)	6,150	6,150	6,150	6,150
Deficiency (-)/Capacity (+) (SF)	650	350	-150	-850

Source: Delta Airport Consultants, Inc. Analysis
Note: Peak hour pilots and passengers equals 2.5 times peak hour operations.

In summary, the existing terminal building has adequate space to support the forecasted activity levels throughout the first ten years of the planning period. **Additional capacity may be required after that time, or at such time that demand significantly increases.**

2. Airport Access and Automobile Parking

a. Airport Access

Primary access to the commercial aeronautical services and the northern perimeter of the airport is via U.S. Highway 9 east from Georgetown, connecting to local Route 319, or Airport Road. The truck route for U.S. Highway 9 (local Route 318 connecting to Route 321) circles the airport to the south and east and provides direct access to the Airport's Industrial Air Park.

Both Airport Road and County Road 319 offer adequate access to the terminal area of the airport, although both require travel through a residential area. **It is recommended that alternative access routes be considered during evaluation of development options for the extension of Runway 4-22.**

b. Automobile Parking

The Sussex County Airport currently provides 60 public parking spaces. Since the FBO and other corporate tenants on the airfield provide adequate parking for employees, employee parking was not a factor in estimating parking requirements for the planning period. Public parking spaces are located in front of and adjacent to the general aviation and FBO terminal buildings. For planning purposes, the number of automobile parking spaces required equals the sum of the peak hour pilots and passengers (2.5 pilots and passengers per peak hour operation). The results are shown in **Table 3-18**.

Table 3-18
Sussex County Airport
Public Automobile Parking Requirements

	2002	2007	2012	2021
Peak Hour Operations	22	23	25	28
Peak Hour Pilots and Passengers	55	58	63	70
Total Spaces Required	55	58	63	70
Total Existing Spaces	60	60	60	60
Deficiency (-)/Capacity (+)	5	2	-3	-10

Source: Delta Airport Consultants, Inc. Analysis

Table 3-18 indicates that adequate parking exists to accommodate automobile parking demand through the first ten years of the planning period. **Additional parking may be required after that time, or at such time that demand significantly increases.** It should be noted that the airport restaurant provides private meeting and dining room areas that are proving to be quite attractive to area community groups and additional public parking space may be required to meet this demand.

3. Fencing and Access Control

As noted in Chapter One, perimeter fence and gate access controls are limited at GED but do provide a basis for implementing an access control system. Two electronic card reader gates are currently installed, one southwest of the new general aviation terminal building and one north of the DeCrane Hangar Facility. Access authority for the gates is granted to county operations and maintenance personnel, as well as key airport tenants and users. The gates may be "siren activated" to allow approaching emergency vehicles expedited passage.

Although the airport perimeter encompasses more than 25,000 linear feet, only approximately 1,000 feet is currently fenced along Truck Route 9 near the approach end of Runway 4. Additionally, a five-foot-high chain-link fence around the DeCrane Facility offers a baseline level of security for the large commercial type aircraft (B737-700) typically on-site there.

No fence line currently exists that provides any direct access control to the airfield or aircraft. Intrusion is possible from virtually all borders by both humans and wildlife. **It is recommended that chain-link fencing be installed along the entire border of the airport property. In areas outside the terminal area, stranded barbed wire may be installed on top. The access control system initiated with the two gates noted above should be expanded as necessary to provide adequate access, but the total number of access points (gates) should be limited.**

G. ANCILLARY REQUIREMENTS

1. Fuel Facilities

Sussex County Airport has eight above-ground storage tanks (AST) related to fuel storage and delivery – Jet-A, 100LL AvGas, auto, diesel, and fuel sludge. Georgetown Air Services owns and operates four of the tanks from a fuel farm that is located northeast of the FBO terminal building. American Aerospace owns and operates a single tank to supply fuel to their customers, and DeCrane owns and operates one AST, which holds Jet-A fuel for use in their customers' aircraft. Detail on the airport's fuel storage and dispensing equipment was provided in Table 1-8.

DeCrane's fuel storage system

Fuel farm storage requirements were derived by correlating the estimated volume of fuel dispensed with the total number of annual operations. This gallon per operation ratio was used to project the annual fuel demand presented in **Table 3-19** and **Table 3-20.**

Table 3-19
Sussex County Airport
Annual Jet-A Fuel Demand

Year	Business Jet/Prop Operations	Gal./Operation	Estimated Annual Fuel Demand (Gal.)
2000	1,810	83	150,000
2002	2,199	83	183,000
2007	3,154	83	262,000
2012	4,219	83	350,000
2021	5,743	83	477,000

Source: Delta Airport Consultants, Inc.

Table 3-20
Sussex County Airport
Annual AvGas Fuel Demand

Year	Piston Operations	Gallons per Operation	Annual Fuel Demand (Gal.)
2002	39,597	1.3	50,000
2007	41,858	1.3	54,400
2012	43,985	1.3	57,200
2021	49,175	1.3	64,000

Source: Delta Airport Consultants, Inc.

Fuel storage demand calculations were based on a weekly fuel farm replenishment cycle of 9,173 Jet-A gallons and 1,230 gallons of AvGas per week. Results of the required tank capacity for the 20-year planning period are presented in **Table 3-21**.

Table 3-21
Sussex County Airport
Fuel Storage Demand and Capacity

Year	Weekly Jet-A Demand (Gal.)	Storage Jet-A Capacity (Gal.)	Weekly AvGas Demand (Gal.)	Storage AvGas Capacity (Gal.)
2002	3,519[1]	10,000	961	11,000
2007	5,038[1]	10,000	1,046	11,000
2012	6,730[1]	10,000	1,100	11,000
2021	9,173[1]	10,000	1,230	11,000

Source: Delta Airport Consultants, Inc.
[1]Estimates based on FBO sales to the public only. Figures do not include DeCrane sales to BBJ customers.

As shown in Table 3-21, fuel capacity for both Jet-A and AvGas will be more than adequate for the 20-year planning period. This analysis is based on data received from the local FBO. This analysis also assumes that a fuel supply is and will be readily available, on a weekly basis, from the petroleum suppliers.

2. Snow Removal Equipment (SRE) Storage/Maintenance Facility

Airfield maintenance equipment and snow removal equipment are currently stored in and outside of an equipment building at the northwest corner of airport property. This building is in good condition and should be maintained for the airport•s field maintenance equipment. The county is currently acquiring new snow removal equipment, and the existing field maintenance facility is inadequate to store all existing or any additional field maintenance equipment, snow removal equipment, and snow removal supplies.

Construction of a snow removal equipment building, consistent with FAA Advisory Circular 150/5220-18, "Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials," is recommended to protect the investment in the equipment and to ensure efficient snow removal operations during inclement weather conditions.

3. Airport Electrical Vault

The existing airport electrical vault is located southwest of the general aviation terminal building. **It is recommended that the electrical vault be upgraded as necessary in conjunction with the runway projects. Additional demand will be created by the high-intensity runway lighting, increased taxiway lighting and crosswind runway lighting and NAVAIDS.**

H. FACILITY REQUIREMENTS SUMMARY

This chapter presented the facility requirements for the continued development of the Sussex County Airport. Facility requirements were predicated on the existing and forecasted aviation demand. These improvements are needed to satisfy the short- and long-range aviation needs of the community. Recommendations contained herein are intended to optimize the operational efficiency, effectiveness, flexibility, and safety of the airport.

Table 3-22 contains a summary of facility requirements presented earlier in this chapter.

Table 3-22
Sussex County Airport
Facility Requirements Summary

	2002	2007	2012	2021
Itinerant/Based Apron				
Required Apron (SY)	15,200	16,100	17,800	20,900
Existing Apron (SY)	28,000	28,000	28,000	28,000
Deficiency (-)/Capacity (+)	12,800	11,900	10,200	7,100
T-Hangars				
Required Units	31	32	34	39
Existing Units	18	18	18	18
Deficiency (-)/Capacity (+)	-13	-14	-16	-21
Conventional Hangars				
Required Space (SF)	18,400	25,800	31,400	44,400
Existing Space (SF)	53,850	53,850	53,850	53,850
Deficiency (-)/Capacity (+)	35,450	28,050	22,450	9,450
Terminal Building				
Required Space (SF)	5,500	5,800	6,300	7,000
Existing Space (SF)	6,150	6,150	6,150	6,150
Deficiency (-)/Capacity (+)	650	350	-150	-850
Public Auto Parking				
Total Spaces Needed	55	58	63	70
Total Existing Spaces	60	60	60	60
Deficiency (-)/Capacity (+)	5	2	-3	-10
Fuel Farm				
Weekly Jet-A Demand (Gal.)	3,519	5,038	6,730	9,173
Weekly Jet-A Capacity (Gal.)	10,000	10,000	10,000	10,000
Deficiency (-)/Capacity (+)	6,481	4,962	3,270	827
Weekly AvGas Demand (Gal.)	961	1,046	1,100	1,230
Weekly AvGas Capacity (Gal.)	11,000	11,000	11,000	11,000
Deficiency (-)/Capacity (+)	10,039	9,954	9,900	9,770

Source: Delta Airport Consultants, Inc. Analysis

In addition to the tabulated facility requirements presented in Table 3-22, other requirements and/or recommendations are as follows:

- Develop airfield consistent with FAA design standards for ARC C-II aircraft.
- Extend Runway 4-22 and maintain 150-foot width to support ARC C-III aircraft.
- Shift Runway 4-22 to the southwest as necessary to accommodate ARC C-II RSA.
- Improve Runway 4-22 safety areas to meet ARC C-II design criteria.
- Acquire property to clear and retain control of the existing and future RPZs.
- Rehabilitate Runway 4-22 to provide the necessary pavement strength of 70,000 lbs. dual-wheel loading.
- Construct a new parallel taxiway for Runway 4-22 at 400 feet from runway centerline.
- Close Runway 13-31 or rehabilitate for use as taxiway only.
- Rehabilitate and reopen Runway 10-28 to meet ARC B-II design criteria.
- Construct parallel taxiway for Runway 10-28.
- Construct additional exit taxiways from Runway 4-22 to the new parallel taxiway.
- Replace MIRLs with HIRLs for Runway 4-22 in conjunction with an ILS
- Install ILS on Runway 4.
- Upgrade Runway 4-22 markings to precision.
- Install a MALSR on Runway 4.
- Replace Runway 4-22 VASI units with PAPIs.
- Install PAPIs on Runways 10 and 28.
- Install REILs on Runways 10 and 28.
- Construct T-hangars to meet demand.
- Install perimeter fencing and access control gates.
- Upgrade electrical vault.
- Relocate rotating beacon to elevated tower structure.
- Construct snow removal equipment building.