Delaware Department of Transportation
Federal Aviation Administration

DELAWARE AVIATION SYSTEM PLAN

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Phase 1 Report

Delaware Aviation System Plan 2019 Update

Phase 1 Report, Chapters 1-4

Prepared for:

Delaware Department of Transportation
Federal Aviation Administration

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TABLE OF CONTENTS

CHAPTER ONE: AVIATION SYSTEM PLAN ISSUES, GOALS, & OBJECTIVES

CHAPTER TWO: ANALYSIS OF EXISTING SYSTEM

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

LIST OF FIGURES

LIST OF TABLES

TABLE OF CONTENTS (Cont.)

Chapter 1

Issues, Goals, & Objectives

AVIATION SYSTEM PLAN ISSUES, GOALS, & OBJECTIVES

THIS CHAPTER IS CONCERNED WITH THE IDENTIFICATION of both general and specific issues that the study effort must address. In addition, goals and objectives must be defined to help direct the study toward desired ends. In this regard, the existing goals and objectives of the State of Delaware, FAA, and any other appropriate agencies were utilized in providing a starting point for updated aviation goals and objectives for the study. However, aviation technology, new business applications, and other system parameters have changed over time. Also, changes in policies or funding can impact the role of the State of Delaware in managing their aviation system, and thus must be incorporated into this new study effort. It should be noted that the study process will be open through Phases 1 and 2 to incorporating new goals and objectives which may be dictated by interim results.

1. SYSTEM PLAN ISSUES

THERE IS AN ACCELERATED PACE AT WHICH changes are coming to the National Airspace System (NAS). This includes the implementation of Automatic Dependent Surveillance-Broadcast (ADS-B) instrumentation in aircraft, the integration of Unmanned Aviation Systems (UAS) into conventional airspace corridors, and the introduction of autonomous flying vehicles that may carry passengers in the future. In addition, the decreasing growth of single engine, propeller aircraft point toward lower numbers of overall aircraft operations within the U.S. airspace system. At the same time, there is an increased usage of larger business and jet aircraft which drive the economics of airports and aviation.

NASCAR Teams at the Civil Air Terminal

In Delaware, these and other issues impact the technical, physical, financial, and environmental aspects of the aviation system. Aviation issues that were identified at the outset of this system plan included, but were not limited to, the following:

- ***UAS Integration into Delaware Aviation System:*** In 2015, the UAS Task Force identified a range of issues associated with the integration of UAS vehicles into full economic commerce and development in Delaware. There were remaining objectives that the Task Force did not fully examine, but instead were recommended for further study.

- ***Inclusion of Privately-Owned, Public-Use Airports in Facility Requirements:*** With the prospect of increased State funding for aviation through a proposed jet-fuel fee, DelDOT may be in a position to use capital funding for privately-owned, public-use airports. This could include potential assistance to Summit Airport, Chorman, and a number of the turf runway airports.

Skydivers at Laurel Airport

- ***More Detailed Facility Requirements than "System Plan Level":*** The system plan should examine the creation of facility "must haves" for private airports (Level 1, 2, 3, etc.) These airports must have priority rankings in the system plan and must serve a defined segment of general aviation in Delaware to achieve higher rankings. Details would cover facility items such as runway length, paving needs, airspace obstructions, development standards, and other safety and operational issues.
- ***Costing of Facility Needs for Potential State Funding Program:*** To plan adequately for needed airport capital improvement funding, the facility needs program must use more detailed costing efforts. The greater the detail and accuracy, the better able to manage State-generated funding resources.
- ***Consideration of Geographic Coverage/Acquisition of Private Airport:*** In previous statewide aviation system plans, the geographic coverage standards for general aviation service areas showed a deficiency in western Sussex County. This implicated the need for Laurel Airport to remain open. If threatened with closure, the State could decide whether it could purchase the facility (similar to Delaware Airpark), or work with public-private-partnerships to keep the facility open for the long term.
- ***Development of Public-Use Heliports in Demand Areas:*** In a previous study, both the city of Wilmington and the southern beach communities were identified as possible demand areas for public-use heliports. The system plan could examine whether or not this demand still existed, and if so, what the interest of the State may be in providing facilities or partnering with private enterprise to do so.
- ***Priority Rating System for State-funded Projects:*** Because of the potential for higher State funding levels, a detailed priority rating system is needed for these projects. This rating system must consider all factors, including safety, geographic coverage, economic viability, business use, population service area, economic impact, and any other relevant decision metric.

- ***Potential Development of Civil Air Terminal/Possible Extension of Delaware Airpark Runway:*** Given the new runway location at Delaware Airpark and the possible development of the CAT for commercial purposes, a mini-system analysis is needed for interaction between Delaware Airpark and the CAT. It is possible that demand for a longer runway exists at Delaware Airpark and if so, the feasibility of such a project should be examined at a preliminary level of detail.

Galaxy C-5s at Dover AFB

- ***Examination of State Aviation Regulations/Update:*** If the State is to become more involved in funding private airport development, adjustments to current regulations will be needed. Currently, the State is authorized to remove airspace obstructions off private airport property, if the airport owner will commit to keeping the airport open for at least 10 years. There is a repayment schedule for the grant if the private airport owner violates this agreement. Similar language needs to be developed for other State-funded capital improvements at privately-owned, public-use airports.
- ***Land Use Compatibility Measures/Encroachment Analyses:*** A continuing issue with airports and residential development around them is the nature of continued expansion on both sides. The least compatible uses surrounding an airport are residential. However, a brief inventory of airports in Delaware shows that pattern unabated. As a result, potential solutions should be developed that employ zoning, easements, and other means of avoiding or mitigating these conflicts.
- ***Future Technology Impacts to the Delaware Aviation System:*** To date, no state aviation system plan for Delaware has examined the potential impacts of future technology on the aviation system. This would include the possible deployment of Uber/Lyft air taxi service, self-driving cars, virtual reality, drone-carried air freight, etc.
- ***Increased Public Involvement Program:*** In previous aviation system planning efforts, public involvement occurred mostly through the Delaware Aviation Advisory Council (DAAC). For this effort, the expansion of possible public involvement portals can be examined. If there is an interest in the work of the plan by the public, this part of the planning process can be expanded to meet the interest. It is believed that briefings and project workshops with the DAAC and County and Municipal Planning/Zoning agencies would be a firm component of the public information program. In addition, open meetings with the public could be held on a same-day basis in the evening to permit broader circulation of the study findings and processes.

2. GOALS AND OBJECTIVES


Delaware Airpark

GOALS AND OBJECTIVES FOR THE AVIATION SYSTEM Plan Update were aligned to the Delaware Long Range Transportation Plan (DLRTP). Goals can be described as the ideal vision of aviation system infrastructure and performance. The attainment of goals may take decades. However, they remain the prime reasons for action steps toward their fulfilment. Objectives, on the other hand, are measures of goal attainment. Objectives should be quantifiable and should serve to gauge the progress toward goal achievement. In this regard, there are seven primary goals in the DLRTP that fit aviation transportation modes. The applications of these goals have been altered slightly from considering the broad transportation systems in Delaware to focusing on the specific needs of the aviation system. Goals and their associated objectives include the following:

Goal 1: Economic Vitality:

Promote and strengthen the economic vitality of Delaware with an excellent aviation transportation network that meets the needs of a diverse and growing economy.

Objectives:

1.1 Continue to invest in the growth of the Civil Air Terminal (CAT) at the Dover Air Force Base (DAFB) due to the increased flexibility of the Joint Use Agreement.

1.2 Continue to provide capital funds to assist with 10 percent sponsor match requirements of FAA Airport Improvement Program (AIP) grants at federally-eligible airports in the National Plan for Integrated Airport Systems (NPIAS).

1.3 Coordinate with the Delaware Prosperity Partnership (DPP) to identify future economic development opportunities and identify specific resources that can be provided.

1.4 Update and maintain an Economic Impact Assessment of Aviation in Delaware and provide the output data to aviation stakeholders and policy makers for use in decision-making.

1.5 Develop and maintain a program for identifying specific facility needs at system airports, including privately owned airports that may be eligible for State funding.

1.6 Develop a program to provide limited capital funds for airport improvements at public-use airports that are not classified as NPIAS airports and therefore ineligible for federal AIP grant funds.

Goal 2: Safety and Security:

Ensure the safe and secure movement of people and goods while limiting the potential for incidents that may cause harm or disrupt aviation operations.

Objectives:

2.1 Continue periodic safety inspections to update the master records (FAA Form 5010) for Delaware's public-use airports and improve data collection procedures through staff training and new technology.

2.2 Improve the airspace obstruction review process by evaluating current regulations, technical criteria and the application process to develop new efficiencies and technological advancements.

2.3 Develop outreach materials to increase public awareness about agricultural spraying flights and related safety tips.

Goal 3: Quality of Life:

Maintain and enhance vibrant and appealing communities and support planned growth and development through an aviation transportation network that serves the mobility needs of Delawareans.

Objectives:

3.1 Coordinate with local government agencies to ensure that current zoning and future land use plans consider the impacts of development to the operations at airports.

3.2 Identify methods to educate local community members about the value and potential of Delaware's airports, such as events, publications and contests.

3.3 Reach out to local community groups and Homeowners Associations (HOAs) to find opportunities to spread awareness.

Goal 4: System Preservation:

Provide access to safe, attractive, and reliable transportation options and enhance integration of a well-connected multi-modal transportation system.

Objectives:

4.1 Coordinate with airport management, private businesses and government officials to identify opportunities to integrate Unmanned Aircraft Systems (UAS) technology into airport operations.

4.2 Update the current Aviation System Plan (Phases I and II) to establish statewide goals, forecast aviation demand and recommend future capital funding priorities.

4.3 Identify potential airspace obstruction mitigation projects to preserve the safe operation of the aviation system.

Goal 5: System Management and Operations:

Enhance system management and operations through innovative strategies and technology that increase the efficiency of the aviation transportation system.

Objectives:

5.1 Continue collecting sample data of the number of take-offs and landings at non-towered airports and develop more efficient and precise sampling techniques.

5.2 Evaluate the current state licensing procedures for public-use airports and determine if changes are necessary.

5.3 Review State aviation regulations to ensure there is a mechanism to fund eligible capital needs for privately-owned, public-use airports.

5.4 Improve the partnership with Delaware State University (DSU) to expand opportunities to support the Aeronautics Program through staffing and research.

5.5 Evaluate the current DelDOT Helipad lighting system and determine if upgrades or a full replacement is needed.

Goal 6: Travel and Tourism:

Facilitate efficient mobility options for tourist destinations that support Delaware residents, businesses, and visitors.

Objectives:

6.1 Partner with the Division of Small Business, Development & Tourism to identify current programs and/or develop new programs to promote General Aviation (GA).

6.2 Examine the impacts of future technology (other than UAS) on the aviation system and how gains in personal transportation technology may provide opportunities for tourism at the beach communities and other Delaware locations.

Goal 7: Customer Service & Communication:

Provide the highest level of customer service possible in order to proactively provide information and to learn from and address Delaware customers' needs.

Objectives:

7.1 Continue to engage the Delaware Aviation Advisory Council (DAAC) to advise staff on the development and prioritization of strategies for the Aeronautics Program.

7.2 Rebuild the Aeronautics Program website to promote Delaware aviation to new audiences.

7.3 Improve and update GIS data and develop interactive web maps for Gateway.

Aerial of New Castle Airport

Chapter 2

Analysis of Existing System

ANALYSIS OF EXISTING SYSTEM

THE PURPOSE OF THIS CHAPTER IS TO provide the necessary database for subsequent phases of the System Plan. Pertinent data, regarding each airport/heliport and the area it serves was collected from each airport and the appropriate State and local agencies. In addition to the data provided by these sources, information published by the Federal government and other sources required for comprehensive understanding of the existing aviation system was collected, tabulated, and reviewed. Maximum use was made of the existing system planning work, various existing airport master plans, and environmental studies that have been completed. From these data, the analysis of the existing system was developed. Inventory items included:

- Airport and Heliport Facilities
- Aeronautical Activity
- Fuel Sales by Airport
- Land Use Around System Airports
- Socioeconomic Base
- Statutes and Regulations
- Future Technology

Of these items, the examination of State Aviation Regulations was used to determine whether an update is needed to accommodate funding for private airport development.

1. AIRPORT AND HELIPORT FACILITIES

THE FACILITY INVENTORY RECORDS OF DELDOT (WHICH are used for the FAA Form 5010), were used as one source of inventory data for airport and heliport facilities. **Figure 2-1** presents a map of Delaware showing the locations of each of the existing public-use airports and heliports. Additional data and information were obtained through review of existing completed airport master plans, and those that are in progress. In addition to the data from published records, on-site inspections of some of the system airports were necessary to inspect runway and taxiway pavement conditions. The inventory effort collected information concerning obstruction data and existing navaids; aircraft operations by type; general condition and type of runways, taxiways, and aprons; size and condition of terminal buildings, and parking facilities.

State Police Helicopter

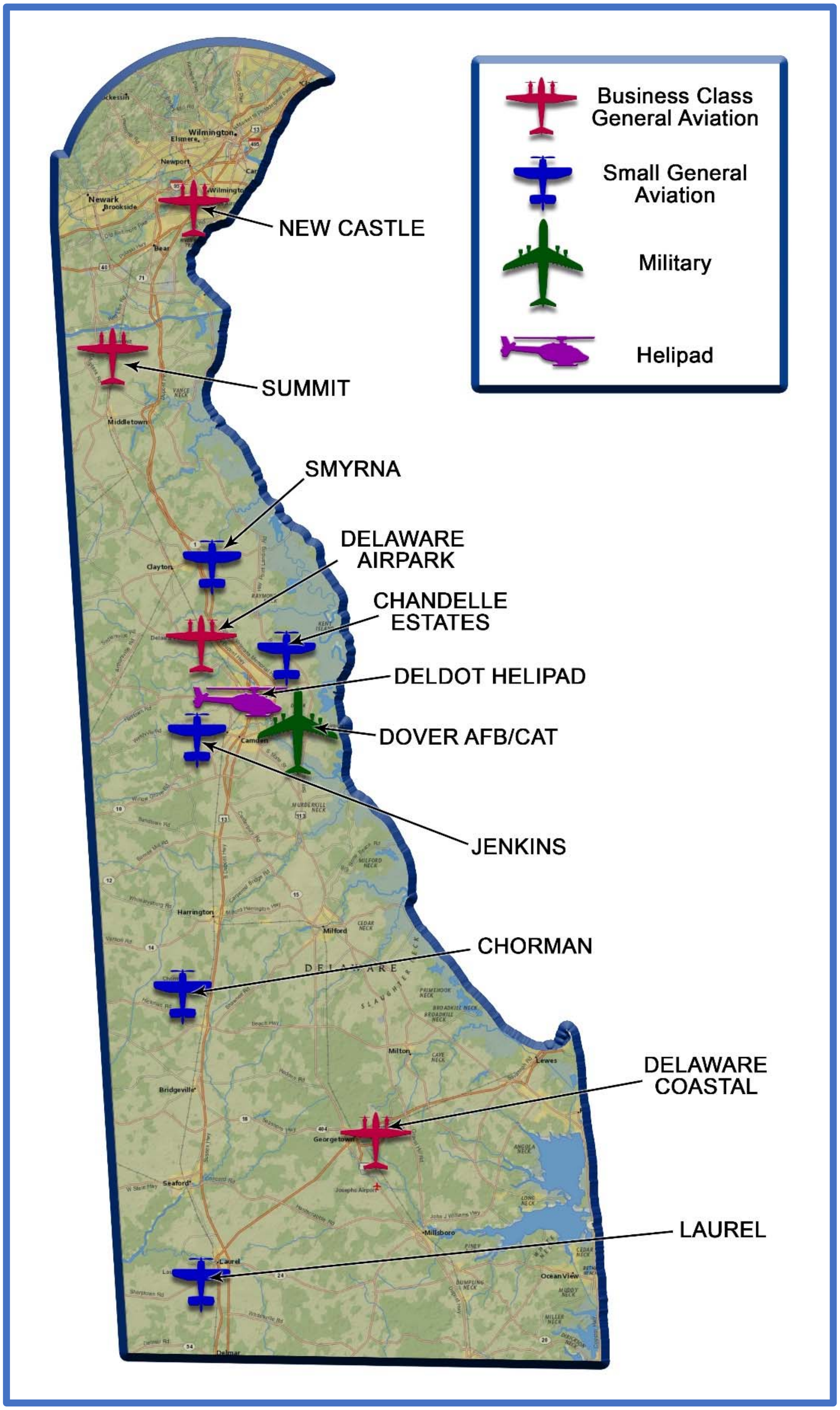

Figure 2-1 – Delaware Public-Use Airports and Heliports

Special attention was given to the physical limitations of each airport for expansion. All this data provided information for each airport including but not limited to:

- Present classification
- Land area owned or available at the airport
- An inventory of facilities at each airport, such as runways and taxiways, terminal buildings, hangar buildings, and airport lighting systems, aircraft apron, auto parking, cargo facilities, and fueling facilities
- Any limitations on future expansion
- Planned improvements
- Pavement conditions
- Ground access to the airport
- Navigational aids, airspace conditions
- Existing activity levels at system airports

In addition to the database, accurate counts of aircraft operations and based aircraft were included as a part of the inventory process. In this regard, the State's aircraft operations counting devices are being used by Office of Aeronautics staff to gather accurate operational data.

1.1 AIRPORT CLASSIFICATIONS

Airport classifications are based on an Airport Reference Code (ARC). The ARC is based on the characteristics of the most demanding aircraft, or group of aircraft (generally referred to as the "design aircraft") that regularly use the airport, with the term "regularly" defined as at least 250 takeoffs annually (500 annual operations). The ARC signifies the airport's highest Runway Design Code (RDC), minus the third (visibility) component of the RDC. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport.

Table 2-1 presents a summary of the Airport Reference Code aircraft categories and their operating and dimensional characteristics. The ARC is represented by a letter and Roman numeral. The letter defines the approach category and is based on the approach speed, or 1.3 times the stall speed of the design aircraft. The Roman numeral, which indicates the design group, is based on the wingspan or the tail height of the design aircraft, whichever is more demanding.

Table 2-1 - Airport Reference Code (ARC)

Aircraft Approach Category	Approach Speed
A	Less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots

Table 2-1 - Airport Reference Code (ARC)		
E	166 knots or more	
Airplane Design Group	**Wingspan**	**Tail Height**
I	Up to but not including 49 feet	Up to but not including 20 feet
II	49 feet up to but not including 79 feet	20 feet up to but not including 30 feet
III	79 feet up to but not including 118 feet	30 feet up to but not including 45 feet
IV	118 feet up to but not including 171 feet	45 feet up to but not including 60 feet
V	171 feet up to but not including 214 feet	60 feet up to but not including 66 feet
VI	214 feet up to but not including 262 feet	66 feet up to but not including 80 feet

Source: FAA Advisory Circular 150/5300-13A

Under this system, short runway airports and turf airports are classified as A-I and Less than A-I, respectively. Other airports are classified, based upon their design characteristics and critical aircraft type usage. In this regard, each of the State's airports can be classified by ARC as follows:

Table 2-2 - Airports by ARC		
A-I or Less:	**B-I, B-II, or B-III**	**C-I or Higher**
Chandelle Estates Airport	Chorman Airport	New Castle Airport
Jenkins Airport	Delaware Airpark	Civil Air Terminal at Dover AFB
Laurel Airport	Delaware Coastal Airport	
Smyrna Airport	Summit Airport	

1.2 DESCRIPTION OF FACILITIES

Since the previous aviation system plan, there have been no changes in the number of public- use airports in Delaware. As such, there are currently nine public-use airports, one joint-use military air base, and one public-use heliport in Delaware. There have been some changes on the Airport level since the 2013 System Plan Update. Some notable changes include:

Windsock at Summit Airport

Chorman Airport:

- Paved and widened runway increasing from 3,588' x 37' to 3,588' x 50'
- Multiple hangars were constructed which increased based aircraft by 25.

Delaware Airpark:

- Constructed a new runway increasing from 3,582' x 60' to 4,200' x 75'

- Full parallel taxiway
- ARC BI to ARC BII
- Demolished hangars and relocated them during construction - net loss of 27 aircraft

Delaware Coastal Airport:

- Changed name from Sussex County
- Purchased 48 acres of land (an increase from 615 to 663)
- Lengthened runway from 5,000 feet to 5,500 feet
- Finished construction of a full parallel taxiway for the main runway

Jenkins Airport:

- Closed one of its two turf runways; Runway 18-36 (2,842' x 70')

New Castle:

- Airport role changed from Reliever to Commercial Service back to Reliever.

In the following pages, graphic and tabular data describes each of the existing public-use airports. These airports make up the database of existing facilities from which the recommended aviation system will be developed.

Table 2-3 – Summary of Delaware Public-Use Airport and Heliport Facilities									
AIRPORT	**Ownership**	**ARC Class****	**# of Runways**	**Runway Dimensions**	**Runway Surface**	**Based Aircraft**	**Civil Aircraft Operations**	**Service Area**	**Business Aviation Activity**
Chandelle Estates Airport	Private	Less Than A-I	1	2,533' x 28'	Asphalt	24	1,100	Local	Crop Spraying, Powerline Surveillance, Pilot Training
Chorman Airport	Private	B-I	1	3,588' x 50'	Asphalt	44	13,500	Local	Crop Spraying, Aircraft Maintenance
Civil Air Terminal at Dover AFB*	Civil-Mil. Joint Use	E-VI	2	9,602' x 200' 12,903' x 150'	Concrete Asphalt	0	200	Regional	Corporate Aviation, NASCAR Race Air Travel Support, Military Aviation
Delaware Airpark	Public	B-II	1	4,200' x 75'	Asphalt	29	23,600	Regional	Pilot Training, Business Aviation, Sight Seeing, Tourism
Delaware Coastal	Public	B-III	2	5,500' x 150' 3,109' x 75'	Asphalt Asphalt	61	34,400	Regional	Pilot Training, Aircraft Manufacturing, Corporate Aviation, Tourism, Banner Towing, Military Aviation, Air Cargo, Medevac
Jenkins Airport	Private	Less Than A-1	1	2,035' x 70'	Turf	20	500	Local	Aircraft Salvage
Laurel Airport	Private	Less Than A-I	1	3,175' x 270'	Turf	14	7,500	Local	Parachute Training, Crop Spraying, Pilot Training, Sight Seeing
New Castle Airport	Public	D-III	3	7,275' x 150' 7,012' x 150' 4,602' x 150'	Asphalt Asphalt Asphalt	198	36,600	Regional	Air Cargo, Pilot Training, Corporate Aviation, Military Aviation, Medevac, Tourism
Smyrna Airport	Private	Less Than A-I	1	2,600' x 125'	Turf	10	1,700	Local	Pilot Training, Crop Spraying
Summit Airport	Private	B-II	2	4,488' x 65' 3,601' x 200'	Asphalt Turf	32	31,900	Regional	Corporate Aviation, Military Aviation, Aircraft Maintenance, Medevac
DELDOT Helistop	Public	N/A	1	60' x 60'	Concrete	0	50	Local	Helicopter Operations

* Joint-use facility with State-owned civil facilities.
** ARC = Airport Reference Code

2. AIRPORT ACTIVITY LEVELS

THE PAST AND PRESENT AIR TRAFFIC VOLUMES at the existing public-use airports in the State were reviewed to establish a basis for forecasting future aeronautical activity. The categories of air traffic activity collected and studied included:

- General Aviation
  - Based aircraft
  - Fleet mix
  - Aircraft operations
- Military
  - Total aircraft operations at system airports

Laurel Airport Sky Diving Training Area

The primary source for aircraft activity information at the outset of the planning effort was airport management records, Air Traffic Control Tower (ATCT) records, FAA Form 5010 data, and aircraft activity counts from the State's airport operations counting program.

Data regarding military aviation operations was collected from Dover AFB, New Castle Airport, and Delaware Coastal Airport. Although the Civil Air Terminal is located at Dover Air Force Base, military operations at Dover AFB are not considered to be a part of the CAT's operations. Delaware Coastal Airport and Summit Airport show only a small number of military operations each year. Military activity in the State consists mostly of Dover traffic, with additional weekend training and transport operations conducted by the Air National Guard. The level of military operations is determined by the Department of Defense policy and Congressional funding.

Table 2-4 presents a summary of aircraft activity for all categories. As shown, all general aviation activity for 2018 totaled 151,000 operations. Military operations totaled 129,182, with Dover AFB showing the major share of activity (124,000). The top three airports in the State with regard to based aircraft are: New Castle County (198), Delaware Coastal (61), and Chorman Airport (44).

Table 2-4 – Airport Activity Summary

AIRPORT	ANNUAL OPERATIONS		BASED AIRCRAFT
	General Aviation	Military	
Chandelle Estates Airport	1,100	0	24
Chorman Airport	13,500	0	44
Civil Air Terminal at Dover AFB	200	124,000[1]	0
Delaware Airpark	23,600	0	29
Delaware Coastal Airport	34,400	100	61
Jenkins Airport	500	0	20

Table 2-4 – Airport Activity Summary			
AIRPORT	**ANNUAL OPERATIONS**		**BASED AIRCRAFT**
	General Aviation	**Military**	
Laurel Airport	7,500	0	14
New Castle Airport	36,600	4,982	198
Smyrna Airport	1,700	0	10
Summit Airport	31,900	100	32
DELDOT Helistop	0	0	0
GRAND TOTALS	**151,000**	**129,182**	**432**

[1] Dover Air Force Base Operations

Table 2-5 shows differences in operations from the previous system plan. Appendix 2A shows these differences by individual airport.

Table 2-5 – Statewide Differences from Previous System Plan			
Categories	**2010**	**2018**	**Change**
Based Aircraft	437	432	(5)
Operations- Total	206,640	156,182	(50,458)
General Aviation	197,570	151,000	(46,570)
Military	9,070	5,182	(3,888)
Peak Hour Operations- Total	214	187	(28)
Enplanements - GA	115,600	92,200	(23,400)

3. POTENTIAL JET FUEL TAX

IN 2019, THE DELAWARE LEGISLATURE ENACTED HOUSE Bill No. 86; a $0.05 per gallon excise tax on jet fuel, effective July 1, 2019. Revenues generated by this Act will be directed toward the improvement and capital maintenance of Delaware's public-use system of airports. A retroactive estimate of the new jet fuel tax was made, based upon the most recent records available for jet fuel sales at public-use airports in Delaware. These numbers show what the new tax would have accumulated, had it been in place over the last three years. It also shows a possible trend toward future revenues in this category.

Fuel Truck at Delaware Coastal Airport

Table 2-6 – Potential Jet Fuel Tax Estimates			
Airport	**2016**	**2017**	**2018**
Civil Air Terminal	17,800	22,051	25,771

Table 2-6 – Potential Jet Fuel Tax Estimates			
Airport	**2016**	**2017**	**2018**
New Castle Airport	3,897,900	4,043,300	3,902,000
Summit Airport	103,160	85,884	126,680
Delaware Coastal	232,200	254,000	281,600
Chorman/Laurel Spray Ops*	190,000	190,000	190,000
Total Gallons	**4,423,260**	**4,595,235**	**4,526,051**
Total Revenue (Total Gallons * $0.05)	**$212,553**	**$220,262**	**$216,803**

* Excludes spray operations at Chorman/Laurel

As shown, potential tax revenues for 2018 are $216,800. This excludes fuel that is used for spray operations. Future revenue streams were not estimated, however, 2018 could be considered a low-end number relative to future years.

4. LAND USE AROUND SYSTEM AIRPORTS

THE PURPOSE OF THIS SECTION IS TO highlight the land use development around system airports in Delaware. From an aviation planning standpoint, compatible land use is a key factor in the healthy development of system airports. In cases where incompatibilities exist, there are difficulties in providing new facilities to accommodate aviation demand, simply because of the environmental objections of area residents.

Mowing at Delaware Coastal Airport

Impacts of airport noise on land uses have relative scale of compatibility. The general scale would include the following five types of land uses from lowest to highest impact:

- **Agricultural:** Mostly rural farmland with very few residential structures.
- **Industrial:** Includes factories, plants, warehouses, outdoor storage areas and facilities, machine shops, and similar workplaces.
- **Commercial:** Includes retail shops, big box stores, office complexes, professional practice offices, and other places of business (including hotels).
- **Recreational:** Includes parks, recreational facilities, and school athletic facilities.
- **Residential:** Includes residential housing, apartment buildings, mobile homes, schools, churches, day care centers, nursing homes, and hospitals.

The rank order for these land uses indicates that residential land uses are the least compatible with airports because people are sleeping in those houses during night hours. Thus, they are particularly sensitive to night aircraft noise. In the other land uses, most recreational parks and commercial businesses do not have people sleeping there. Agricultural uses are considered buffer areas because there are generally very few structures and people on the land.

4.1 DEVELOPMENT AROUND AIRPORTS

While Industrial and Commercial development around airports can be considered mostly compatible, residential development is not. Therefore, this portion of the analysis shows the recent history of development beginning, in most cases, in 1992. Using Google Earth's historical pictures of land use at system airports (mostly in black and white photos), a comparison with present day development can be made. In cases where new residential housing has occurred in visible density, those changes are shown on the recent (2018) aerial photos.

Figures 2-2 to 2-10 show the before and after photos for each system airport. Not included are the DelDOT heliport and the Civil Air Terminal. The significant changes are marked with a color shading on the recent photos. Again, the purpose of pointing out new residential development near airports is to underscore the potential conflicts that will arise in the future. In some cases, these could be detrimental to the aviation system.

4.2 SUMMARY OF CHANGES

Examination of the changes in residential and other development around Delaware public-use airports reveals a number of changes throughout the State. The degree of those changes at each airport is subjectively different. However, the primary purpose of this analysis is to raise awareness of the issue. Described below is a summary of changes by airport:

- ***Delaware Coastal Airport:*** As shown in **Figure 2-2**, the primary change in development around Delaware Coastal has been the ball parks located to the north of the airport. In this regard, there are significant numbers of playing fields which are used for tournaments during sports seasons. There has been discussion of adding hotel or similar types of facilities to accommodate visiting ball teams. Given the location of this development off the end of the primary runway, the land use compatibility has decreased to some degree over the last 26 years or so.
- ***Delaware Airpark:*** As shown in **Figure 2-4**, the primary change in development around Delaware Airpark has been the development of high-density residential housing to the east off Main Street feeding Parkers Drive. There are more than 200 homes in the roughly 60-acre development. These homes are in line with the new runway at the airport. However, the new runway was shifted almost 700 feet to the west, thereby causing aircraft to be at higher elevations over the residential development when on approach or departure. It should be noted that there are new residential developments planned just to the north and east of the airport across Moorton Road. These planned streets will be accessible via Lynnbury Woods Road (Highway 152). In addition, the development of a

Figure 2-2: Delaware Coastal Airport- Current/March 1992

Figure 2-3: Delaware Airpark- Current/March 1992

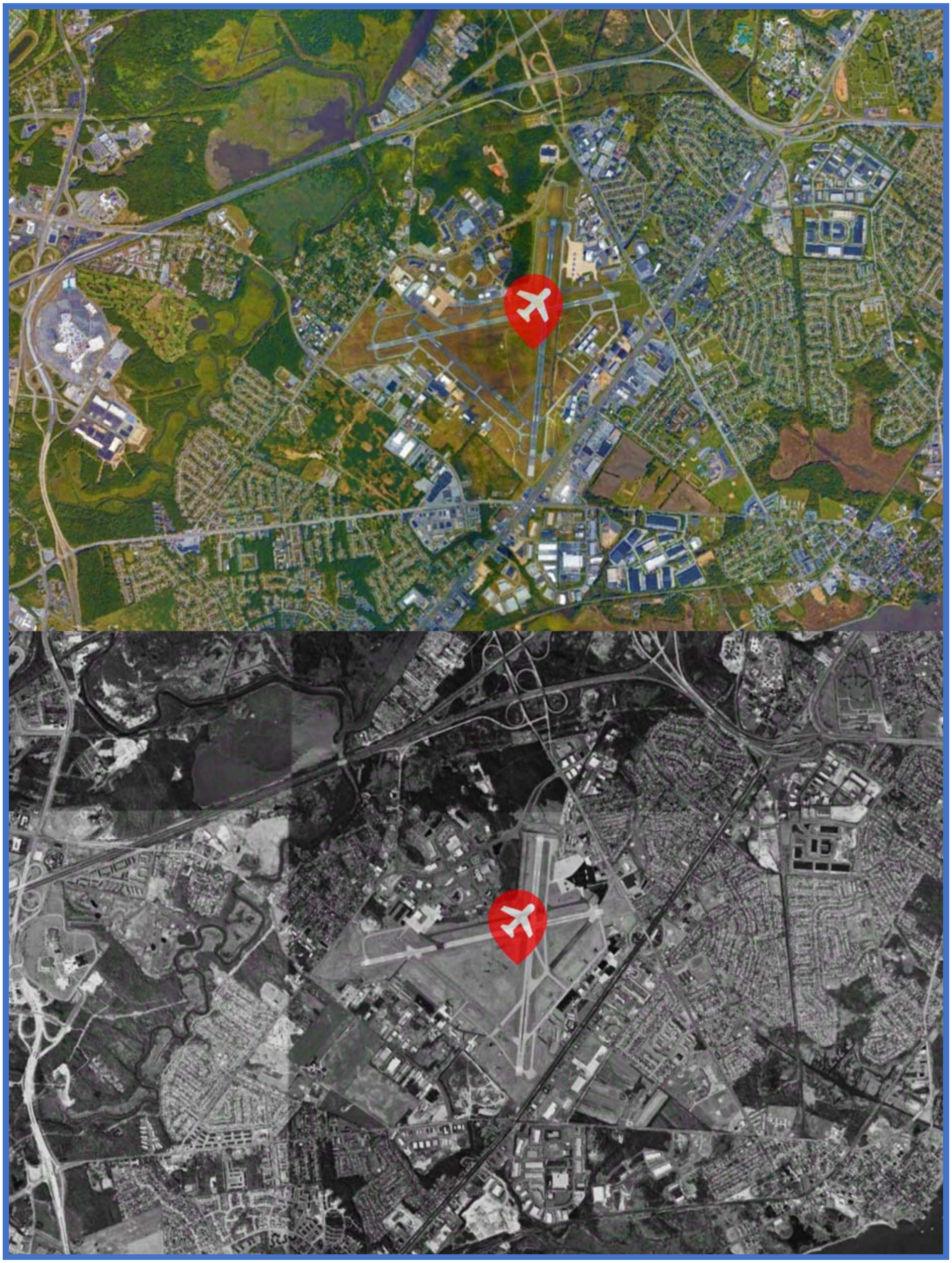

Figure 2-4: New Castle Airport- Current/March 1992

Figure 2-5: Summit Airport- Current/March 1992

Figure 2-6: Chorman Airport- Current/March 1992

Figure 2-7: Laurel Airport- Current/March 1992

Figure 2-8: Jenkins Airport- Current/September 2005

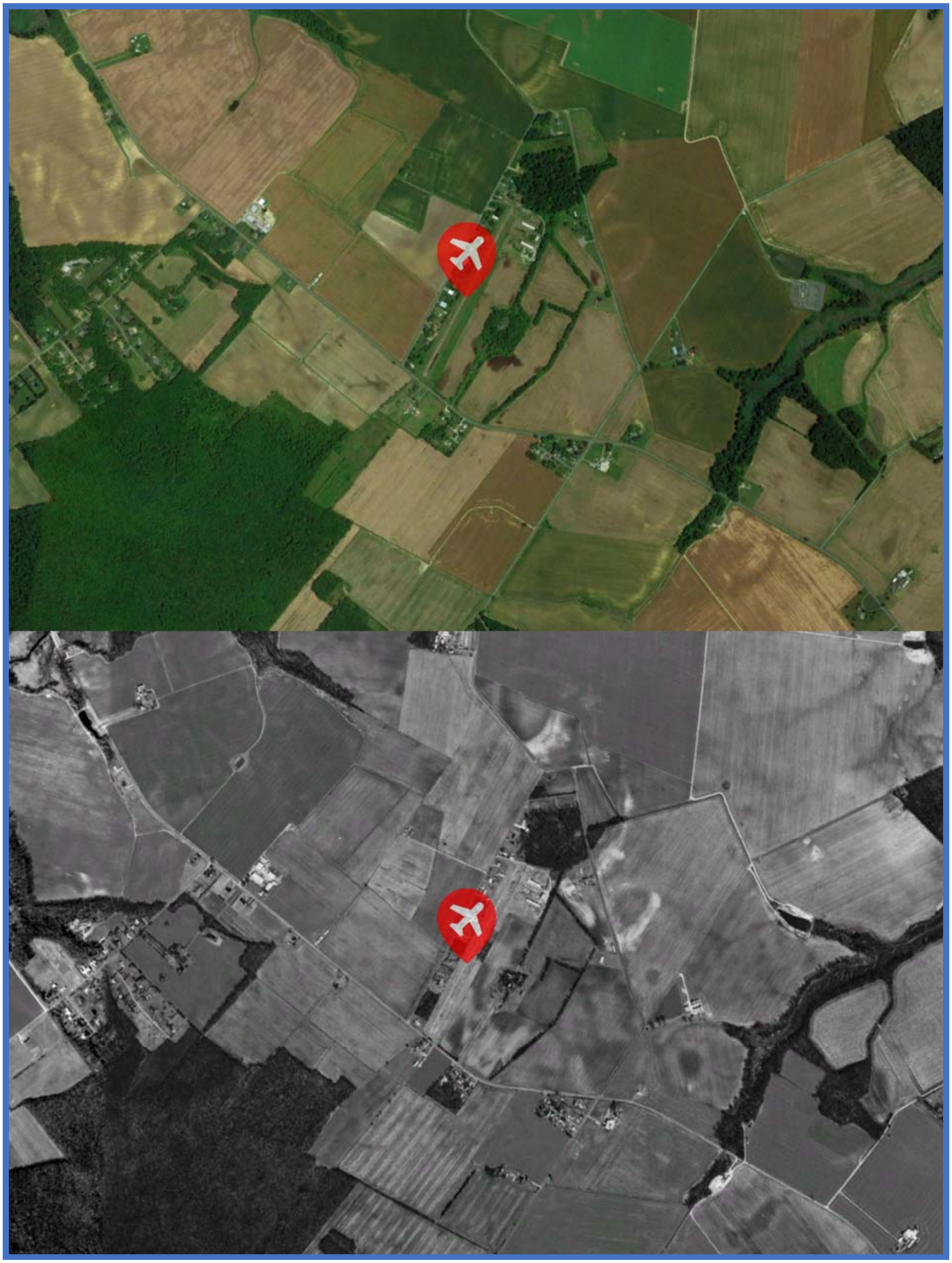

Figure 2-9: Chandelle Estates Airport- Current/March 1992

Figure 2-10: Smyrna Airport- Current/March 1992

mobile home park to the south of the airport has occurred since 1992. Because these homes are not off the runway ends, they are impacted somewhat less than those located under the approach or departure paths of aircraft.

- ***New Castle Airport:*** It is interesting that the residential development (and other development for that matter) around New Castle Airport has remained mostly unchanged since 1992. This is primarily because most of the developable land was already taken.
- ***Summit Airport:*** Residential development around Summit Airport has grown significantly since 1992. In this regard, developments to the southwest, northwest, and southeast have been constructed or enlarged. These areas are shown on **Figure 2-5**. There is currently new development directly north of the airport which may not be compatible with potential expansion plans of the airport.
- ***Chorman Airport:*** Very little has changed for the land use around Chorman Airport since 1992. The land use remains mostly agricultural and few new homes have been developed.
- ***Laurel Airport:*** Similar to Chorman Airport, there has been very little change in the land use around Laurel Airport. It remains mostly agricultural in nature.
- ***Jenkins Airport:*** There has been very little change in the land use around Jenkins Airport since 2005 (the best historical aerial picture available). It remains mostly agricultural in nature.
- ***Chandelle Estates:*** This airport was originally developed as a residential airport, with owners of the adjacent residences having access to the runway. Some residents do have aircraft and do use the airport from their back yards. However, there has been no other significant residential development around the airport since the aerial photo from 1998.
- ***Smyrna Airport:*** There has been residential development to the west of Smyrna Airport over the past 20 years (**Figure 2-10**). This development has occurred on the west side of Highway 1, off East Commercial Street. It is likely that the high produces a significantly higher noise level than the airport and thus, actually shields the airport from receiving any noise complaints.

As shown, there have been some significant changes in residential land use near Delaware's system of airports. These changes have mostly occurred near Delaware Coastal, Delaware Airpark, and Summit Airport. New Castle Airport has not had new residential construction, as there is little or no land available near the airport for such development.

As residential development continues, there it will be important to plan for compatible land uses. This is to keep the airports open and functioning, while at the same time providing property to residential developers. More will be explored as the System Plan progresses. The purpose of this section was simply to show the recent trends near system airports.

5. CURRENT AND FORECAST SOCIOECONOMIC INDICATORS

SOCIOECONOMIC STATISTICS ARE GENERALLY USED TO DESCRIBE the economic and demographic trends expected to occur in a particular area. Socioeconomic factors have been shown in numerous studies sponsored by the FAA to be related to an area's demand for aviation facilities and services. Among the most significant are population, income, and employment. This section identifies each of these factors and presents historical statistics and trends for the years 2008-2018 for all three Delaware counties.

5.1 POPULATION

Analysis and projection of population are the basis for almost all major planning decisions. In many instances, they determine the level of demand for future facilities and serve as indices of most county and urban characteristics. Further, they have typically served as one of the best indicators of local aviation demand. Historical population, when compared to aviation demand statistics, has shown a high correlation in many areas of the country. Until population growth or declined in the study area is compared to aviation demand statistics in Delaware, it is uncertain whether or not population can be used as a prediction variable in the forecasting process.

Table 2-7 presents the historical population growth for Delaware counties. As shown, Sussex County has shown the highest percentage growth (19.3%), and highest population growth (a net gain of 37,093 over the period). For the State, there has been a 9.8 percent growth over the 2008-2018 period, growing from 883,874 to 970,727.

Table 2-7 – Delaware Historical Population Trends

Year	Kent	New Castle	Sussex	State Total
2008	157,925	533,958	191,991	883,874
2009	160,081	536,898	194,751	891,730
2010	162,973	538,831	197,908	899,712
2011	165,149	542,282	200,453	907,884
2012	167,442	546,120	203,306	916,868
2013	169,150	549,486	206,478	925,114
2014	171,664	552,465	210,676	934,805
2015	173,332	555,587	215,188	944,107
2016	174,754	557,851	220,093	952,698
2017	176,824	559,793	225,322	961,939
2018	178,412	563,231	229,084	970,727
Net Change	**20,487**	**29,273**	**37,093**	**86,853**
% Change	**12.97%**	**5.48%**	**19.32%**	**9.83%**
CAGR: 2008-2018	**1.23%**	**0.54%**	**1.78%**	**0.94%**

Source: Bureau of Economic Analysis (BEA), U.S. Department of Commerce, July 2019. www.bea.gov
Source: Growth rates from 2018 population consortium estimates were used to estimate 2018 population statistics

By 2040, The 2018 Delaware Population Consortium estimates the following population totals for each Delaware County:

- Kent County- 201,639 (a growth of 13.0%, or 0.56% per year)
- New Castle County- 606,346 (a growth of 7.7%, or 0.34% per year)
- Sussex County- 268,180 (a growth of 17.1%, or 0.72% per year)
- State Total- 1,076,165 (a growth of 10.9%, or 0.47% per year)

Delaware's population is expected to grow through 2040. However, the Delaware Population Consortium predicts that the overall rate of population growth will steadily decline during that time.

5.2 INCOME

Similar to population, an area's income and economic activity have been shown to be positively related to the demand for aviation services and facilities in many parts of the country. Further, there is an assumed causal relationship between concentrated economic activity and demand for air transportation.
Income statistics commonly include Total Personal Income (TPI) and Per Capita Personal Income (PCPI). For tracking growth trends, PCPI is the preferred statistic since it removes the population growth factor from the income growth factor. Thus, PCPI statistics for Delaware counties were collected for the inventory. **Table 2-8** presents the historical growth in PCPI for the three counties and Delaware State totals.

Table 2-8 – Delaware Historical PCPI (Constant 2012 $)

Year	Kent	New Castle	Sussex	State Total
2008	$35,194	$46,879	$39,956	$43,287
2009	$36,239	$46,890	$38,987	$43,252
2010	$35,351	$46,466	$38,180	$42,630
2011	$36,007	$49,311	$39,248	$44,669
2012	$35,641	$47,832	$40,430	$43,964
2013	$35,737	$46,707	$41,868	$43,621
2014	$36,071	$47,649	$42,922	$44,458
2015	$36,623	$49,280	$46,102	$46,232
2016	$37,359	$49,400	$45,275	$46,239
2017	$37,996	$50,510	$44,614	$46,829
2018	$39,284	$50,355	$45,203	$47,099
Net Change	**$4,090**	**$3,476**	**$5,247**	**$3,812**
% Change	**11.62%**	**7.41%**	**13.13%**	**8.81%**
CAGR: 2008-18	**1.11%**	**0.72%**	**1.24%**	**0.85%**

Source: Bureau of Economic Analysis (BEA), U.S. Department of Commerce, July 2019. www.bea.gov
Source: Source: Woods & Poole Economics, (2019 CEDDS)

By 2040, Woods & Poole Economics[1] estimates the following Per Capital Personal Income averages for each Delaware County:

- Kent County- $49,790 (a growth of 26.7%, or 1.08% per year)
- New Castle County- $64,619 (a growth of 28.3%, or 1.14% per year)
- Sussex County- $57,476 (a growth of 27.2%, or 1.10% per year)
- State Total- $59,782 (a growth of 26.9%, or 1.09% per year)

Because of the strong growth in New Castle County, the State's overall PCPI is anticipated to grow at 1.09 percent per year. The PCPI numbers have been indexed to exclude the effects of inflation. Therefore, these projections represent estimates of real economic growth expected in each County.

5.3 EMPLOYMENT

Employment statistics are another measure of economic activity and thus are related to the demand for air transportation facilities and services. Growing employment trends point toward greater economic activity. This activity, in turn, leads to more use of aviation and air transportation services. Historical employment statistics for Delaware counties are presented in **Table 2-9**.

Aircraft Maintenance Operation at Summit Airport

As shown, overall employment for Delaware grew by 8.9 percent over the period. Sussex County showed the fastest growth with 16.2 percent, while New Castle County had the slowest growth with 6.5 percent. Between 2008 and 2018 overall employment grew by 48,661 jobs with 37,000 jobs being created in the last five years of the period (2009 and 2010 had negative growth).

Table 2-9 – Delaware Historical Employment

Year	Kent	New Castle	Sussex	State Total
2008	84,602	359,443	100,866	544,911
2009	81,629	345,682	98,324	525,635
2010	81,671	341,825	98,907	522,403
2011	83,856	348,576	97,969	530,401
2012	84,763	350,311	99,186	534,260
2013	86,586	356,946	101,265	544,797
2014	87,648	363,922	104,988	556,558

[1] Source: Woods & Poole Economics, 2019.

Table 2-9 – Delaware Historical Employment				
Year	**Kent**	**New Castle**	**Sussex**	**State Total**
2015	88,491	372,113	108,289	568,893
2016	90,457	376,087	112,225	578,769
2017	91,545	377,938	114,583	584,066
2018	93,298	383,082	117,192	593,572
Net Change	**8,696**	**23,639**	**16,326**	**48,661**
% Change	**10.3%**	**6.6%**	**16.2%**	**8.9%**
CAGR: 2008-18	**1.0%**	**0.6%**	**1.5%**	**0.9%**

Source: Bureau of Economic Analysis (BEA), U.S. Department of Commerce, July 2019. www.bea.gov
Source: Woods and Poole estimates for 2018

By 2040, Woods & Poole Economics[2] estimates the following Employment totals for each Delaware County:

- Kent County- 125,701 (a growth of 34.7%, or 1.36% per year)
- New Castle County- 449,143 (a growth of 17.2%, or 0.73% per year)
- Sussex County- 166,968 (a growth of 42.5%, or 1.62% per year)
- State Total- 741,812 (a growth of 25.0%, or 1.02% per year)

Employment in Delaware is anticipated to grow faster than its population. This implies greater utilization of the potential work force over the next 20 years.

6. STATUTES AND REGULATIONS

GOVERNMENT AT ALL LEVELS HAVE LONG BEEN involved in the regulation, funding, and development of aviation. This section presents a summary of more recent relevant federal and State legislation and regulations which may affect the development of the Delaware Aviation System Plan. Of significance to this study are the regulations impacting the State's ability to fund privately owned, public-use airports. Given the recent passage of aviation fuel taxes on jet fuel, the State Aeronautics program will have dedicated funds to invest in needed airport infrastructure and capital maintenance.

6.1 FEDERAL AVIATION LEGISLATION

The federal government has assisted and encouraged the aviation industry from its inception. In this regard, aviation safety has been relegated to the control of the FAA. The FAA establishes, operates, and maintains the nation's air traffic control and navigation facilities and provides both technical standards and funding for airport facility construction. While much of the early federal

[2] Source: Woods & Poole Economics, 2019.

legislation covered the formation of the Federal Aviation Administration and environmental protection of airports, it has been covered in previous state aviation system plans. This plan is focused on the more recent laws impacting funding since the year 2000.

- Aviation Investment and Reform Act for the 21st Century, 2000: (funding)
- Aviation and Transportation Security Act of 2001: (aviation security)
- Vision 100, the Century of Aviation Act of 2003: (funding)
- FAA Reauthorization Act of 2007
- FAA Modernization and Reform Act of 2012 (funding and FAA structure)
- FAA Reauthorization Act of 2018 (funding)

These and other environmental legislation make up the bulk of federal involvement in the nation's aviation system. Essentially, the federal government provides funding for airport development, airport security, rules for the operation of aircraft and airports, and environmental protection for the operation and development of the system.

For Delaware Airports, only four are eligible for FAA funding: Delaware Airpark, Delaware Coastal Airport, New Castle Airport, and Summit Airport. These airports are included in the FAA's National Plan of Integrated Airport Systems (NPIAS). Summit Airport is privately owned and had been designated a reliever airport to the Wilmington area. Summit has not accepted any FAA grants in more than 20 years and is free of any grant assurances. The remaining airports are privately owned and not eligible for federal funding. These other airports will be the focus of analysis to determine which, if any, would justify State funding of capital maintenance or improvement.

6.2 STATE AVIATION LEGISLATION

State legislation pertaining to aviation in Delaware is contained primarily in Title 2, Parts 1 and 2 of the State Code (Transportation, Aeronautics). These statutes define the State's authority and legal role in the aviation system in Delaware. Powers granted to the State provide that DelDOT be involved in the following:

- Encourage the development of aeronautics, the establishment of airports and other air navigation facilities.
- Coordinate aeronautical matters between the federal government and political subdivisions of the state and others.
- Participate in the investigation of aircraft accidents.
- Enforce aviation safety standards, flight regulations and aeronautical laws.
- Design and map airways systems for the State that are in conformance with federal standards.
- Offer engineering and design services for airports free of charge to any political subdivision requesting such services.

- Provide financial assistance to political subdivisions in support of airport development, operation, and maintenance.
- License and inspect airports, airmen, aircraft, air schools, or aeronautics instructors for safety, qualifications, airworthiness, etc. DelDOT cannot grant exclusive rights to any airport or aviation facility.
- Receive and disburse federal money for airports. Acquire and operate State airports.
- Invoke penalties against violators of aeronautics laws.
- Establish the Delaware Aviation Advisory Council (DAAC) to promote the interests of aviation in Delaware.
- Remove existing obstructions to air navigation either on or off existing public-use airport property. The power of eminent domain is conveyed by State law to DelDOT for this purpose. Also, the authority to review building permits and deny potential obstructions to air navigation is granted to DelDOT.

The Federal Aviation Regulations (Part A of Subtitle VII of Title 49 of the United States Code, as amended) govern the operation of aircraft and are therefore adopted by the State of Delaware into their laws.


Air Traffic Control Tower at New Castle Airport

In addition to aviation laws, a recent law that changed the Delaware's motor fuel tax will have a significant impact on Delaware's public-use airport system. House Bill 86 was recently passed in July of 2019. This Act imposes a 5 cent per gallon tax on certain aviation jet fuel, exempting aerial spray operations. The revenue generated by this tax will be dedicated to the aviation system and its improvement.

An important task in this aviation system plan will be to recommend updates to aeronautical legislation or new regulations that are needed. One purpose of these recommendations will be to empower DelDOT to invest in privately owned, public-use airports for capital maintenance and improvement. The associated regulations will ensure the protection of the State's interest in these improvements through the airports' obligation period. It will be important for the DAAC to input the development of these recommendations as they are identified.

6.3 STATE AVIATION REGULATIONS

Title 2 Transportation Delaware Administrative Code provides the authority for the Office of Aeronautics to develop aviation regulations. There are two sets of aviation regulations – one for airport licensing and the other for airport obstructions.

Aviation Regulation 2151 – Delaware Airport Licensing

Delaware State law says, "The Department, through the Office of Aeronautics may approve and license airports and helicopter landing sites, or other air navigation facilities, in accordance with regulations it adopts pertaining to such approval and licensure. Licenses granted under this section shall be renewed annually in conjunction with the Federal Aviation Administration sponsored airport survey program."

Aircraft Interior Completion at Delaware Coastal Airport

To implement this law, Regulation 2151 provides guidance for the Office of Aeronautics. First, only public-use airports need licenses. In this regard, a representative from the Office of Aeronautics will conduct an annual inspection of the licensed airports. Licensing criteria have been developed for two specific areas of airport or heliport facility operation. The first involves the requirement of each public use airport to obtain and carry minimum levels of liability and property insurance. The second involves the requirement for displaced thresholds at runways obstructed by existing roadways, railways, or navigable waterways.

Minimum insurance requirements include one million dollars ($1,000,000) in liability insurance covering bodily injury and property damage liability in any one accident, along with fifty-thousand dollars ($50,000) coverage for property damage for each accident. Certificates of insurance, issued by an insurance company licensed to write such insurance in the State of Delaware, need to be filed annually with the Department of Transportation, Office of Aeronautics, as a part of the licensing procedure.

Runways that are obstructed, as defined in FAR Part 77, either by highways, railways, or navigable waterways shall have the thresholds of the impacted runways displaced by the appropriate distance. Appropriate displacement markings are required on paved surfaces in accordance with FAA guidelines and need to be installed as in-ground flush markers or other suitable FAA approved markings on turf strips.

Provisions for temporary waivers and license revocation are included in the regulation.

Aviation Regulation 2152 – Delaware Airport Obstructions

The Delaware Airport Obstruction Regulation (2152) focuses on preventing the construction or establishment of regulations through new building permit reviews by the Office of Aeronautics (Sections 4-6). These reviews ensure that imaginary surfaces around public-use airports are not penetrated by obstructions. If penetrations are unavoidable, they must be marked or lighted in order to preserve operational safety.

Section 7 addresses the removal of existing obstructions. The section requires the Office of Aeronautics to conduct an inventory of airspace obstructions not less than every 24 months. The obstruction inventory is to prioritize the severity of the obstruction, develop a cost for removal, and consider the activity level at the airport. Prior to the State investment of funds greater than $10,000 in obstruction removal, privately owned, public use airports must agree to a deed restriction keeping the airport as an airport for a minimum of 10 years. A violation of this restriction will trigger a reimbursement schedule for State expenditures. An Advisory Committee shall rank the list of obstruction removal priorities for DelDOT consideration and funding. Civil penalties not exceeding $1,000 per day can be imposed.

7. TECHNOLOGY IMPACTS

PREVIOUS SYSTEM PLANNING EFFORTS HAVE NOT EXAMINED the impacts of future technology on the demand for aviation transportation. However, because technological changes have been occurring at an increasing pace, it is likely that the Delaware system will look very different in 20 years, relative to the existing system. Not only will there be new means of communication which will limit the need to travel in person to meetings, there will be new methods of transportation itself. Across multiple industries, disruptive innovations are occurring at a rapid pace. Some of the new technology that is either already here, or coming soon includes the following:

- Electric Aircraft
- Autonomous Cars
- Flying Taxis
- Virtual Reality
- Unmanned Aerial Systems (UAS) Integration
- Airport Sustainability Practices

By including these technology considerations at the outset of the system plan, future airport facility needs that may be impacted can be adjusted.

7.1 ELECTRIC AIRCRAFT

Electric powered aircraft are already being manufactured in the U.S. These aircraft use electric engines instead of gas or jet fuel engines. Currently, the smaller general aviation aircraft are the most likely to be feasible because the size and weight of batteries is suited to a smaller weight payload and engine type. Large jet-powered airliners remain a difficult problem for manufacturers of electric engines.

Electric batteries pack much less energy per unit of weight than jet fuel - about 40 times less, even if the best batteries available are considered. Electric motors partly compensate this disadvantage by being more efficient in converting energy into power, but a huge gap remains.[3]

Rolls-Royce, a British developer of electric aircraft engines, is looking to set a world speed record with a propeller plane. In 2017, Siemen set an electric flight record of 210 mph. The Rolls-Royce electric aircraft (called ACCEL) is being readied to fly at more than 300 mph. Despite their plans for electrification, batteries remain the biggest hurdle to fully electrified commercial flight. Industry observers believe it will be decades before airlines will have fully electric aircraft that can perform like the large jet aircraft used today.[4]

An Israeli firm, Eviation, has developed an aircraft - called Alice – that will carry nine passengers for up to 650 miles at 10,000 ft at 276 mph. It is expected to enter service in 2022. Alice is an unconventional-looking craft, powered by three rear-facing pusher-propellers - one in the tail and two counter-rotating props at the wingtips to counter the effects of drag. It also has a flat lower fuselage to aid lift.[5] Cape Air has multiple orders for this aircraft. It is also likely that this type of aircraft will enter the business aviation market as an alternative to the King Air or Pilatus 12.

For Delaware, airports will need to prepare for general aviation electric aircraft with new charging stations. In addition, a new way to collect "fuel flowage fees" will have to be developed for these electric charging stations. Smaller, 4-seat electric aircraft models are entering the market and are said to be able to fly more than 300 miles on a single charge. In addition, they are very quiet compared to internal combustion powered aircraft.

7.2 AUTONOMOUS CARS

Recent developments in Cloud computing and emerging technologies like Artificial Intelligence, (AI), the Internet of Things (IoT) and Light Detection and Ranging (LiDAR) have turned autonomous cars from a vision to a present reality. As such, a number of companies have announced their plans of launching autonomous cars, and trial runs of these cars are already going on in different cities of the world.

The Internet of Things refers to the ever-growing network of physical objects that feature an IP address for internet connectivity. The communication that occurs between these objects and other Internet-enabled devices and systems does not require human-to-human or human-to-

[3] Source: CNN Travel: ***7 Electric Aircraft You Could Be Flying in Soon,*** Miquel Ros, November 2017.

[4] Source: Green Car Reports: ***Rolls Royce Guns for Electric Airplane Speed Record,*** Eric Evarts, June 2019. https://www.greencarreports.com/news/1123371_rolls-royce-guns-for-electric-airplane-speed-record, accessed 8/13/19.

[5] Source: ***Why the Age of Electric Flight is Finally Upon Us***, Tim Bowler, BBC News. July 2019. https://www.bbc.com/news/business-48630656 accessed 8/14/19.

computer interaction. Thus, an autonomous car is linked with IoT to Cloud-based resources, which serves as its intelligence. The car "sees" with LiDAR and is able to navigate with AI.

Companies like Waymo and Tesla are the forefront of the autonomous revolution. Recently, Drive.ai, a Silicon Valley-based startup building self-driving car software, announced that it will offer free rides to passengers in Frisco, Texas. It is anticipated that autonomous cars will transform the existing automobile industry more than any other technology since its inception in the beginning of the 20th century.[6]

Impacts of this technology on aviation will occur primarily at airline airports, where the main source of income is auto parking. In this case, many air travelers will be able to ride to the airport and simply tell their cars to drive home. Millions of dollars of revenue to these airports will be lost with the widespread use of this technology. In Delaware, the main impact would be felt at New Castle Airport, where new airline service is expected to generate significant auto parking needs. Autonomous cars will not replace the need for the proposed parking expansion at New Castle Airport, but they should limit the long-term future additional parking needs if the potential airline service is successful.

For general aviation airports, the picture is not nearly as bad. Very few general aviation airports charge for parking, and thus, will not be hurt by self-driving cars. At Delaware general aviation airports, the future need for automobile parking could level off because of this technology.

7.3 FLYING CARS AND TAXIS

Companies such as Uber, Boeing, and Airbus have started developing flying cars and taxis technology. Silicon Valley startups are showing enthusiasm about flying taxis. Uber desires to fly these taxis by 2023 and has partnered with NASA to make it a reality. Uber's plans for an urban aviation rideshare network will be combined with NASA's latest in airspace management computer modeling and simulation to assess the impacts of small aircraft. This will include delivery drones as well as passenger aircraft with vertical take-off and landing capability in crowded environments.[7]

Uber hopes its flying taxi will have a cruising speed of 150 to 200 miles an hour and a range of about 60 miles. This means a flying taxi could serve an area with a radius of 30 miles, assuming it must return to its base. While this market would directly compete with helicopter transportation, it would not compete with fixed wing aircraft.

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6 Source: ***5 Futuristic Transportation Technologies That Will Transform the World***, by Aditya Chaturvedi, 5/28/18, Geospatial World Website: https://www.geospatialworld.net/blogs/5-futuristic-transportation-technologies/

7 Ibid.

One possibility in the future is the transportation of executives from their downtown offices by flying taxi to a general aviation airport in the suburbs. With increasing automobile gridlock on the freeways, a flying taxi ride would greatly compress the time in transport. Otherwise, the trip to the general aviation airport may take as long as the airborne leg of the journey to their distant destinations.

For the purposes of this study, a phone interview with the head of business development at Uber Elevate revealed that the company sees a distinct opportunity utilizing general aviation airports in the future. Specifically, the company expects to have a significant need for maintenance work on their fleet of air-taxis that would likely need to be provided by operators at general aviation airports. Because Uber's air taxis cannot operate in Class B airspace, the company will be unable to use high density commercial service airports for any of their needs.

In Delaware, New Castle Airport is under Class D and Class B airspace. The Class D airspace extends from the ground up to 2,600 feet, while the Class B airspace begins at 4,000 feet and extends up to 7,000 feet. It is possible that an Uber air taxi operating below 4,000 feet could use New Castle Airport, it is likely that systems will have to be developed which will ensure segregation of traffic prior to any implementation. Thus, the near-term changes will be limited. However, within 20 years, it is likely that full airspace integration of autonomous air taxis and flying cars could be possible.

7.4 VIRTUAL REALITY

Virtual reality is the computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors. Many of the new rides at theme parks such as Disney World or Universal Studios attempt to fill the riders' visual, hearing, and feeling world with synthetic experiences, designed to seem real. This is a type of virtual reality experience, but very expensive to produce.
Computer-generated VR will have significantly greater applications that will impact transportation. New VR programs are being created for businesses. Using these, employees could one day hold meetings in virtual environments, allowing them to be anywhere they want, with anyone, regardless of geographical boundaries. This may reduce the amount of air travel needed to meet in person.

For tourism, VR could potentially reduce the number of vacation trips taken by people who can enjoy simulated travel instead. For businesses, VR could reduce the number of trips taken to meet people in person. Similarly, VR technology could produce a "try-before-you-buy" experience that would also reduce the need to test products at their site of origin or manufacture. In any event, it is likely that VR will reduce the growth in demand for both airline and general aviation travel in the future. This reduction is likely to be greater for airlines than for general aviation, primarily because of the higher numbers of overall person-trips taken using commercial airlines versus general aviation.

7.5 UAS INTEGRATION

The FAA has made significant progress in integrating UAS into the National Airspace System (NAS). However, the FAA believes much more must still be accomplished to achieve their vision for full integration. Tremendous growth has occurred in the UAS sector over the past several years, and the growing interest in using UAS for business applications will continue in concert with the small UAS rule (FAR Part 107).

FAA considers safety as the first priority. As such, UAS integration must consider risk and mitigations, and above all, must ensure the safety of the current airspace system and its users is maintained as progress is made. While finalizing the small UAS rule was an important first step, the FAA continues to gain valuable experience from issuing waivers to the rule, as well as from continued work performed through other UAS initiatives.

The newly launched Integration Pilot Program for UAS sets the stage to move even closer to expanded operations through enhanced partnerships among industry and State, local and tribal authorities. This experience will inform the next round of rulemaking, which will expand UAS operations beyond visual line of sight (BVLOS) for new purposes and services.[8]

Currently, interaction of small drones in controlled airspace is limited and requires special permission. Because drones can be programed to fly autonomously, it is likely that future technology will incorporate these programs into FAA air traffic control programming to ensure separation from manned flights. Other on-board equipment such as transponders with ADS-B capabilities will help air traffic control monitor locations of the aircraft which cannot be visually seen when they are 1,000 feet or more distant.

In Delaware, UAS operations will continue to rise as new applications are developed or improved. This will involve both small UAS (55 pounds or less) and larger UAS. In particular, UAS aircraft may become the backbone of aerial spray operations in the future. These would require larger UAS that provide a significant payload. Other UAS operations that are or will become commonplace will include highway and bridge inspection, environmental benchmarking, mapping, 3-D quantity measurements, and video capture for commercial uses. It is likely that most of the new UAS operations will be in addition to traditional means of performing tasks. Full integration of UAS operations into the Delaware aviation system will be observed as a part of this study.

[8] Source: ***Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap***, FAA, July 2018.

7.6 AIRPORT SUSTAINABILITY

Airport sustainability is defined by the FAA as actions that:

- Reduce environmental impacts.
- Help maintain high, stable levels of economic growth.
- Help achieve "social progress" - a broad set of actions that ensure organizational goals are achieved in a way that's consistent with the needs and values of the local community.

In terms of technology, airport sustainability impacting operations at Delaware airports are those advances which will create energy savings, economic development, and community compatibility. In this regard, continued progress in green technology has helped reduce costs, such as the use of LED lighting and solar panels where possible. Environmental sustainability also requires Airport drainage technology solutions that will benefit both the Airport and downstream communities. Sustainable economic development is that which provides revenues for the Airport and can coexist with aircraft operations.

Sign at Chorman Airport

The push toward airport sustainability will benefit airport users and nearby residents, as solutions to noise impacts, runway length requirements, area drainage requirements, and reduced energy usage all work toward common goals. While there may be little impact on the number of aircraft operations in the State, the sustainability movement will help the system airports better coexist with their respective communities. In this way, aircraft operations in the future should have a lesser negative impact on Delaware residents.

Appendices

2A and 2B

Appendix 2-A – Aviation Activity Differences From 2010 to 2018			
Airport Name	**2010**	**2018**	**Change**
Chandelle Estates			
Based Aircraft	**24**	**24**	**0**
Operations	3,200	1,100	(2,100)
Peak Hour Operations	3	3	0
Enplanements - GA	700	400	(300)
Chorman			0
Based Aircraft	**19**	**44**	**25**
Operations	13,200	13,500	300
Peak Hour Operations	8	8	0
Enplanements - GA	15,000	15,300	300
Civil Air Terminal			0
Based Aircraft	**0**	**0**	**0**
Operations	600	200	(400)
Peak Hour Operations	24	24	0
Enplanements - GA	5,000	5,000	0
Delaware Airpark			0
Based Aircraft	**56**	**29**	**(27)**
Operations	22,650	23,600	950
Peak Hour Operations	14	18	4
Enplanements - GA	7,400	7,700	300
Delaware Coastal Airport			0
Based Aircraft	**62**	**61**	**(1)**
Operations- Total	34,000	34,500	500
General Aviation	33,900	34,400	500
Military	100	100	0
Peak Hour Operations- Total	25	25	0
General Aviation	21	21	0
Military	4	4	0
Enplanements - GA	12,900	12,100	(800)
Jenkins			0
Based Aircraft	**20**	**20**	**0**
Operations	1,400	500	(900)
Peak Hour Operations	2	2	0
Enplanements - GA	800	200	(600)
Laurel			0
Based Aircraft	14	14	0
Operations	8,950	7,500	(1,450)
Peak Hour Operations	7	7	0
Enplanements - GA	2,100	2,500	400
New Castle Airport			0

Appendix 2-A – Aviation Activity Differences From 2010 to 2018			
Airport Name	**2010**	**2018**	**Change**
Based Aircraft	**189**	**198**	**9**
Operations- Total	78,840	41,582	(37,258)
General Aviation	69,970	36,600	(33,370)
Military	8,870	4,982	(3,888)
Peak Hour Operations- Total	100	72	(29)
General Aviation	70	56	(15)
Military	30	16	(14)
Enplanements - GA	47,500	30,000	(17,500)
Smyrna			0
Based Aircraft	10	10	0
Operations	2,300	1,700	(600)
Peak Hour Operations	2	4	2
Enplanements - GA	600	400	(200)
Summit			0
Based Aircraft	**43**	**32**	**(11)**
Operations- Total	41,500	32,000	(9,500)
General Aviation	41,400	31,900	(9,500)
Military	100	100	0
Peak Hour Operations- Total	29	23	(6)
General Aviation	25	19	(6)
Military	4	4	0
Enplanements - GA	23,600	18,600	(5,000)
STATEWIDE TOTALS			
Based Aircraft	**437**	**432**	**(5)**
Operations- Total	**206,640**	**156,182**	**(50,458)**
General Aviation	**197,570**	**151,000**	**(46,570)**
Military	**9,070**	**5,182**	**(3,888)**
Peak Hour Operations	**214**	**187**	**(28)**
Enplanements - GA	**115,600**	**92,200**	**(23,400)**

Appendix 2-B - FAA AIP Grants by Airport				
Year	**Airport**	**Service Level**	**Grant Seq Number**	**AIP Federal Funds**
2010	Delaware Airpark	GA	14	$1,583,555
2012	Delaware Airpark	GA	15	$149,314
2013	Delaware Airpark	GA	16	$2,802,840
2014	Delaware Airpark	GA	17	$4,383,671
2015	Delaware Airpark	GA	18	$5,813,539
2016	Delaware Airpark	GA	19	$3,478,891
2017	Delaware Airpark	GA	20	$132,247
2018	Delaware Airpark	GA	21	$14,310
2018	Delaware Airpark	GA	21	$346,500
2010	Sussex County	GA	24	$50,804
2010	Sussex County	GA	25	$227,712
2011	Sussex County	GA	26	$514,234
2011	Sussex County	GA	27	$723,900
2012	Sussex County	GA	28	$3,101,080
2013	Sussex County	GA	29	$4,297,047
2014	Sussex County	GA	30	$255,600
2015	Sussex County	GA	31	$479,182
2016	Delaware Coastal	GA	32	$225,549
2017	Delaware Coastal	GA	33	$430,196
2018	Delaware Coastal	GA	34	$5,532,528
2010	New Castle	R	30	$45,524
2010	New Castle	R	31	$3,679,042
2011	New Castle	R	32	$445,630
2012	New Castle	R	33	$1,421,275
2012	New Castle	R	34	$856,767
2013	New Castle	R	35	$893,910
2013	New Castle	R	36	$154,388
2014	New Castle	R	37	$4,479,108
2015	New Castle	P	38	$2,846,864
2015	New Castle	P	39	$810,000
2016	New Castle	P	40	$776,850
2016	New Castle	P	41	$4,240,191
2017	New Castle	P	42	$5,432,041
2018	New Castle	R	43	$4,133,293
2018	New Castle	R	44	$241,509
2018	New Castle	R	45	$1,015,900
2018	New Castle	R	46	$115,020
Total				**$66,130,011**

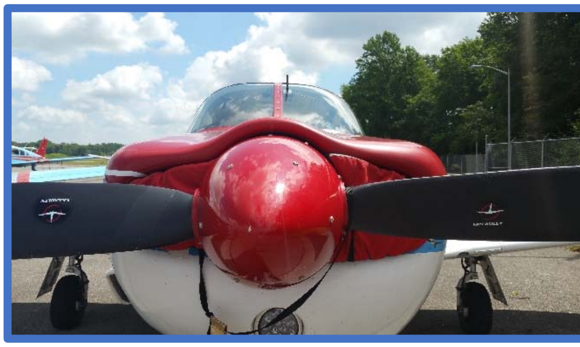
Chapter 3

Aviation Demand Forecasts

FORECAST OF AVIATION DEMAND

THIS CHAPTER DESCRIBES THE FORECAST OF AVIATION demand for general aviation and military aircraft activity in Delaware. The purpose of this work is to create a planning foundation for study recommendations through the year 2040. Because the number of active aircraft in the U.S. has been declining overall in recent years, forecasts of activity will focus on shifts in the types and characteristics of aircraft that are being introduced into the market. This includes the high-end business jets, experimental aircraft, turboprop aircraft, new single engine aircraft with glass cockpits, as well as rotorcraft, ultralights, and gliders.

With changing fleet mixes at airports, the annual operational capacity may not be as much an issue as are compliance with FAA safety standards, larger critical aircraft usage, runway pavement strengths, and capabilities for improved visibility minimums. In addition, environmental conditions assessments and financial feasibility plans require accurate aviation activity forecasts.



Delaware Airpark Based Aircraft

Major sections of this chapter include:

- Aviation Demand Elements
- Forecast Framework
- Role of the FAA's Terminal Area Forecasts
- Forecasts of General Aviation Activity
- Forecasts of Military Demand
- Forecasts of Potential Scheduled Air Service
- Summary of Aviation Demand Forecasts

1. AVIATION DEMAND ELEMENTS

FORECASTS OF AVIATION DEMAND CAN BE developed for a variety of activity indicators. In the case of Delaware airports, demand elements revolve primarily around existing and future general aviation activity. Basic activity indicators include the type and number of aircraft operations, along with the number of aircraft based at each airport. Military operations forecasts were also developed for New Castle Airport, Delaware Coastal Airport, and Summit Airport. Other important elements are derived from these basic indicators. Specifically, aviation activity forecasts were prepared for the following aviation elements:

- **Based Aircraft:** Defined as a general aviation aircraft which is stationed at an airport on a permanent basis.
  - Based Aircraft Fleet Mix
- **General Aviation Aircraft Operations:** This type of operation is either a takeoff or a landing of a general aviation aircraft.
  - Annual Operations
  - Local Versus Itinerant
  - Fleet Mix Forecast
  - Peak Period Operations (Monthly, Daily, Hourly)
- **General Aviation Enplaned Passengers:** Defined as air travelers who have boarded departing general aviation aircraft.
- **Military Aircraft Operations:** This type of operation is either a takeoff or a landing of a military aircraft.
- **Potential Airline Service:** A recent announcement of new airline service at New Castle Airport will be addressed in this forecast, along with potential airline passenger generation from Kent and Sussex Counties.

2. FORECAST FRAMEWORK


Aircraft Modification Work at Delaware Coastal Airport

THE FRAMEWORK FOR THIS FORECAST WAS BASED upon the development of a consensus or likely set of projections of demand, accompanied by potential adjustments (up or down) resulting from changes to basic assumptions of the likely forecast. Because the future is uncertain, a number of projections were developed that used different methods of prediction. Some methods were based upon local socioeconomic factors, others were based on national forecasts, while others used historical trends. The benefit of using a variety of projection methods occurs when the results show a forecast consensus. That is, if a number of projections all point in the same direction, even though they were generated using different data and methods, greater confidence is gained in the resulting forecast.

To achieve a forecasting consensus, all projection methods employed traditional means of extrapolating historical aviation trends at each airport or in an airport's service area into future time frames. For this forecasting effort, individual forecasts were created for the Delaware's four NIPIAS airports (Delaware Airpark, Delaware Coastal Airport, New Castle Airport, Summit Airport), along with a private airport (Chorman). Chorman Airport was included in the individual forecasts because of recent infrastructure development and the doubling of based aircraft. Due to lack of growth in based aircraft and operations at other privately owned, public-use airports in Delaware, an aggregate forecast of based aircraft was created for Chandelle Estates Airport, Jenkins Airport, Laurel Airport, and Smyrna Airport. Totals were then allocated to each airport. Because there can be no based aircraft at the Civil Air Terminal, only operations were forecast for that facility.

Delaware Coastal Airport Terminal Area

Market Share Projection

Market share projections are developed by calculating historical shares of national or regional activity measures and projecting these respective shares into future time frames. This method of projection reflects demand based upon trends occurring in the entire U.S. It is essentially a "top-down" method of forecasting where other forecasts of activity for larger areas are used as drivers of the local share of that demand. Socioeconomic projections, on the other hand, are considered "bottom-up" methodologies and are based upon local factors. Market share projections reflect historical trends and may include increasing, constant, or decreasing future market shares.

Socioeconomic Regression Analysis

The socioeconomic regression projection is based upon an assumed causal relationship between population, income, or employment and the aviation activity in a particular area. This projection of demand is obtained by relating socioeconomic data via regression analysis to aviation activity. The resulting set of regression equations produces a projection of aviation activity when they are coupled with independent projections of future socioeconomic data.

This forecast utilized population, income (in the form of Per Capita Personal Income or PCPI), and employment statistics as the independent socioeconomic variables. These statistics were obtained from the U.S. Department of Commerce, Bureau of Economic Analysis. Projections of population and employment were collected from the latest Delaware Population Consortium report.[1] These projections are officially recognized by the Delaware State Planning Office and the U.S. Department of Housing and Urban Development. Projections for PCPI were obtained from Woods & Poole Complete Economic and Demographic Data Source (CEDDS) 2019.

[1] Delaware Population Consortium Annual Population Projections, November 11, 2018, Version 2018.0

Trend Analysis

Trend projections use historical data to formulate predictions of future activity. For this study, two trend analysis methods were used to project baseline aviation activity: double exponential smoothing and least squares linear trending.

The double exponential smoothing process produces projections by combining the forecast for the previous period with an adjustment for past errors. It is desirable to correct for past errors when the error has resulted from changes in the trend. In this case, correcting for past errors will put the forecast back on track. Double exponential smoothing is appropriate when the time series contains a linear trend. It acts by calculating two smoothed series - a single and a double smoothed value. Both will lag behind any trend. However, the difference between them indicates the size of the trend. This difference is used to adjust the forecast for the trend.

The second trend method used was least squares linear trend. This method uses aviation activity regressed against time to produce a projection. No assumptions about the causes of trends are included in the trending methodologies.

3. ROLE OF THE FAA'S TERMINAL AREA FORECASTS

THE TERMINAL AREA FORECAST SYSTEM (TAF) IS the official FAA forecast of aviation activity at U.S. airports. These forecasts are prepared annually to meet the budget and planning needs of FAA and provide information for use by state and local authorities, the aviation industry, and the public. The TAF includes forecasts for active airports in the National Plan of Integrated Airport System (NPIAS). In all, there are currently 3,328 airports included in the forecasting database. Privately owned, non-NPIAS airports in Delaware are not included in the TAF.

Guidance from the FAA indicates that independent forecasts such as those generated by this System Plan must conform to the TAF in order to be approved for FAA funded projects. Locally developed forecasts for operations, based aircraft, and enplanements are considered consistent with the FAA's Terminal Area Forecasts if the meet the following criteria:

- All NPIAS Airports:
  - The forecast must differ by less than 10 percent in the 5-year forecast period and by 15 percent within the 10-year forecast period.
  - Forecast activity levels do not affect the timing or scale of an airport project.
- Commercial Service Airports other than Large, Medium, and Small Hub facilities, and General Aviation and Reliever Airports:
  - The forecast activity levels do not affect the role of the airport as defined in the NPIAS
- General Aviation and Reliever Airports:

- Airports with under 100,000 annual operations or with less than 100 based aircraft are exempt from the 10 and 15 percent conformance rules.

Only one Delaware airport is impacted by these guidelines (New Castle Airport), since all others have or are forecast to have less than 100,000 annual operations and less than 100 based aircraft within the forecast period. Forecasts generated by this System Plan have included consideration of the TAF and are consistent with the guidelines listed above.

4. GENERAL AVIATION DEMAND FORECASTS

GENERAL AVIATION ACTIVITY IS DEFINED AS civil aviation aircraft takeoffs and landings not classified as airline passenger or military. Forecasts of aviation demand can be developed for a variety of activity indicators. With the current lack of airline service in the State (as of 9/19), all demand for airports, airport facilities, and airport services stems from general aviation. A recent announcement of new airline service at New Castle Airport will be addressed in a different section of this Chapter.

Delaware State Flight Training Aircraft

Basic activity indicators include the type and number of aircraft operations, along with the number of aircraft based at each airport in the system. Other important elements are derived from these basic indicators. These different elements include:

- Based Aircraft Forecast
  - Based Aircraft Fleet Mix
- General Aviation Aircraft
  - Annual Operations
  - Local Versus Itinerant
  - Fleet Mix Forecast
  - Peak Period Operations (Monthly, Daily, Hourly)
- General Aviation Enplaned Passengers

4.1 BASED AIRCRAFT FORECAST

By definition, a based aircraft is an aircraft that is operational, air worthy, and based at the facility for a majority of the year. Forecasting based aircraft at Delaware airports proceeded through an analysis of historical data followed by forecasting into future years. For this study, existing and historical based aircraft information was taken from the FAA's Form 5010-1, supplemented by input from airport managers and the FAA's Terminal Area Forecasts.

Historical Based Aircraft Trends

Figure 3-1 presents a graphic illustration of the based aircraft growth trends since 2007. Historical based aircraft data obtained from historical documents, 5010, and Airport management has fluctuated in the past 8 years with little overall growth. **Table 3-1** shows the individual airport totals of based aircraft that make up the graph.

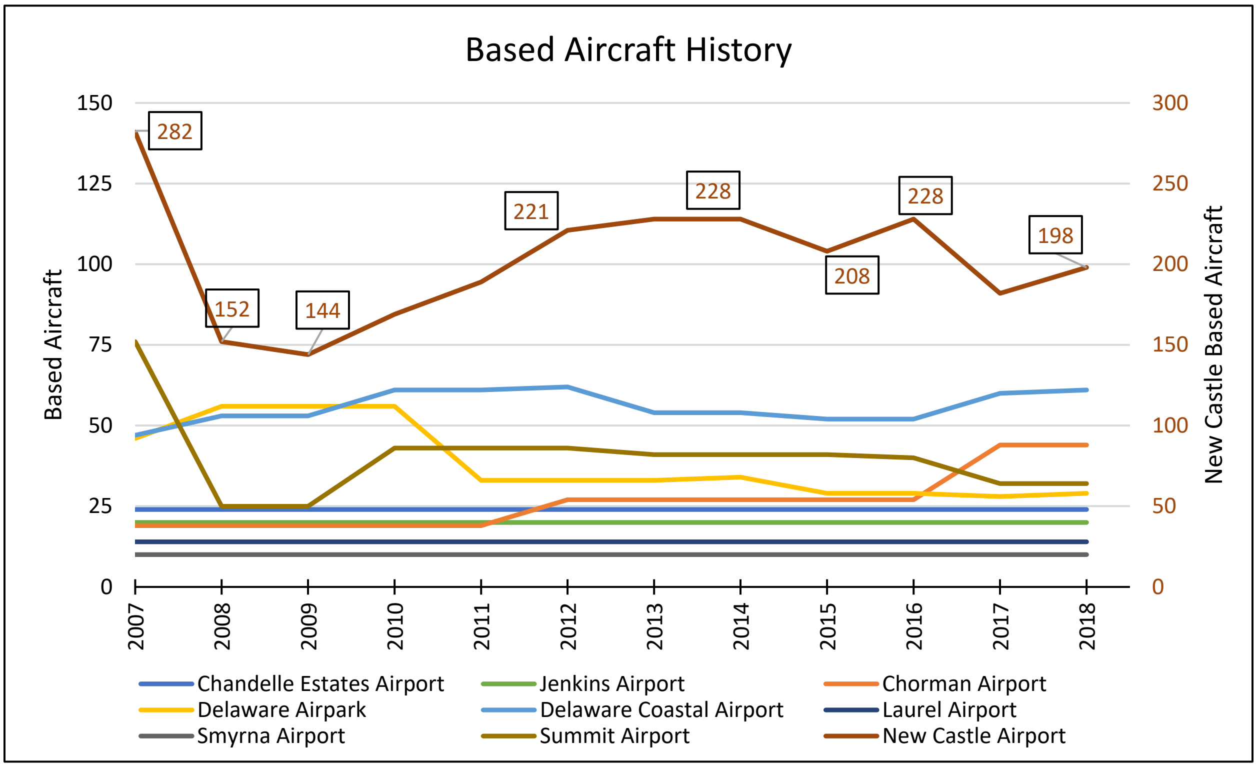


Figure 3-1- Based Aircraft History

Table 3-1 Based Aircraft History

Airport	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Chandelle Estates Airport	24	24	24	24	24	24	24	24	24	24	24	24
Chorman Airport	19	19	19	19	19	27	27	27	27	27	44	44
Civil Air Terminal, Dover AFB												0
Delaware Airpark	46	56	56	56	33	33	33	34	29	29	28	29
Delaware Coastal Airport	47	53	53	61	61	62	54	54	52	52	60	61
Jenkins Airport	20	20	20	20	20	20	20	20	20	20	20	20
Laurel Airport	14	14	14	14	14	14	14	14	14	14	14	14

Table 3-1 Based Aircraft History												
Airport	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
New Castle Airport	282	152	144	169	189	221	228	228	208	228	182	198
Smyrna Airport	10	10	10	10	10	10	10	10	10	10	10	10
Summit Airport	76	25	25	43	43	43	41	41	41	40	32	32
Total	**538**	**373**	**365**	**416**	**413**	**454**	**451**	**452**	**425**	**444**	**414**	**432**

Forecast Projections of Based Aircraft

To forecast based aircraft at the NPIAS airports and Chorman Airport, a total of 10 projections were developed for analysis. Projection methods included Market Share, Socioeconomic Regression, Trend Analysis, and others. The TAF was used as one projection and two others were derived projections (High-Low Average, Multi-Average).

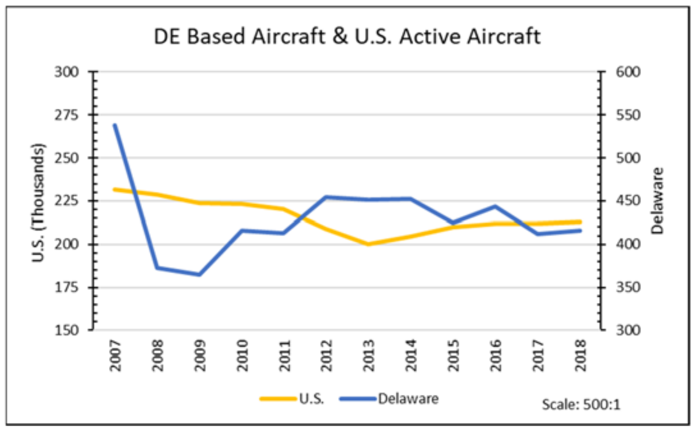


Figure 3-2- Delaware & US Aircraft Comparison

The Market Share Projections of demand predict the number of based aircraft for both Constant and Dynamic growth scenarios. For the Constant scenario, the projection shows the results, assuming the service area keeps pace with national growth trends. Given the lack of forecast growth of active aircraft in the U.S., the Constant Market Share Projection yields little or no growth over the period. **Figure 3-2** shows the relationship between Delaware based aircraft and the U.S. active aircraft fleet since 2007.

The Dynamic Market Share Projection of demand examines historical market shares and incorporates other factors that may affect growth of the based aircraft. For example, these factors included information about aircraft purchases at Delaware State University. Planned development at other airports, the increase of flight school training, and runway length improvements also impact the dynamic market share projections.

The Socioeconomic Regression Projections used historical population, employment, and income statistics from Delaware. These projections resulted from the regression analyses between each indicator and based aircraft at each airport for their respective historical periods.

The Trend Analysis Projection, like the Socioeconomic Regression Projections, examined the historical trend of based aircraft growth using Linear Trend Analysis (least squares) and Double Exponential Smoothing Analysis. Both the linear trend projection and the exponential smoothing projection will reflect the historical trend, either upward or downward.

The FAA's Terminal Area Forecasts reflect the FAA's official position on aviation activity growth at NPIAS airports. Therefore, TAF forecasts were included for each NPIAS airport. For non-NPIAS airports the TAF growth rates for Delaware were used.

The Derived Projections are simply derivatives of the other existing projections. For example, the High/Low Average is the average of the highest and lowest viable projections. The Multiple Average is the average of all viable projections.

Chorman Airport

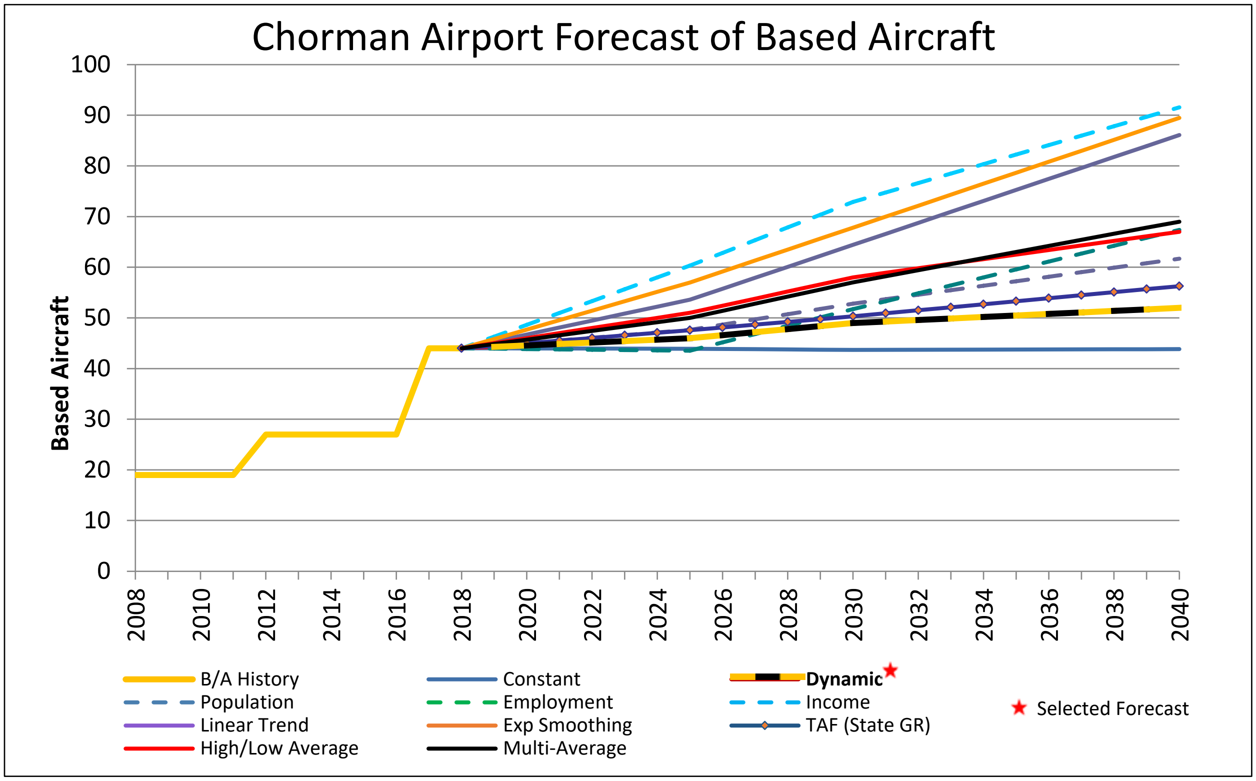


Figure 3-3- Chorman Airport Forecast of Based Aircraft

As shown in **Figure 3-3**, a total of 10 projections of based aircraft demand were developed for Chorman Airport. These projections range from a no growth (TAF projection) to high growth (PCPI regression projection). Because of the recent development at the airport and the increase of 17 aircraft in 2017, aircraft historical trends and the socioeconomic regressions show high growth over the period. As a result, the history shows a stair-step growth pattern. These patterns correspond to the development of new aircraft storage facility space. However, for the future, growth is not anticipated to be as dramatic. Thus, for Chorman Airport, the Dynamic Forecast was chosen and is contingent on some future development at the Airport. The forecast assumes an additional 8-unit T-hangar or similar storage space will be provided by 2040.

Delaware Airpark

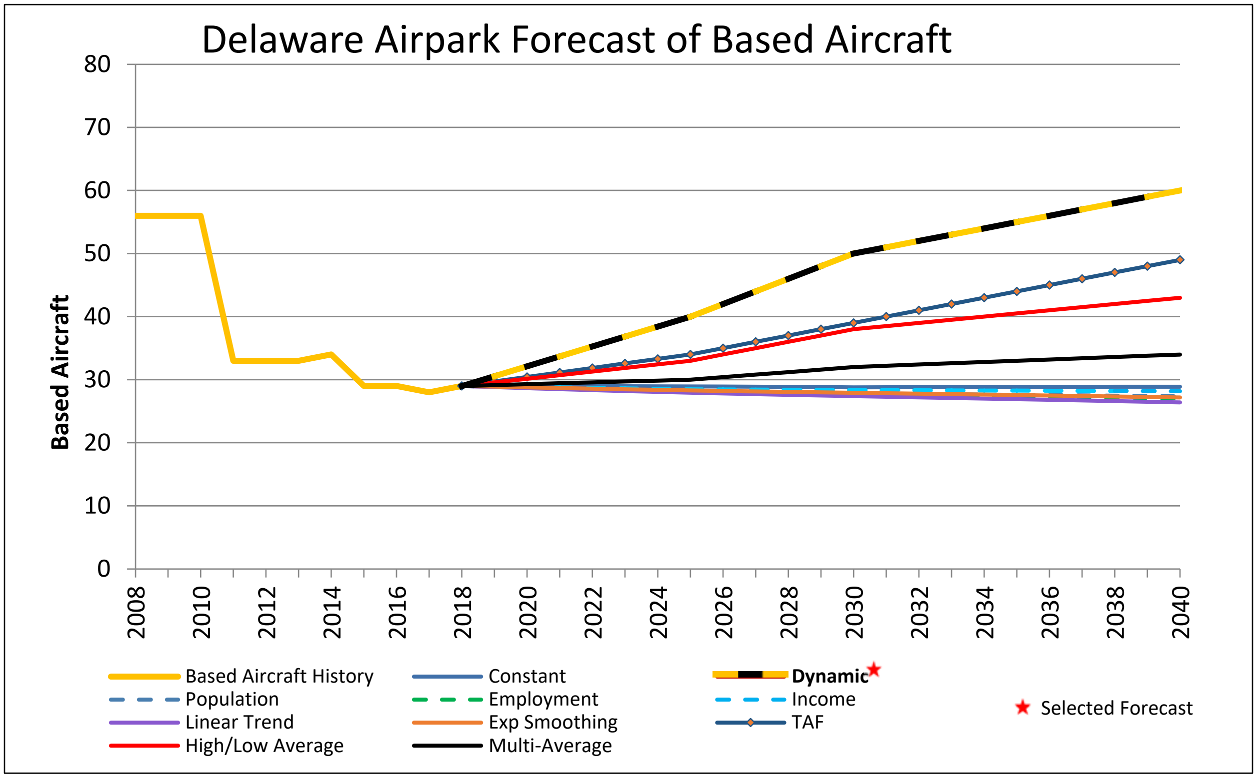


Figure 3-4- Delaware Airpark Forecast of Based Aircraft

Figure 3-4 shows the various projections of based aircraft demand for Delaware Airpark. These projections show a consensus of no growth, except for the Dynamic, TAF, and derived projections influenced by these two higher projections. The forecast selection process included consideration of a number of factors, including some non-market activities that are highly important.

The historical trends have been down, particularly when construction activities associated with the new runway at the airport drove some of the based aircraft owners to other facilities in Delaware. During that time, old T-hangars had to be torn down and new ones constructed across the runway. Because of the loss of based aircraft, historical trends and the socioeconomic regressions show negative growth over the period.

On the positive side, the TAF shows the based aircraft growth of 2.4 percent per year over the period with 20 additional aircraft by 2040. The non-market information that caused the creation of the Dynamic Market Share projection involved the announcement that Delaware State University is increasing their fleet by 11 aircraft by 2020. The ultimate plan for the University in 10 to 15 years is to have 50 aircraft and 500 students. There are currently plans to build an additional 20,000 square foot hangar for the Delaware State flight program at the Delaware Airpark. Given these significant growth plans, the Dynamic Market Share Projection of based aircraft was selected as the preferred forecast of Delaware Airpark.

Delaware Coastal Airport

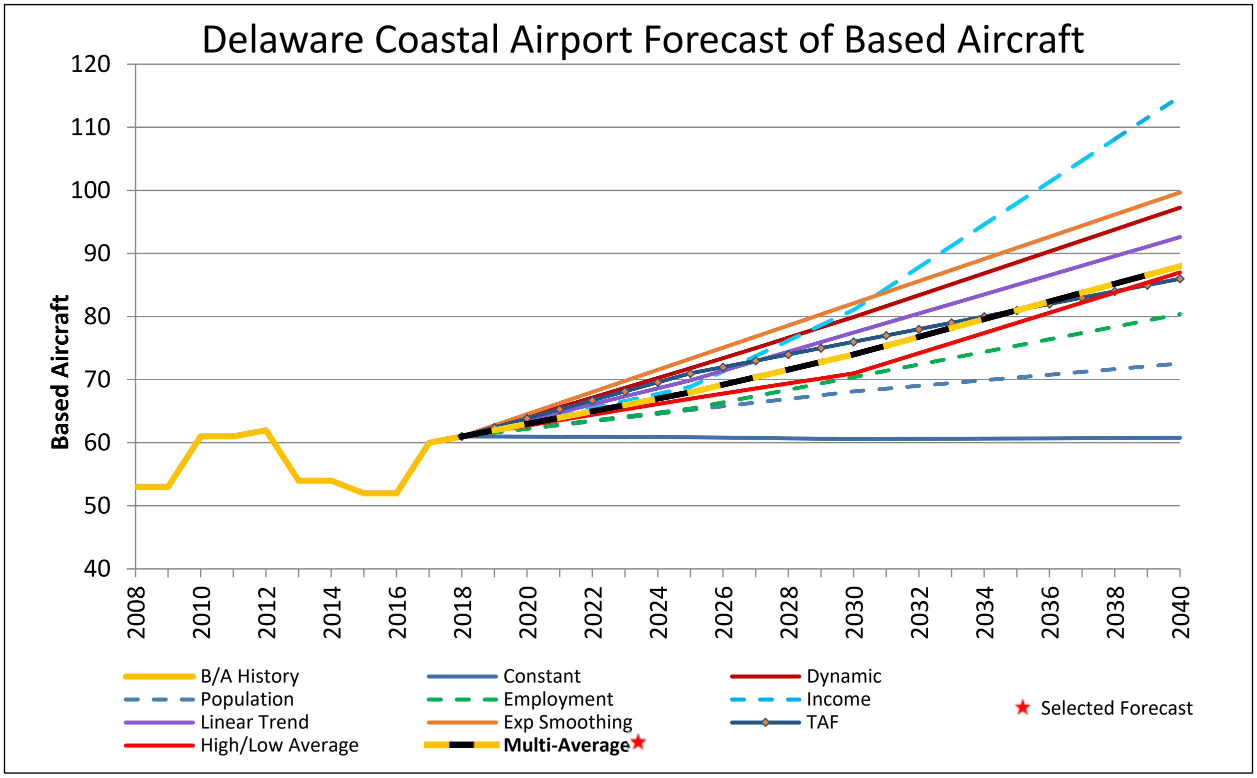


Figure 3-5- Delaware Coastal Airport Forecast of Based Aircraft

Figure 3-5 presents a summary of the projections of based aircraft demand for Delaware Coastal Airport. As shown, there are significant differences between the high (PCPI regression) and low (Constant Market Share) projections. Factors impacting the forecast selection process included the consideration of the County's plans to lengthen the runway by 500 feet to a total length of 6,000 feet. Airport management indicated that when the runway was increased from 5,000 feet to 5,500 feet, the number of annual jet operations doubled. In fact, a new Gulfstream G-4 has based at the airport in 2019.

Airport management anticipates future growth to be concentrated in business class aircraft. Because the airport is used by beach tourists and second-home owners, it will continue to have a large itinerant operation base. Given these growth factors, a mid-range projection was considered most realistic. The Multi Average Projection of based aircraft is the most mid-range projection possible and thus was selected as the preferred forecast. It's interesting that the Multi Average Projection shadows the FAA's TAF throughout the planning period. The agreement between these two forecasts provides greater confidence in the selection of the preferred forecast.

New Castle

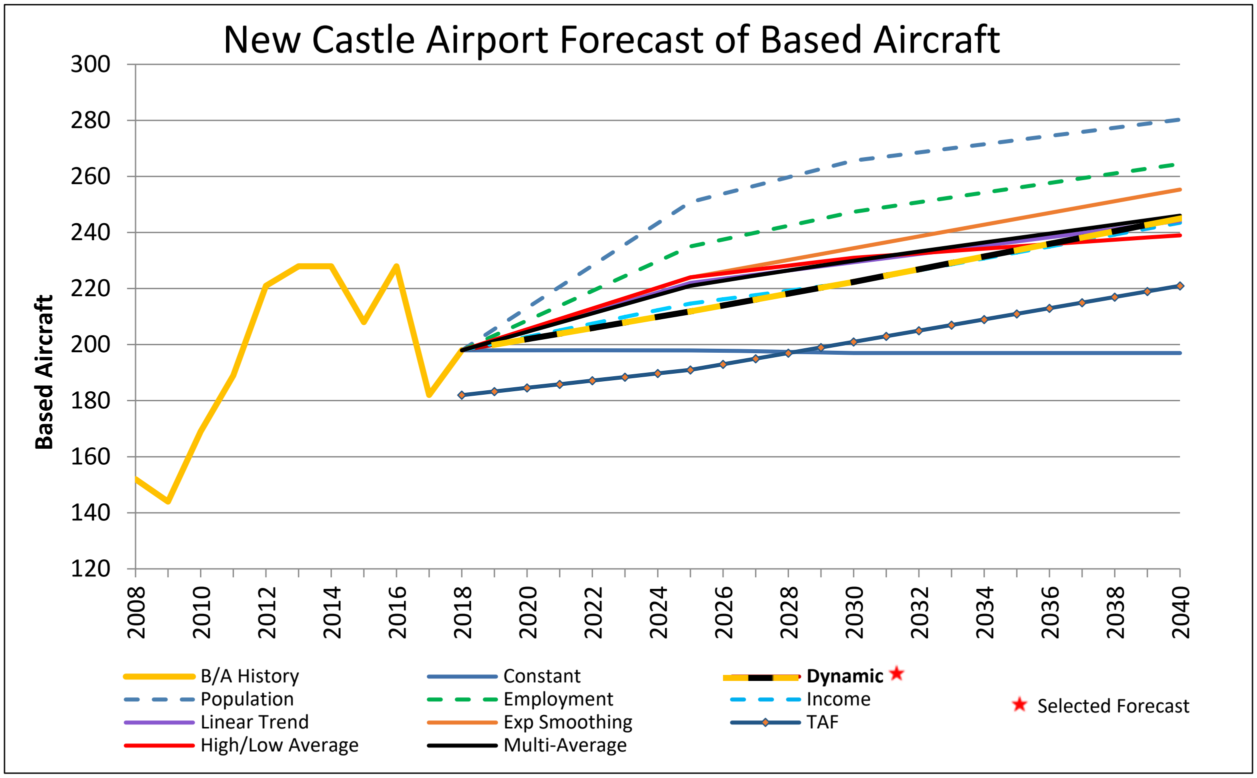


Figure 3-6- New Castle Airport Forecast of Based Aircraft

Figure 3-6 presents a graphic summary of the based aircraft projections for New Castle Airport. As shown, there is a wide range between high and low projections. The history of based aircraft demand shows a fluctuating pattern, with a significant decline of 46 based aircraft in 2017. Airport management indicates that this loss was more related to FAA accounting practices than to actual losses of based aircraft on the airport.

Even with a fluctuating history of based aircraft levels, airport management believes that continued growth will occur at the airport, stemming from greater use by business aviation and an increasing flight training presence. The Dynamic Market Share Projection shows growth at 0.97 percent per year.

The TAF shows growth of 0.89 percent per year while the Dynamic Market Share Projection shows a growth of 0.97 percent per year. It should also be noted that the 2016 Airport Master Plan showed a growth of 0.75 percent per year, however, the starting level of based aircraft was 228 in 2016 rather than 198 in 2018. This created a much higher level of based aircraft than the System Plan forecasts.

Considering these factors, the Dynamic Market Share Projection was selected as the preferred forecast. It is within 3 percent of the TAF forecast by the year 2040, and thus meets FAA forecast approval criteria for compliance.

Table 3-2 Comparing Airport Planning and TAF Forecast of Based Aircraft

Based Aircraft	Year	Airport Forecast	TAF	(% Difference)	Adjusted TAF	(% Difference)
Base yr.	2018	198	182	9%	198	0.00%
Base yr. + 7yrs.	2025	212	191	11%	208	2.03%
Base yr. + 12yrs.	2030	222	201	10%	219	1.52%
Base yr. + 17yrs.	2035	234	211	11%	230	1.72%
Base yr. + 22yrs.	2040	245	221	11%	240	1.90%
CAGR		**0.97%**	**0.89%**		**0.89%**	

Summit Airport

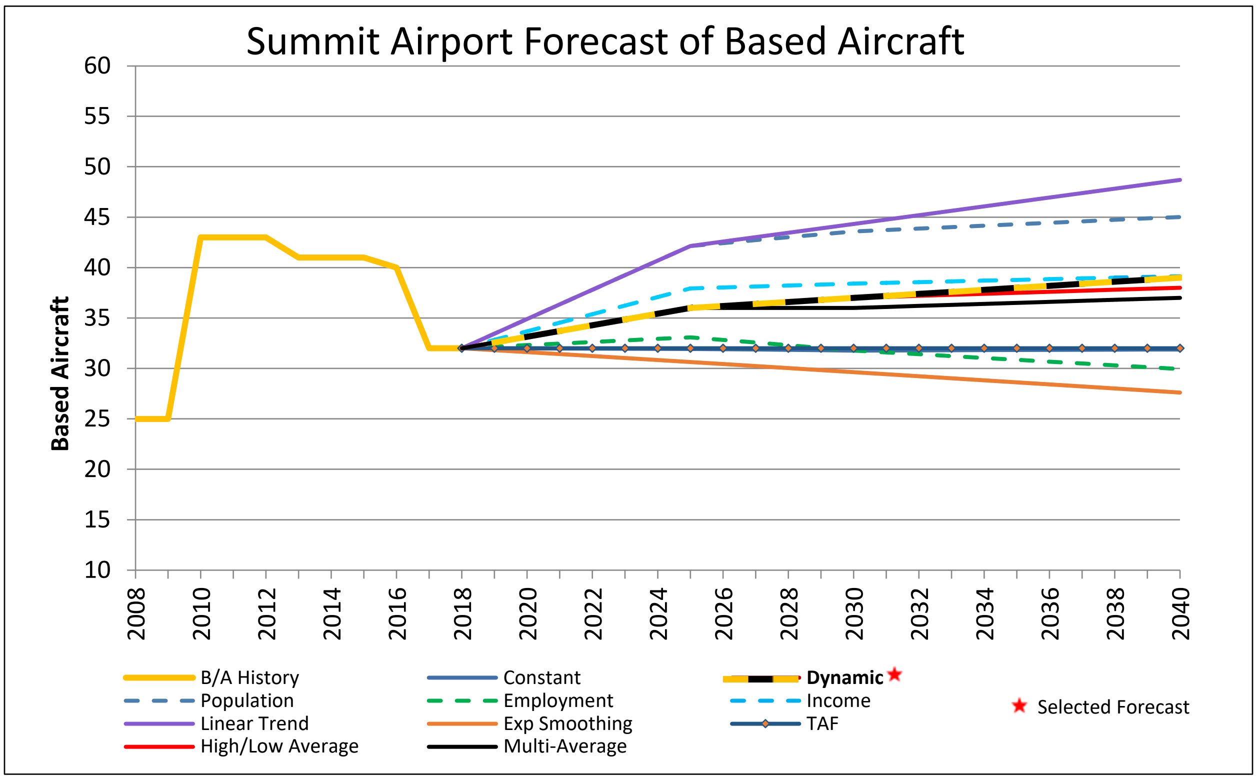


Figure 3-7- Summit Airport Forecast of Based Aircraft

Discussions with Summit Airport management representatives indicate that their business model does include modest growth. The airport has sufficient T-hangar space to accommodate more aircraft, however, in recent years, demand has been shrinking. Management is not sure why demand has contracted but are ready to welcome new based aircraft owners.

The TAF for Summit Airport shows no growth. Typically, a flat line forecast in the TAF means that FAA has either not looked at the airport yet, or, has concluded there is no growth potential. The TAF will not show negative growth, even if FAA models predict it. Because the history has been negative, forecasting models that use only historical data will show negative or no growth projections.

The Dynamic Market Share Projection was selected as the preferred forecast for Summit Airport. It shows a slight growth from 32 based aircraft in 2018 to 39 based aircraft by the year 2040.

Other Airports

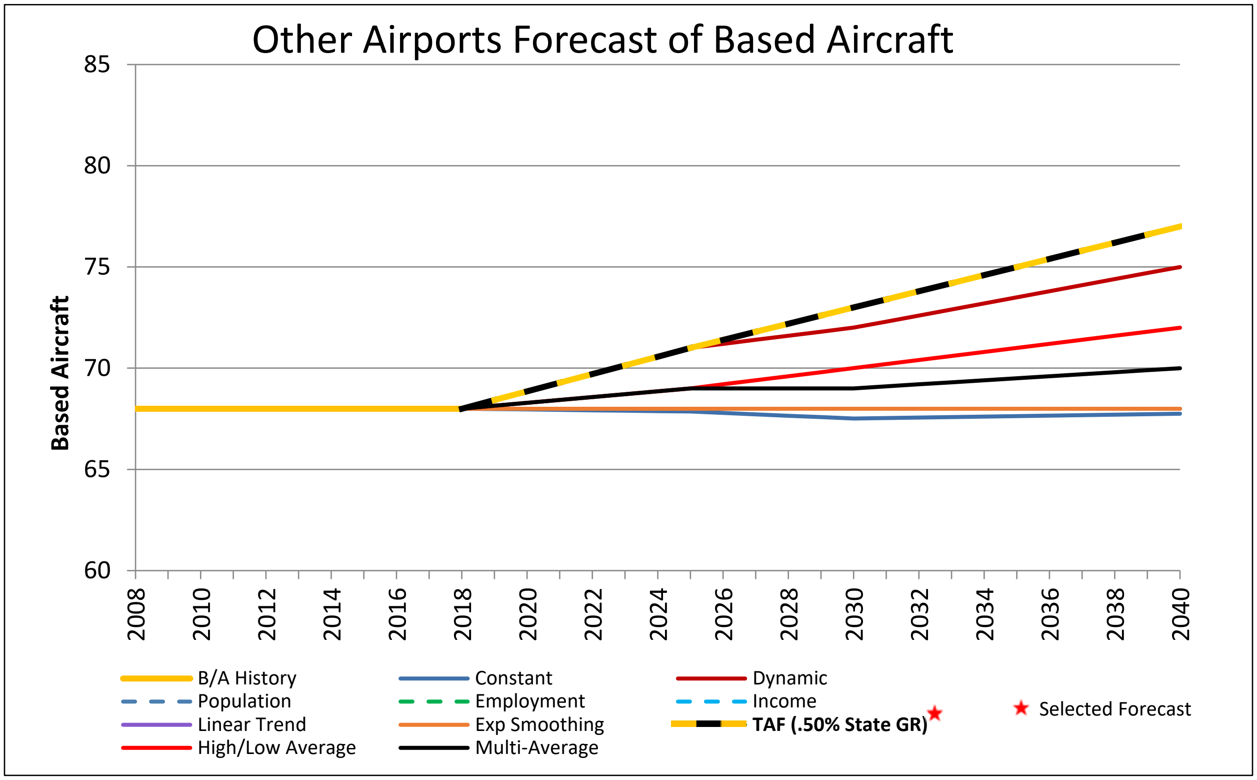


Figure 3-8- Other Airports Forecast of Based Aircraft

In 2018, there were 68 aircraft based at four privately owned, public use airports in Delaware. If the full TAF growth rate for Delaware were applied to these airports, there would be a total of 19 based aircraft increase over the forecast period. However, because these airports have had little or no growth for many years, that growth rate was cut in half and applied to the aggregate total based aircraft forecast. The resulting increases were allocated to each airport based upon their potential to grow. **Table 3-3** shows the distribution of forecast based aircraft to these four privately owned, public-use airports.

Table 3-3 Private Airport Based Aircraft						
Airport	**2018**	**2025**	**2030**	**2040**	**Change in A/C**	**Average GR**
Chandelle Estates Airport	24	25	25	26	2	0.36%
Jenkins Airport	20	20	21	21	1	0.22%
Laurel Airport	14	16	17	19	5	1.40%
Smyrna Airport	10	10	10	11	1	0.43%
Total	**68**	**71**	**73**	**77**	**9**	**0.57%**

Selected Based Aircraft Forecasts

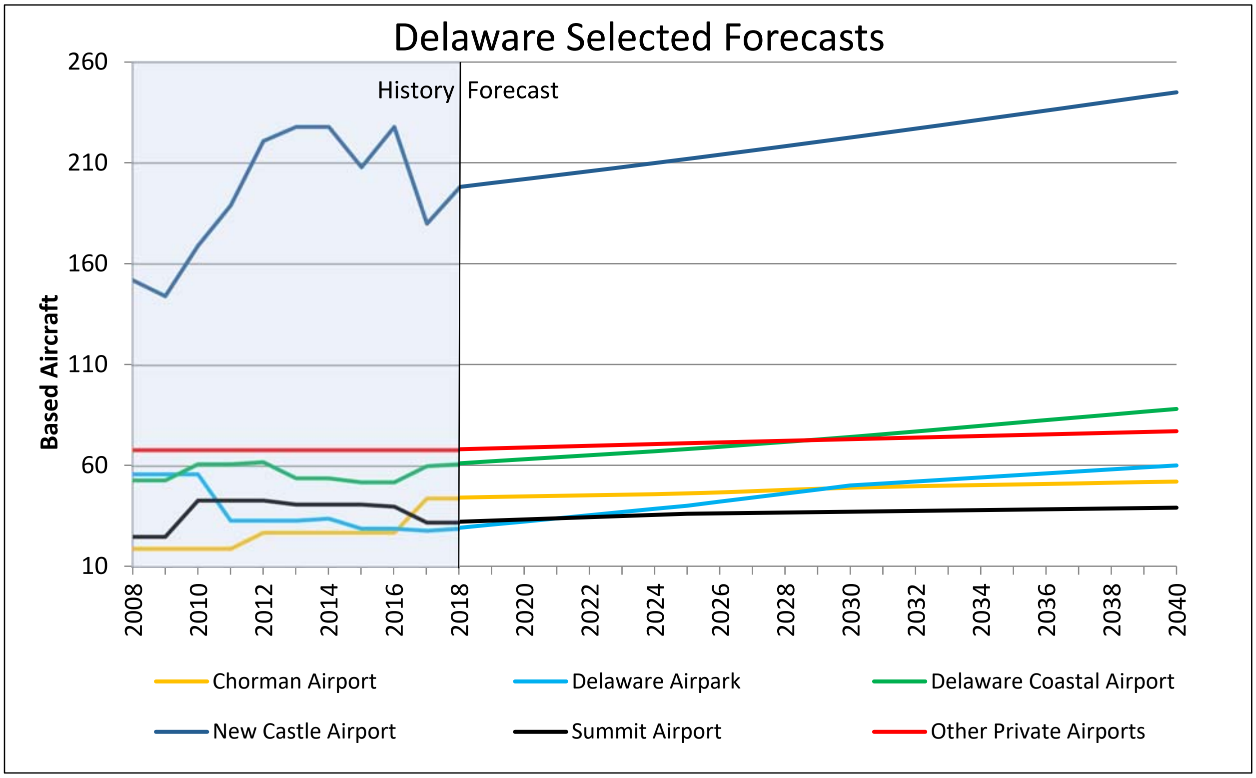


Figure 3-9- Delaware Selected Forecasts of Based Aircraft

Table 3-4 presents the forecasts of based aircraft for all public-use airports in Delaware. The Selected Forecast considered each of the projections as a possible forecast for the based aircraft at each airport. The rationale for forecast selection has been presented on the previous pages.

Table 3-4 - Selected Based Aircraft Forecast					
Airport	**2018**	**2025**	**2030**	**2040**	**CAGR**
Chandelle Estates Airport	24	25	25	26	0.4%
Chorman Airport	44	46	49	52	0.8%
Civil Air Terminal, Dover AFB	0	0	0	0	0.0%
Delaware Airpark	29	40	50	60	3.4%

Table 3-4 - Selected Based Aircraft Forecast					
Airport	**2018**	**2025**	**2030**	**2040**	**CAGR**
Delaware Coastal Airport	61	68	74	88	1.7%
Jenkins Airport	20	20	21	21	0.2%
Laurel Airport	14	16	17	19	1.4%
New Castle Airport	198	212	222	245	1.0%
Smyrna Airport	10	10	10	11	0.4%
Summit Airport	32	36	37	39	0.9%
Delaware Total	**432**	**473**	**505**	**561**	**1.2%**

As shown, the numbers of based aircraft in the State are forecast to increase from 432 in the first period to 561 by the year 2040 – a net gain of 129 aircraft (29.9 percent growth over the period-1.2 percent per year). This growth is higher than the national average of -0.0374 percent growth of active aircraft over the same period. However, the national average growth in aircraft other than single and multi-engine piston aircraft are forecast to grow by 1.445% per year (37 percent) over the period.

This forecast is still considered reasonable due to the fact that in 2016 there were 444 based aircraft at the public-use airports in Delaware, a number that is forecasted to be reached by 2022, and in 2007, there were 538 based aircraft at the public-use airports in Delaware which is 23 less aircraft than the 561 aircraft forecast to be reached in 2040.

Based Aircraft Fleet Mix

An aircraft fleet mix refers to the characteristics of a population of aircraft. General aviation aircraft are classified by specific physical traits such as aircraft type (whether fixed wing or rotorcraft), their weight, and number and type of engines. Aircraft having dissimilar physical and operating traits require varying types and amounts of airport facilities. For this reason, it is important to estimate the type of aircraft that will be operating and based at Delaware airports.

Table 3-5- Delaware Fleet Mix 2018							
Airport	**Single Engine**	**Multi Engine**	**Jet**	**Rotor**	**Other**	**Total**	**Market Share**
Chandelle Estates Airport	22	2	0	0	0	24	5.6%
Chorman Airport	40	2	0	2	0	44	10.2%
Civil Air Terminal, Dover AFB	0	0	0	0	0	0	0.0%
Delaware Airpark	25	4	0	0	0	29	6.7%
Delaware Coastal Airport	40	11	3	6	1	61	14.1%
Jenkins Airport	18	1	0	0	1	20	4.6%
Laurel Airport	13	1	0	0	0	14	3.2%
New Castle Airport	85	21	68	4	20	198	45.8%
Smyrna Airport	8	0	0	0	2	10	2.3%

Table 3-5- Delaware Fleet Mix 2018							
Airport	**Single Engine**	**Multi Engine**	**Jet**	**Rotor**	**Other**	**Total**	**Market Share**
Summit Airport	29	0	0	3	0	32	7.4%
Total	**280**	**42**	**71**	**15**	**24**	**432**	**100%**
Percent of Total	**64.8%**	**9.7%**	**16.4%**	**3.5%**	**5.6%**		

In the forecasting process, the based aircraft fleet mix is used as one component to help determine operational fleet mix forecasts. It is also used to determine the future design category each public-use airport. Fleet mix categories included: single engine, multi-engine, turbojet, rotorcraft, and "other." This information was available from the most recent FAA Form 5010-1, Airport Master Record.

Projection of the fleet mix involved the consideration of the effects of the national trends in aircraft manufacturing, and the based aircraft fleet mix. **Figure 3-10** shows the projected national fleet mix for general aviation aircraft. **Table 3-6** shows the forecast in tabular form for the forecast period. As shown, there is negative growth for single engine aircraft and relatively flat growth for multi-engine aircraft. The majority of the growth occurs in the jet and rotorcraft categories.

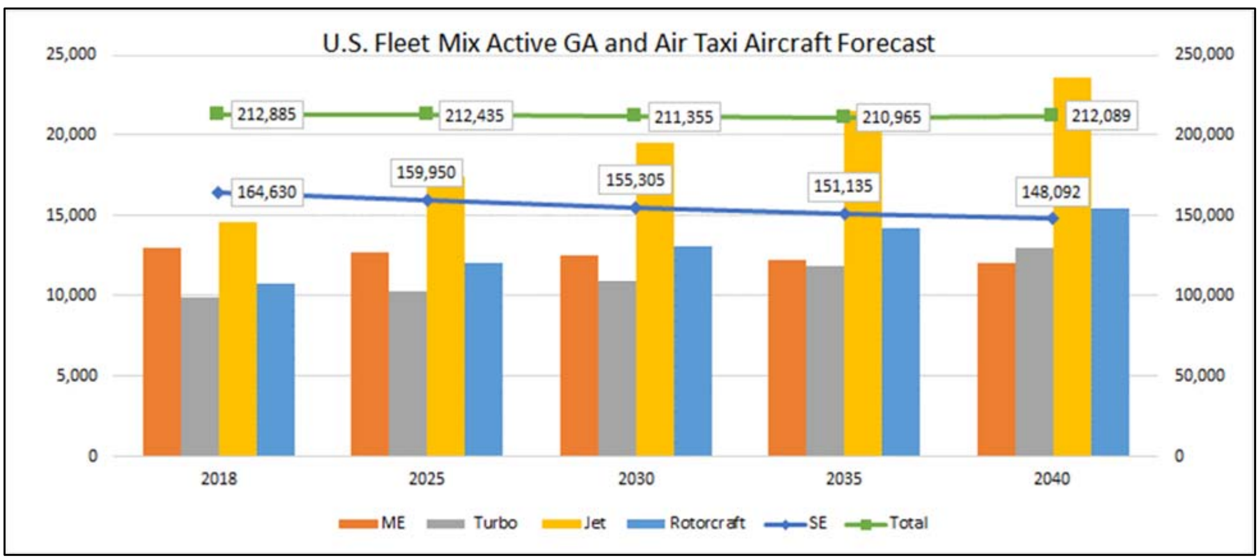


Figure 3-10 - US Fleet Mix Active GA and Air Taxi Aircraft Forecast

Table 3-6 – U.S. Fleet Mix Forecast						
Year	**SE**	**ME**	**Jet**	**Rotorcraft**	**Other**	**Total**
2016	164,605	17,876	13,751	10,577	4,986	211,794
2017	164,280	18,058	14,217	10,511	4,692	211,757
2018	164,878	18,003	14,585	10,705	4,715	212,885
Forecast						

Table 3-6 – U.S. Fleet Mix Forecast						
Year	**SE**	**ME**	**Jet**	**Rotorcraft**	**Other**	**Total**
2025	160,230	17,880	17,445	12,045	4,835	212,435
2030	155,905	18,000	19,520	13,060	4,870	211,355
2040	149,682	18,528	23,553	15,429	4,897	212,089
CAGR[1]	**-0.44%**	**0.13%**	**2.20%**	**1.68%**	**0.17%**	**-0.02%**

Source: FAA Aerospace Forecasts for Fiscal Years 2019-2039, year 2040 extrapolated by consultant
Legend: AC = Air Carrier; AT = Air Taxi; GA = General Aviation
[1] CAGR: Compound Annual Growth Rate (2018-2040)

Because the total number of based aircraft in Delaware is expected to grow moderately over the forecast period, fleet mix changes will occur as a result of new aircraft being based at system airports. The decline in single engine aircraft nationally will be reflected more by the larger airports such as ILG and GED with slower or negative growth in that aircraft type. Although the total number of aircraft will be significant, the based fleet will be moving toward a more sophisticated, larger, business-type aircraft mix at the larger airports.

Table 3-7 presents the forecast of based aircraft fleet mix anticipated for each public-use airport in Delaware. As shown, the single engine aircraft totals are anticipated to increase from the existing 280 to 340 by 2040. The second largest category anticipated to increase is the Jet aircraft category, with an additional 32 jets in 22 years – growing from 71 to 103 over the period.

Table 3-7 - Forecast of Based Aircraft Fleet Mix by Airport						
Airport Name	**Single Engine**	**Multi Engine**	**Jet**	**Rotor**	**Other**	**Total**
Chandelle Estates Airport						
2018	22	2	0	0	0	24
2025	23	2	0	0	0	25
2030	23	2	0	0	0	25
2040	24	2	0	0	0	26
Chorman Airport						
2018	40	2	0	2	0	44
2025	42	2	0	2	0	46
2030	42	4	0	3	0	49
2040	44	5	0	3	0	52
Civil Air Terminal						
2018						N/A
2025						N/A
2030						N/A
2040						N/A
Delaware Airpark						
2018	25	4	0	0	0	29

Table 3-7 - Forecast of Based Aircraft Fleet Mix by Airport						
Airport Name	**Single Engine**	**Multi Engine**	**Jet**	**Rotor**	**Other**	**Total**
2025	34	6	0	0	0	40
2030	43	7	0	0	0	50
2040	52	8	0	0	0	60
Delaware Coastal Airport						
2018	40	11	3	6	1	61
2025	43	12	5	7	1	68
2030	45	13	7	8	1	74
2040	52	15	11	9	1	88
Jenkins Airport						
2018	18	1	0	0	1	20
2025	18	1	0	0	1	20
2030	18	1	0	0	2	21
2040	18	1	0	0	2	21
Laurel Airport						
2018	13	1	0	0	0	14
2025	15	1	0	0	0	16
2030	16	1	0	0	0	17
2040	18	1	0	0	0	19
New Castle Airport						
2018	85	21	68	4	20	198
2025	89	23	74	5	21	212
2030	89	26	80	5	22	222
2040	93	28	92	7	25	245
Smyrna Airport						
2018	8	0	0	0	2	10
2025	8	0	0	0	2	10
2030	8	0	0	0	2	10
2040	9	0	0	0	2	11
Summit Airport						
2018	29	0	0	3	0	32
2025	31	1	0	4	0	36
2030	30	2	0	5	0	37
2040	30	3	0	6	0	39
STATEWIDE TOTALS						
2018	**280**	**42**	**71**	**15**	**24**	**432**
2025	**303**	**48**	**79**	**18**	**25**	**473**
2030	**314**	**56**	**87**	**21**	**27**	**505**
2040	**340**	**63**	**103**	**25**	**30**	**561**

4.2 GENERAL AIRCRAFT OPERATIONS FORECAST

An aircraft operation is defined as either a takeoff or a landing. A takeoff and landing are considered two operations. General aviation operations forecasts were prepared for each public-use airport in Delaware for a number of activity measures. In this regard, the following operational elements were forecast:

Delaware Coastal Airport - Runway 4 (and 10)

- Total Annual Operations
  - Local versus Itinerant
  - Fleet Mix Forecast
- Peak Period Operations (Monthly, Daily, Hourly)

The general aviation annual operations forecast (**Table 3-8**) was derived for both local and itinerant operations using an operations-per-based-aircraft (OPBA) ratio. The OPBA's are ratios of total general aviation operations at an airport divided by the corresponding number of based aircraft. These OPBA ratios were further subdivided into local and itinerant OPBA ratios. By definition, local operations are performed by aircraft that operate within the local traffic pattern or within site of the airport. They can also be assigned to aircraft arriving or departing from local practice areas within 20 miles of the airport. In general, local operations are associated with pilot training. Itinerant operations, on the other hand, are all other aircraft operations other than local operations. **Table 3-8** presents the forecast of local and itinerant general aviation operations for each Delaware public-use airport.

Table 3-8 – Forecast of General Aviation Operations												
Airport Name	**2018**			**2025**			**2030**			**2040**		
	Local	**Itinerant**	**Total**	**Local**	**Itinerant**	**Total**	**Local**	**Itinerant**	**Total**	**Local**	**Itinerant**	**Total**
Chandelle Estates Airport	900	200	1,100	1,000	200	1,200	1,000	200	1,200	1,000	200	1,200
Chorman Airport	1,400	12,100	13,500	1,500	12,700	14,200	1,500	13,500	15,000	1,600	14,300	15,900
Civil Air Terminal, Dover AFB	0	200	200	0	800	800	0	1,000	1,000	0	1,400	1,400
Delaware Airpark	19,400	4,200	23,600	26,800	5,800	32,600	33,500	7,200	40,700	40,200	8,700	48,900
Delaware Coastal Airport	27,500	6,900	34,400	30,600	7,700	38,300	33,300	8,400	41,700	39,600	10,000	49,600
Jenkins Airport	400	100	500	400	100	500	500	100	600	500	100	600
Laurel Airport	6,100	1,400	7,500	6,900	1,600	8,500	7,400	1,700	9,100	8,200	1,900	10,100
New Castle Airport	14,000	22,600	36,600	15,000	24,200	39,200	15,700	25,400	41,100	17,300	28,000	45,300
Smyrna Airport	1,500	200	1,700	1,500	200	1,700	1,500	200	1,700	1,600	200	1,800
Summit Airport	18,900	13,000	31,900	21,300	14,600	35,900	21,900	15,000	36,900	23,100	15,800	38,900
Delaware Total	**90,100**	**60,900**	**151,000**	**105,000**	**67,900**	**172,900**	**116,300**	**72,700**	**189,000**	**133,100**	**80,600**	**213,700**

Operational Fleet Mix Forecast

The operational fleet mix forecast was derived directly from based aircraft fleet mix unless other specific information concerning operational use was available. The process involved multiplying the operations per based aircraft (OPBA) utilization rate times the number of aircraft in each category. **Table 3-9** presents the forecast of operational fleet mix for each public-use airport in Delaware.

Table 3-9 – Forecast of Operational Fleet Mix

Airport Name	Single Engine	Multi Engine	Jet	Rotor	Other	Total
Chandelle Estates Airport						
2018	1,008	92	0	0	0	1,100
2025	1,104	96	0	0	0	1,200
2030	1,104	96	0	0	0	1,200
2040	1,108	92	0	0	0	1,200
Chorman Airport						
2018	12,273	614	0	614	0	13,500
2025	12,965	617	0	617	0	14,200
2030	12,857	1,224	0	918	0	15,000
2040	13,454	1,529	0	917	0	15,900
Civil Air Terminal						
2018	0	91	429	80	0	600
2025	0	158	536	106	0	800
2030	0	197	670	133	0	1,000
2040	0	276	938	186	0	1,400
Delaware Airpark						
2018	20,345	3,255	0	0	0	23,600
2025	27,710	4,890	0	0	0	32,600
2030	35,002	5,698	0	0	0	40,700
2040	42,380	6,520	0	0	0	48,900
Delaware Coastal Airport						
2018	22,557	6,203	1,692	3,384	564	34,400
2025	24,219	6,759	2,816	3,943	563	38,300
2030	25,358	7,326	3,945	4,508	564	41,700
2040	29,309	8,455	6,200	5,073	564	49,600
Jenkins Airport						
2018	450	25	0	0	25	500
2025	450	25	0	0	25	500
2030	514	29	0	0	57	600
2040	514	29	0	0	57	600
Laurel Airport						

Table 3-9 – Forecast of Operational Fleet Mix						
Airport Name	**Single Engine**	**Multi Engine**	**Jet**	**Rotor**	**Other**	**Total**
2018	6,964	536	0	0	0	7,500
2025	7,969	531	0	0	0	8,500
2030	8,565	535	0	0	0	9,100
2040	9,568	532	0	0	0	10,100
New Castle Airport						
2018	17,478	4,318	13,982	822	0	36,600
2025	18,182	4,699	15,118	1,021	0	39,200
2030	18,073	5,280	16,246	1,015	0	41,100
2040	18,724	5,637	18,523	1,409	0	45,300
Smyrna Airport						
2018	1,360	0	0	0	340	1,700
2025	1,360	0	0	0	340	1,700
2030	1,360	0	0	0	340	1,700
2040	1,473	0	0	0	327	1,800
Summit Airport						
2018	6,380	0	0	25,520	0	31,900
2025	8,695	280	0	26,925	0	35,900
2030	9,340	623	0	26,937	0	36,900
2040	10,609	1,061	0	27,230	0	38,900
STATEWIDE TOTALS						
2018	**88,815**	**15,134**	**16,102**	**30,420**	**929**	**151,400**
2025	**102,653**	**18,055**	**18,469**	**32,613**	**928**	**172,900**
2030	**112,174**	**21,008**	**20,860**	**33,512**	**961**	**189,000**
2040	**127,139**	**24,130**	**25,660**	**34,816**	**948**	**213,700**

It should be noted that at Summit Airport, 80 percent of current operations are from helicopters. The forecast showed a decline to 70 percent of total operations by the end of the period. Also, there are no single engine aircraft operations shown for the Civil Air Terminal because civil aviation training activity is prohibited, and the landing fees work to shift those operations to Delaware Airpark where there are no fees.

Peak Period Operations

Since many general aviation landside and airfield facility needs are related to the levels of activity during peak periods, forecasts were developed for peak month, design day, and peak hour general aviation operations at Delaware public-use airports. Typically, non-towered general aviation airports do not keep accurate records of peak period activity. Thus, an industry-accepted method of estimation was used to predict peak period activity that does not require a census of hourly operations totals. The approach used in developing the peak period operations forecasts is outlined as follows:

- ***Peak Month GA Operations:*** This level of activity is defined as the calendar month when peak aircraft operations occur. Peak Month percentages at Delaware Airports were estimated using the assumption that peak month operations are 10 percent greater than average month operations. The only exception to this rule was for New Castle Airport, where actual FAA Air Traffic Control Tower statistics were used to establish general aviation peak month operations.

- ***Design Day Operations:*** This level of operations is defined as the average day within the peak month. This indicator can be developed by dividing peak month operations by 30 or 31. For conservative forecasting purposes, a 30-day month was selected rather than a 31-day month.

- ***Peak Hour Operations:*** This level of operations is defined as the peak hour within the design day. For airports with between 50 and 300 design day operations, general aviation peak hour operations tend to be 20 percent of those design day operations. As the design day operations decrease, the peak hour percentage increases and vice versa.

Table 3-10 – Forecast of Peak Operations

Airport Name	GA Operations	Peak Month	Design Day	Peak Hour
Chandelle Estates Airport				
2018	1,100	101	3	3
2025	1,200	110	4	4
2030	1,200	110	4	4
2040	1,200	110	4	4
Chorman Airport				
2018	13,500	1,238	41	8
2025	14,200	1,302	43	9
2030	15,000	1,375	46	9
2040	15,900	1,458	49	10
Civil Air Terminal				
2018	600	300	120	24
2025	800	400	160	32
2030	1,000	500	200	40
2040	1,400	700	280	56
Delaware Airpark*				
2018	23,600	2,163	72	18
2025	32,600	2,988	100	25
2030	40,700	3,731	124	31
2040	48,900	4,483	149	37
Delaware Coastal Airport				

Table 3-10 – Forecast of Peak Operations				
Airport Name	**GA Operations**	**Peak Month**	**Design Day**	**Peak Hour**
2018	34,400	3,153	105	21
2025	38,300	3,511	117	23
2030	41,700	3,823	127	25
2040	49,600	4,547	152	30
Jenkins Airport				
2018	500	46	2	2
2025	500	46	2	2
2030	600	55	2	2
2040	600	55	2	2
Laurel Airport				
2018	7,500	688	23	7
2025	8,500	779	26	7
2030	9,100	834	28	8
2040	10,100	926	31	9
New Castle Airport**				
2018	36,600	3,718	328	56
2025	39,200	4,147	366	62
2030	41,100	4,348	384	65
2040	45,300	4,793	423	72
Smyrna Airport				
2018	1,700	156	5	4
2025	1,700	156	5	4
2030	1,700	156	5	4
2040	1,800	165	6	4
Summit Airport				
2018	31,900	2,924	97	19
2025	35,900	3,291	110	22
2030	36,900	3,383	113	23
2040	38,900	3,566	119	24

Delaware Airpark's peak hour percentage was increased to 25 percent of design day operations due to the high volume of training flights by Delaware State University students.
** New Castle's design day is actual peak day taken from Air Traffic Control Tower data. Peak hour percentage used was 15 percent of design day operations.

4.3 GENERAL AVIATION ENPLANEMENTS

Forecasts of annual general aviation enplaned passengers play an important role in determining such landside facilities as access roads, general aviation terminal building sizes, and the amount of automobile parking areas. This activity indicator is often ignored due to the lack of historical data.

To forecast general aviation enplaned passengers, an aircraft occupancy rate was multiplied by the number of itinerant general aviation departures from the Airport. A number, long used by the FAA and the Aircraft Owners and Pilots Association (AOPA), estimated that an average of 2.5 passengers per general aviation itinerant departure was a reasonable estimate of aircraft occupancy. For this study, this factor was applied to all forecast itinerant departures and 10 percent of local departures (except for the Civil Air Terminal which used a much higher ratio because of the high number of passengers per aircraft using the facility during NASCAR races). Local departures are considered training operations and do not add to the landside facility use. Therefore, only a fraction of those operations were counted as contributing passengers to the landside facility use.

Table 3-11- Forecast of Aviation Enplanements

Airport Name	**2018**	**2025**	**2030**	**2040**
Chandelle Estates Airport	400	400	400	400
Chorman Airport	15,300	16,100	17,100	18,100
Civil Air Terminal, Dover AFB	5,000	5,500	6,000	7,000
Delaware Airpark	7,700	10,600	13,200	15,900
Delaware Coastal Airport	12,100	13,500	14,700	17,500
Jenkins Airport	200	200	200	200
Laurel Airport	2,500	2,900	3,100	3,400
New Castle Airport	30,000	32,100	33,700	37,200
Smyrna Airport	400	400	400	500
Summit Airport	18,600	20,900	21,500	22,600
Delaware Total	**92,200**	**102,600**	**110,300**	**122,800**

It can be argued that this methodology ignores 90 percent of the local operations component, which is true. However, local operations are primarily training and are typically made up of repeated takeoffs and landings. Pilots in training do not add significantly to the passenger through-put of the airport facilities and thus their total inclusion would unduly raise the projected demand levels, which in turn, would suggest unnecessary facilities.

5. MILITARY FORECASTS


Dover Air Force Base Tarmac

MILITARY ACTIVITY SHOWS LITTLE OR NO correlation to community socioeconomic data or other recognized air traffic indicators. The level of military operations is a function of Department of Defense Policy and Congressional funding. Therefore, it is difficult to accurately predict the level of activity for Delaware airports. **Table 3-12** presents the existing and forecast military activity for each Delaware public-use airport with existing military operations. To develop a forecast, the most recent historical level of activity was simply held constant throughout the planning period. In addition to the annual operations forecast, a projection of peak hour operations was included in **Table 3-12.** The New Castle Airport peak hour military operations were taken from FAA Control Tower records.

Table 3-12- Forecast of Military Operations

Airport	2018	2025	2030	2040
Delaware Coastal Airport	100	100	100	100
Peak Hour	4	4	4	4
New Castle Airport	4,982	5,000	5,000	5,000
Peak Hour	16	16	16	16
Summit Airport	100	100	100	100
Peak Hour	4	4	4	4

6. FORECASTS OF POTENTIAL SCHEDULED AIR SERVICE

THIS SECTION OF THE FORECAST IS ORGANIZED to examine the following topics concerning scheduled airline service in Delaware:

- Airline History in Delaware
- Airline Passenger Generation by County
- Potential Airline Service Capture of Demand

6.1 AIRLINE HISTORY IN DELAWARE

The history of airline service in Delaware has been on and off over the years. In recent history, the only airline service point has been from New Castle Airport. Although air service feasibility studies have been conducted for Dover, there have been no airline offers of service. Thus, the primary airline study point for the system plan is New Castle Airport.

In times when airline service was not available in the State, passenger demand was distributed primarily between Philadelphia International and BWI airports. Although Salisbury, MD and Trenton, NJ offer airline service, these are relatively minor players for Delaware passengers compared with the two major hubs.

Table 3-13 presents a summary of the four most recent airline service periods and the airline providers. Prior to Shuttle America, there was no airline service at ILG from 1993 to 1998. As shown, the greatest success in terms of passenger enplanements was with Frontier Airlines: 168,100 during their service period. For a single calendar year, Frontier enplaned 114,600 passengers (2014).

Table 3-13 - Recent History of Airline Service in Delaware (ILG)

Airline	Beginning Date	Ending Date	Enplanements
Shuttle America	11/1998	2/2000	52,800
Delta Connection	6/2006	9/2007	19,300
Skybus Airlines	3/2008	4/2008	1,650
Frontier Airlines	7/2013	6/2015	168,100

At the time of this writing, it was recently announced that Frontier Airlines will re-enter the Wilmington market at New Castle Airport.

6.2 AIRLINE PASSENGER GENERATION BY COUNTY

The first step in forecasting potential airline demand is to estimate the number of airline travelers that originate in Delaware. In periods of no airline service, all these passengers use out-of-state airports for their airline trips. Even when New Castle Airport had airline service, the bulk of Delaware air travelers used other out-of-state airports to begin the air portion of their trips. Therefore, the purpose of this section is to estimate the number of airline trips made by Delaware citizens over the course of a one-year period.

Commercial airline service available to air travelers from Delaware is located primarily at three airports.

Airport	Number of Enplanements (2018)[2]
• Philadelphia International	15,285,948
• Baltimore/Washington International	13,373,773
• Salisbury-Ocean City Wicomico Regional	64,393

Large airports in Philadelphia and Baltimore attract the majority of northern and central Delaware air travelers due to their close proximity to the region and their numerous air service offerings. Depending on the location in Delaware, these airports can be reached within a one to two-hour drive. Furthermore, air travelers from southern Delaware can access scheduled air service by driving to airports in Salisbury, Maryland and the Washington, D.C. area.

One way to estimate or project the total number of air passengers in Delaware is to base the number of enplanements on the average propensity of U.S. residents to use airline transportation. Applying these averages to the population of the State of Delaware should yield the total number of generated air travelers, assuming that Delaware conformed to national averages.

In 2018 there were an estimated 778.0 million domestic air passenger enplanements in the United States. The population in the United States in 2018 was approximately 327.2 million, which results in an average of 2.38 enplanements per U.S. resident. The FAA provides data that can be used to analyze the number of transfer passengers at the nation's hub airports. In this regard, it is estimated that about one-third of passenger enplanements are double counted because they travel through a hub airport and must change planes to reach their final destination. Thus, they are counted as an enplanement at their originating airport and again at the hub airport. Thus, the connections represent about 33 percent of total enplanements.

Using this information, the enplanement ratio of 2.38 enplanements per U.S. resident overstates the generation of new passengers by 33 percent. Reducing the ratio by that amount reveals that there is an actual average of 1.59 enplanements per U.S. resident. Using this ratio, the number of potential enplanements in Delaware is shown in **Table 3-14**.

Table 3-14 - Potential Delaware Domestic Enplaned Passengers

Catchment Area	2018 Population*	U.S. passenger ratio	Enplanements
New Castle County	559,335	1.59	889,300
Sussex County	229,286	1.59	364,600
Kent County	178,550	1.59	283,900
Delaware Total	**967,171**	**1.59**	**1,537,800**

* Population from census.gov

Under these assumptions, there are an estimated 1.54 million passenger enplanements that originate in Delaware each year. The question that airlines must answer before providing service

[2] T-100 Domestic Market (U.S. Carriers), Origin Airport

at Delaware airports is: how many of these air travelers can be captured at a local airport for their air trips?

6.3 POTENTIAL AIRLINE SERVICE CAPTURE OF DEMAND

When there is no reliable track record of airline service, it is often beneficial to develop a comparable market analysis. In this regard, a model developed for this study compared 93 cities with existing airline service to determine enplanement levels, population, drive time distance from the nearest hub airport, and the type of airline service offered. These airports were mostly located in small markets with varying levels of passenger enplanements. Similarly, the population centers were smaller, averaging about 263,400.

To approximate the potential airline service in Delaware, it was assumed that Wilmington was the strongest candidate for realized airline service. This is not to say it would be impossible for Kent or Sussex Counties to attract service, however, the obstacles to that service are formidable. This includes lack of adequate facilities at the Civil Air Terminal and the lack of runway length and FAR Part 139 certification at Delaware Coastal Airport.

Focusing on New Castle Airport, the recent announcement of airline service to be performed by Frontier Airlines has reignited the desire for commercial service to succeed in Wilmington. Using our comparative model, cities with either Frontier Airline or Allegiant Air service (or both) were identified and statistics were generated. The resulting linear formula (in the form of $Y=m*X + B$) showed the following:

$$Y=40*0.017471+(-0.19569) \text{ or } Y= 0.50315$$

Where: Y= Per Capita Airline Passenger Enplanements; m= Drive Time Distance to Nearest Hub – 40 Minutes to Philadelphia International

Using the population of New Castle County (service area) times the per capita factor yields an estimate of potential passengers that could be captured at New Castle Airport. With a population of 559,300 times the per capita factor of 0.50315 results in 281,400 potential enplanements. This amount is significantly less than the total airline passenger generation of the County (889,300), but it is similar to the potential capture rate of airports with comparable profiles. For example, Trenton NJ is 43 minutes' drive time from Philadelphia International. It is served primarily by Frontier Airlines and in 2018, the airport enplaned more than 405,500 passengers. Mercer County (NJ) population is only 375,700, compared to 559,300 for New Castle County. The point of this is to show the reasonableness of capturing more than 280,000 passenger enplanements at New Castle Airport.

Using the same formula and assuming the same type of airline service for Kent County and assuming travel time to Philadelphia International of 68 minutes, there is a potential for 177,200 passengers in Dover. Sussex County, on the other hand, is limited to the potential use of Delaware Coastal Airport, which currently has 5,500 feet of runway length. Discussions with airport management indicate the best that could be accommodated would likely be a small carrier like Cape Air, with only 9 passenger seats per aircraft. This type of service rarely generates more than 10,000 passengers and must be subsidized to achieve feasibility for the carrier.

Given this comparative analysis, **Table 3-15** presents a summary of the airline passenger generating potential for each Delaware County, along with the best probable capture estimate.

Table 3-15 - Delaware Airline Passenger Potentials		
Catchment Area	**Total Potential**	**Capture Potential**
New Castle County	889,300	281,400
Sussex County	364,600	Under 10,000
Kent County	283,900	177,200
Delaware Total	**1,537,800**	**468,000**

The recent announcement of Frontier Airlines' return to ILG included a spring 2020 start. Given this development, tracking of enplanement data will help verify the capture potential numbers shown in this forecast.

7. SUMMARY OF AVIATION DEMAND FORECASTS

TABLE 3-16 PRESENTS A SUMMARY OF THE aviation demand forecasts for each system airport. Included in summary are airport-specific based aircraft and operations numbers, along with enplanement and peak period statistics. It should be noted that peak hour components were added to project the highest potential peak period operations for each airport. While rare, all the types of activity could potentially occur during the same hour.

Table 3-16 - Summary of Aviation Demand Forecasts				
Airport Name	**2018**	**2025**	**2030**	**2040**
Chandelle Estates				
Based Aircraft	24	25	25	26
Operations	1,100	1,200	1,200	1,200
Peak Hour Operations	3	4	4	4
Enplanements - GA	400	400	400	400
Chorman Airport				
Based Aircraft	44	46	49	52
Operations	13,500	14,200	15,000	15,900

Table 3-16 - Summary of Aviation Demand Forecasts				
Airport Name	**2018**	**2025**	**2030**	**2040**
Peak Hour Operations	8	9	9	10
Enplanements - GA	15,300	16,100	17,100	18,100
Civil Air Terminal				
Based Aircraft	0	0	0	0
Operations	200	800	1,000	1,400
Peak Hour Operations	24	32	40	56
Enplanements - GA	5,000	5,500	6,000	7,000
Delaware Airpark				
Based Aircraft	29	40	50	60
Operations	23,600	32,600	40,700	48,900
Peak Hour Operations	18	25	31	37
Enplanements - GA	7,700	10,600	13,200	15,900
Delaware Coastal Airport				
Based Aircraft	61	68	74	88
Operations- Total	34,500	38,400	41,800	49,700
General Aviation	34,400	38,300	41,700	49,600
Military	100	100	100	100
Peak Hour Operations- Total	25	27	29	34
General Aviation	21	23	25	30
Military	4	4	4	4
Enplanements - GA	12,100	13,500	14,700	17,500
Jenkins Airport				
Based Aircraft	20	20	21	21
Operations	500	500	600	600
Peak Hour Operations	2	2	2	2
Enplanements - GA	200	200	200	200
Laurel Airport				
Based Aircraft	14	16	17	19
Operations	7,500	8,500	9,100	10,100
Peak Hour Operations	7	7	8	9
Enplanements - GA	2,500	2,900	3,100	3,400
New Castle Airport				
Based Aircraft	198	212	222	245
Operations- Total	41,582	44,200	46,100	50,300
General Aviation	36,600	39,200	41,100	45,300
Military	4,982	5,000	5,000	5,000
Peak Hour Operations- Total	72	78	81	88
General Aviation	56	62	65	72

Table 3-16 - Summary of Aviation Demand Forecasts				
Airport Name	**2018**	**2025**	**2030**	**2040**
Military	16	16	16	16
Enplanements - GA	30,000	32,100	33,700	37,200
Smyrna Airport				
Based Aircraft	10	10	10	11
Operations	1,700	1,700	1,700	1,800
Peak Hour Operations	4	4	4	4
Enplanements - GA	400	400	400	500
Summit Airport				
Based Aircraft	32	36	37	39
Operations- Total	32,000	36,000	37,000	39,000
General Aviation	31,900	35,900	36,900	38,900
Military	100	100	100	100
Peak Hour Operations- Total	23	26	27	28
General Aviation	19	22	23	24
Military	4	4	4	4
Enplanements - GA	18,600	20,900	21,500	22,600
STATEWIDE TOTALS				
Based Aircraft	432	473	505	561
Operations- Total	156,182	178,100	194,200	218,900
General Aviation	151,000	172,900	189,000	213,700
Military	5,182	5,200	5,200	5,200
Peak Hour Operations- Total	187	214	236	272
Enplanements - GA	92,200	102,600	110,300	122,800

Chapter 4

Capacity & System Needs

DEMAND/CAPACITY & AVIATION SYSTEM NEEDS

FOR AN AVIATION SYSTEM TO PROPERLY SERVICE existing and forecast levels of activity, it must have the ability to efficiently process the demand of its users. This chapter reviews the ability of the existing airport facilities in Delaware to accommodate the number of projected aircraft operations during the planning period by gathering estimates of operational capacity. By definition, operational capacity is determined by the amount of average delay incurred. Therefore, the determination of capacity is a measure of acceptable levels of delay. As demand approaches 100 percent of estimated capacity, the delay incurred by an aircraft increases and the quality of service deteriorates.

Hangars at New Castle Airport

To understand the ability of the Delaware system of airports to process demand, available data pertaining to airport capacity were compared to forecast levels of demand. Results of this comparison, or demand/capacity analysis, offered insight into the locations and types of airport facilities needed to adequately serve the State of Delaware over the long-term future. Areas where capacity deficiencies are expected can be given special attention in the identification of appropriate alternatives that will deal with the specific problems. This chapter is divided into three major sections:

- Demand/Capacity Analysis
- Facility Needs Analysis
- Summary of Findings

1. DEMAND/CAPACITY ANALYSIS

USING EXISTING AIRPORT MASTER PLANS, THE PRIOR aviation system plan, and Federal Aviation Administration (FAA) Advisory Circular 150/5060-5 **Airport Capacity and Delay,** airport airfield capacities for public-use system airports were determined. It should be noted that the forecast capacity availability at Delaware's public use airports differs significantly from the previous SASPU. This is due to the change in demand caused by the negative effects of the Recession of 2007-2009 and higher avgas and jet fuel prices. With overall aviation demand levels lower throughout the State, the available airfield capacity throughout the system has increased.

This section briefly outlines the process by which airfield capacity was obtained or calculated and presents the results of the analysis. The discussion is organized as follows:

- Definition of Airfield Capacity
- Methodology Used
- Hourly Capacity and Annual Service Volume
- Annual Aircraft Delay

1.1 DEFINITION OF AIRFIELD CAPACITY

Airfield capacity, as it applies to the Delaware Aviation System Plan Update is a measure of terminal area airspace and airfield saturation. It is defined as the maximum rate at which aircraft can arrive and depart an airfield with an acceptable level of delay. Measures of capacity in this chapter include the following:

- ***Hourly Capacity of Runways:*** The maximum number of aircraft operations that can take place on an airport runway system in one hour.
- ***Annual Service Volume:*** The annual capacity or a maximum level of annual aircraft operations that can be accommodated on an airport runway system with an acceptable level of delay.
- ***Annual Delay:*** The total amount of time per year that aircraft are delayed due to a constrained operating environment at an airport.

1.2 METHODOLOGY USED

A variety of techniques have been developed for the analysis of airfield capacity. The current technique accepted by the Federal Aviation Administration and employed in this study is described in the FAA Advisory Circular 150/5060-5, **Airport Capacity and Delay**. The Airport Capacity and Delay Model (ACDM) from that Advisory Circular uses the following inputs to derive an estimated airport capacity:

- Meteorological Conditions
- Airfield Layout and Configuration
- Navigational Aids
- Aircraft Operational Fleet Mix
- Touch-and-Go Operations

These inputs were used in the calculation of airfield capacity at public-use airports in Delaware.

Meteorological Conditions

Wind conditions are of prime importance in determining runway use and orientation. The most desirable runway orientation based on wind is the one which has the largest wind coverage and minimum crosswind components. Wind coverage is that percentage of time crosswind components are below an acceptable velocity. In this regard, the FAA recommends that a runway system provide 95 percent wind coverage.

In addition to wind coverage, meteorological conditions involve visibility and cloud ceiling conditions. Visual Meteorological Conditions (VMC) are those weather conditions that permit aircraft to operate and maintain safe separations by visual means (generally a minimum of a 1,000-foot cloud ceiling with 3 miles horizontal visibility). Aircraft that operate under these conditions generally use Visual Flight Rules (VFR). Instrument Meteorological Conditions (IMC) exist when the height of the dominant cloud base falls below that prescribed under VMC, and the range of horizontal visibility is constrained below VMC limits. During these weather conditions, aircraft must operate under Instrument Flight Rules (IFR), which tends to constrain capacity because of the greater aircraft separations needed for safety. Other factors not associated with weather can also influence the use of VFR and IFR operations such as airline operations and instrument flight training.

Airfield Layout and Configuration

Airfield layout and configuration affects the ability of the airport to efficiently accommodate aircraft operations. There are several airport geometrical designs which improve operational capacity. For example, runways with full-length parallel taxiways are more efficient than runways with partial length or no parallel taxiways because departing aircraft can taxi to the threshold with another aircraft on a final approach. Full-length taxiways permit a more rapid exit of aircraft from the runway, reducing the amount of time pilots must spend back-taxiing on the runway to the threshold for departure or to an exit taxiway. The number of taxiway exits on the runway and their width also affects operational capacity.

New Castle Airport Runway and Taxiway System

The spacing between the primary runway and its parallel taxiway are important considerations in the airfield capacity calculation. Additionally, airports with intersecting runways may have a lower annual operational capacity than airports with nonintersecting runways, as intersecting runways require more separation to be provided between aircraft using both runways at the same time. Airports with appropriately spaced, parallel runways are the most efficient since they may allow aircraft to land and take-off simultaneously. Also, it should be noted that for capacity calculation purposes, multiple runway airports are treated as single runway airports if there is no Air Traffic Control Tower (ATCT) available at the facility.

Navigational Aids

The availability of navigational aids permits airports to remain open for greater portions of the year than non-instrument capable airports. For example, airports without navigational aids cannot be used during Instrument Flight Rule (IFR) conditions. Thus, airports that do not have IFR capacity will have a lower overall capacity than airports with such capability. The influence of Air Traffic Control facilities available at an airport is also important. If an Approach Control facility with radar can directly vector an aircraft to a position from which an instrument landing can occur, the separation between arriving aircraft can be shortened. This separation must necessarily increase for safety purposes if no radar or Approach Control facility is available. Thus, the capacity of an instrument-equipped airport will differ, based upon the complexity of facilities available.

Aircraft Operational Fleet Mix

The aircraft fleet mix is an important factor in determining an airport's operational capacity. The FAA's Airport Capacity and Delay Model identifies an airport's aircraft fleet mix in terms of four classifications ranging from A (small, single engine with gross weight 12,500 lbs. or less) to D (large aircraft with gross weights over 300,000 lbs.). These classifications and examples of each are identified in **Table 4-1.**

The capacity model requires that total annual operations be converted to operations by specific aircraft classification category. In particular, the “C” plus “D” percentage (if greater than zero) significantly impacts the capacity calculation. Since requirements for aircraft are based on their approach speed and size, capacity decreases as the number and diversity of approach speeds increases. The greater the difference in size and speed of the aircraft in the fleet, the greater the space required between aircraft and, therefore, the lower the operational capacity

Table 4-1 - Aircraft Classification System Used In Capacity Model

CLASS A	Small single-engine, gross weight 12,500 pounds or less		
	Examples:	Cessna 172/182	Cirrus SR20/22
		Beech Bonanza	Piper Cherokee/Warrior
CLASS B	Twin-engine, gross weight 12,500 pounds or less		
	Examples:	Beech Baron	Piper Navajo
		Cessna 402	Beech 99

Table 4-1 - Aircraft Classification System Used In Capacity Model			
		Mitsubishi Mu-2	Rockwell Turbo Commander
CLASS C	Large aircraft, gross weight 12,500 pounds to 300,000 pounds		
	Examples	Boeing 737/757	Gulfstream G-II/III/IV/V
		Lear 35/55	Airbus 319/320/321
		McDonnell Douglas MD 80/88	Challenger 600/601
CLASS D	Large aircraft, gross weight more than 300,000 pounds		
	Examples	Boeing 747/767/777	Airbus A-300/310/380

Touch-And-Go Operations

A touch-and-go operation occurs when an aircraft lands and then makes and immediate takeoff without coming to a full stop. Touch-and-go operations increase the number of operations that a runway system can process due to the low occupancy time associated with each operation. The primary purpose of touch-and-go operations is for the training of student pilots. In Delaware, Chandelle Estates and Jenkins Airport are two privately owned airports that do not permit touch-and-go operations. Delaware Airpark has a significant number of touch-and-go operations as a result of the Delaware State University flight training program.

1.3 HOURLY CAPACITY AND ANNUAL SERVICE VOLUME

It is important to note that it is possible for airports to operate at operational levels in excess of their Airport Service Volume (ASV). However, ASV is widely used as a reference point for the general planning of capacity-related improvements. Detailed airfield capacity analysis, which is often part of an airport master plan, should be conducted for airports where operations are approaching their estimated ASVs.

For each system airport, the FAA's *Airport Capacity and Delay Model* combined information concerning runway configuration, runway usage, meteorology, operational fleet mix, and touch-and-go operations to produce the ASV and adjusted hourly capacity for each VFR and IFR operational runway use configuration. **Table 4-2** shows the hourly capacity and ASV for each of the public-use airports in Delaware.

Table 4-2 - Airport Airfield Capacity Adjustment Inputs and Results										
Facility Name	Wind Coverage	% TNG	Taxiway	ATCT	Lighting	IAP	Mix Index C +3D	Adjusted Hourly		Adjusted
								VFR	IFR	ASV
Chandelle Estates Airport	95.7%	0	No	No	LI	No	0	22	0	48,400
Chorman Airport	97.6%	10%	No	No	LI	No	0	23	0	54,200
Delaware Airpark	96.0%	40%	Full	No	MI	Yes	0	87	20	198,700
Delaware Coastal Airport	99.8%	20%	Full	No	MI	Yes	7%	73	20	174,500
Jenkins Airport	96.1%	0	No	No	LI	No	0	22	0	24,300
Laurel Airport	97.2%	30%	No	No	LI	Yes	0	27	16	33,400
New Castle Airport	99.9%	20%	Full	Yes	HI	Yes	39%	73	44	194,000
Smyrna Airport	95.9%	30%	No	No	No	No	0	27	0	29,800
Summit Airport	97.2%	20%	Full	No	MI	Yes	0	73	20	173,100

The FAA recommends that individual airports should begin planning for additional airfield capacity when actual annual operations reach 60 percent of ASV. Additionally, FAA recommends that capacity-enhancing improvements should be designed and constructed when actual annual operations reach 80 percent of ASV. Projections of total annual operations at each system airport were compared to published airfield operational capacity figures to identify facilities projected to exceed 60 percent of airfield capacity during the twenty-two-year planning period. **Table 4-3** presents a summary of airfield demand/capacity comparisons for each system airport.

Table 4-3 - Airfield Demand/Capacity Comparisons

Airport	Annual Service Volume	Year 2040 Operations	Percent of Capacity	Annual Delay (Hours)
Chandelle Estates Airport	48,400	1,200	2%	0
Chorman Airport	54,200	15,900	29%	51
Delaware Airpark	198,700	48,900	25%	119
Delaware Coastal Airport	174,500	49,700	28%	153
Jenkins Airport	24,300	600	2%	0
Laurel Airport	33,400	10,100	30%	34
New Castle Airport	194,000	50,300	26%	134
Smyrna Airport	29,800	1,800	6%	0
Summit Airport	173,100	39,000	23%	81
STATE TOTAL	**930,400**	**217,500**	**23%**	**572**

As shown in **Table 4-3**, none of the public use airports are projected to reach 60 percent of their capacity by 2040. Only 23 percent of the airfield capacity available at the State's public use airports will be used by the year 2040.

1.4 ANNUAL AIRCRAFT DELAY

Annual aircraft delay is an important measure of how well the airfield services demand. It can also be used to estimate economic costs of experiencing delay and thus provide a feasibility measure for airport improvement projects. Delay statistics can be expressed either in total number of annual hours or as an average in minutes per aircraft operation. **Table 4-4**, derived from FAA data, shows the typical relationship between the ratio of annual demand at an airport to its calculated ASV and the average annual aircraft delay per operation based on the various demand/capacity ratios:

Table 4-4 – Relationship of ASV to Potential Delay		
Ratio of Annual Demand to ASV	**Average Aircraft Delay (min/op)**	**Peak Delay Range for Individual Aircraft (min)**
0.1	0	0.0 - 0.5
0.2	0.1	0.5 - 1.0
0.3	0.2	1.0 - 2.0
0.4	0.3	1.5 - 3.0
0.5	0.4	2.0 - 4.0
0.6	0.5	2.5 - 5.0
0.7	0.7	3.5 - 7.0
0.8	0.9	4.5 - 9.0
0.9	1.4	7.0 - 14.0
1.0	2.8	13.0 - 26.0
1.1	5.4	27.0 - 54.0

As shown, when annual aircraft operations equal annual service volume (ratio of 1.0), the average annual aircraft delay is 2.8 minutes per aircraft. The actual delay at any given time depends on a number of conditions and can vary by a factor of five or more. Once an airport exceeds 80 percent of its operational capacity (a demand to ASV ratio of 0.8), average delay per operation begins to increase rapidly and resulting peak delays can vary widely.

Average annual delay estimates for each of the Delaware Aviation System Airports were presented earlier in **Table 4-3**. If no capacity expansion is undertaken for the future, the aviation system is anticipated to experience almost 570 hours of aircraft operational delay by the year 2040. 26 percent of this delay will be attributable to Delaware Coastal Airport (149 hours of delay). New Castle and Delaware Airpark will experience the next highest amounts of delay (134 annual hours and 122 annual hours respectively). Aircraft operational delays at the remaining public-use airports will be negligible.

On a State-wide basis, the sum of all airport capacities is enough to handle all future traffic in the area. This assumes that if one airport becomes saturated in terms of aircraft operations, the excess demand would be distributed to nearby airports with surplus capacity. The combined airfield capacities of all system airports is about 930,400 operations per year. The total number of operations projected for the year 2040 is roughly 217,500 or about 23 percent of total capacity.

2. AVIATION SYSTEM NEEDS

NASCAR Race Teams at the Civil Air Terminal

ONE OF THE ULTIMATE OUTPUTS OF THE system plan is to determine the locations and types of airport facilities needed to adequately serve the State of Delaware. The purpose of generating airport facility needs is to identify potential capacity deficiencies or airport improvement needs. This section builds on the results of the Demand/Capacity Analysis in Section 1 and will ultimately provide a base upon which the analysis of alternatives can be performed. In order to adequately address aviation system requirements this chapter has been organized to include the following sections:

- State Role in Airport Systems Concept
- Aviation System Needs Standards
- Airport Facility Need Standards
- Airfield Facility Needs
- Landside Facility Needs
- Summary of Findings

2.1 STATE ROLE IN AIRPORT SYSTEMS CONCEPT

An airport "system" implies a group of interdependent airports regularly interacting toward a unified goal. In many regions and small states, the functionality of a system occurs through the market system of supply and demand. That is, there was no “system planning” that directed the development of airports. In fact, most of the airports were already constructed when the concept of airport system planning began.

From this viewpoint, it can be seen that airport system planning has taken the existing airports in Delaware and “fit” them into a systems concept that helps identify the specific function to which each airport contributes. This manner of planning allows for the identification of gaps in the system and resulting recommendations for improvement.

There has also been a progression of airport system oversight, based upon funding capabilities of the various sponsoring agencies. In this regard, the FAA has been the primary funding agency for eligible airports (National Plan of Integrated Airport Systems – NPIAS – Airports). This covered four Delaware airports, leaving five other privately owned airports out. In previous system plans, these five airports have been included as a result of State funding contributions to the system planning efforts.

Aircraft Maintenance at Delaware Coastal Airport

In 2019, the role of the State has grown with the passage of a $0.05 per gallon jet fuel tax. The resulting revenues from this tax are dedicated to the aviation system in Delaware. Thus, the privately owned, public-use airports are now eligible, with restrictions, to State funding of facility needs. The new program has some precedent, as the State has been permitted to remove airspace obstructions from privately owned, public-use airports in the past using State funds. However, the new program opens State funding to airport capital improvement projects.

This new role for the State requires the development of a more detailed airport facility needs analysis. In the past, a list of capital improvements at privately owned, public-use airports was not needed for the FAA funding estimate. Now, with State funding, this list is needed in some detail. If funding availability is less than requested project needs, then it is a systems analysis that will permit the development of a priority ranking process for funding these projects.

With greater funding availability, the State can now request information from all system airports concerning the capital projects that they need. The solicited information will be added to the facility needs generated by the systems analysis in this Plan, where different. It is anticipated that a much more detailed list of facility needs will be ultimately generated. This is due to the fact that airport-specific projects may be needed that are undetectable from a systems analysis – e.g. realignment of an access roadway, or perimeter fence replacement. Appendix A presents a letter request by DelDOT's Office of Aeronautics to the State's public-use airports.

2.2 AVIATION SYSTEM NEEDS STANDARDS

The goals and objectives of the study provide direction as to what users and citizens find ultimately desirable in the State's air transportation system. The Aviation System Needs portion of the analysis applies system parameters to the network of Delaware public-use airports in conformance with those goals and objectives. To better define the location and types of facilities needed, the following criteria were developed:

- ***Airport Locational Criteria:*** These standards are based upon the stated goals and objectives of the study. As such, the following locational standards apply:
  - Commercial air service should be within 60 minutes driving time for all of the State's citizens.

- Business jet airports (ARC: C-II or Larger) should be within 30 minutes driving time of all significant population centers of more than 25,000.
- Utility airports (ARC: B-I and B-II) should be within 30 minutes driving time of all cities with over 2,500 population.

- ***Demand/Capacity Relationships:*** Where capacity deficits appear (either for the airfield or for the landside), additional airport facilities are needed. Facility requirements in this chapter deal only with existing airports and use FAA and aviation industry standards.
- ***Planned Improvements/Airport Master Planning Recommendations:*** Current planned improvements and recent master plans were examined to determine their site-specific facility recommendations for Delaware airports. Airport master plans often have examined local issues in far greater detail than is possible in a study of this scope. Thus, the facility recommendations from airport master plan studies along with planned improvements will be examined for use in this system plan.
- ***Incorporate Airspace Obstruction Mitigation Plans:*** This is a new addition to the system planning process, triggered by Objective 2.2 of this System Plan. It states: "Improve the airspace obstruction review process by evaluating current regulations, technical criteria and the application process to develop new efficiencies and technological advancements." This objective can be incorporated into the Aviation System Needs process to ensure its implementation.

Using these input factors, a general idea of the location, types of airports, and facilities needed can be generated for the State.

2.3 AIRPORT FACILITY NEED STANDARDS

In addition to planning standards for systemwide analysis, this study developed airport facility need standards for individual airport analysis. Facility need standards refer to acceptable planning guidelines issued by the State, FAA, or other recognized industry authorities. These guidelines deal with airport improvements and are linked to increased aviation activity as it affects the role and service level of an airport. Development standards used in this analysis include the following improvement categories:

- Land
- Runways and Taxiways
- Lighting Systems and Approach Aids
- Hangars
- Aircraft Parking Aprons
- Auto Parking
- Access Roadways
- Miscellaneous

Land

Delaware Airpark Aerial

Airside land requirements include acreage under runway protection zones, the primary runway surface, and the land under transitional slopes extending from the runway centerline out to the building restriction lines. The dimensional standards for airside land requirements can be derived from FAA A/C 150-5300-13A (with Changes), Airport Design. These dimensional criteria were followed as closely as possible in determining minimum land requirements for small general aviation airports and were extrapolated for larger airports. Privately owned airports where no airport upgrades were recommended were not subject to these standards.

Landside areas comprise the land required for fixed base operations, aircraft parking aprons, hangar areas, terminal buildings, auto parking lots, access roads, and utilities. Landside areas are dependent upon runway and taxiway configurations, as well as the airport's ground access system. Since landside acreage requirements will vary according to the airport's configuration and ground access system, minimum acreage will differ among the airports. In general, the minimum land area required by each classification is as follows:

Airport Category	Minimum Acreage
A-I	Variable
B-I	79
B-II	140
C-II & Larger	220

Runways and Taxiways

Runway and taxiway dimensional requirements are outlined in FAA Advisory Circular: 150/5300-13A, Airport Design. Planning guidelines for runway and taxiway development are dependent upon the largest aircraft to regularly use the airport. Runways at turf airports are generally limited by property boundaries and topography. Property boundary limitations at privately owned, public-use airports frequently prevent adequate clear zones needed to meet minimum federal safety standards. Typical runway lengths for system airports in Delaware would include:

- ***A-I/Turf Runways:*** These have varying lengths, but in Delaware they range from 2,035 feet to 3,175 feet. Their minimum width is 60 feet, per FAA guidance.
- ***B-I Runways:*** These have a length of 3,000 feet or longer and a minimum width of 60 feet.

- ***B-II Runways:*** These have a length of 4,200 feet or longer and a minimum width of 75 feet. B-II airports that accommodate small planes with 10 or more seats generally do not exceed runway lengths of 5,000 feet and runway strengths of 30,000 pounds.
- ***C-II or Larger Runways:*** In Delaware, these have a minimum length of 5,500 feet and a width of 100 feet. These runways accommodate aircraft weighing more than 12,500 pounds.

Although dimensional standards for an airport can fit within the categories above, they are not considered to be in that category unless the critical aircraft demand justifies their designation. Thus, Delaware Coastal Airport is considered a B-III facility until it attracts 500 "C" or larger aircraft operations per year. No facility changes will be needed because the airport's primary runway already qualifies as a C-III facility.


Jenkins Airport (Turf)

At turf runway airports, the only need for taxiway markings is to show where aircraft can move between the terminal area and the runway. Many times, aircraft will taxi on a turf runway because their width usually accommodates such activity. For paved runway airports, parallel taxiways are desired in order to minimize the time an aircraft must occupy the runway. Without parallel taxiways and an adequate number of exit taxiways connecting them to the runway, an aircraft must "back-taxi" on a runway to get to an exit taxiway. For the system plan, no specific activity measures were developed that triggered the development of a parallel taxiway. However, in older planning standards, a rule of thumb was 20,000 annual operations.

Separation standards for runway centerline to taxiway centerline can be found in FAA Advisory Circular: 150/5300-13A, Airport Design. Those standards indicate the following:

Table 4-5 - Taxiway Separation from Runway Centerline

Runway Category	Visibility ≥ 3/4 mi.	Visibility < 3/4 mi.
B-I	150 ft	200 ft
B-II	240 ft	300 ft
B-III	300 ft	350 ft
C-II	300 ft	400 ft
D-III	400 ft	400 ft

As shown, the visibility minimums dictate the separation standards to a degree. That is, greater visibility minimums do not require as much separation since a pilot can see farther. The more constricted the visibility, the more safety buffer is needed to see and avoid other aircraft or potential obstacles.

Aircraft Parking Aprons

Aircraft parking apron requirements were generated for three types of aprons – those for based aircraft, itinerant aircraft, and hangar apron areas. **Figure 4-1** presents the FAA-recommended layouts for various types of apron area configurations.

Based Aircraft Apron

Aircraft parking area requirements were calculated on the assumption that paved apron areas will be provided for all based general aviation aircraft not kept in hangars at B-I or larger airports. This was estimated to be equivalent to 20 percent of all small single engine based aircraft throughout the planning period. A total of 300-400 square yards of apron per aircraft was used for planning the local apron requirement.

Itinerant Aircraft Apron

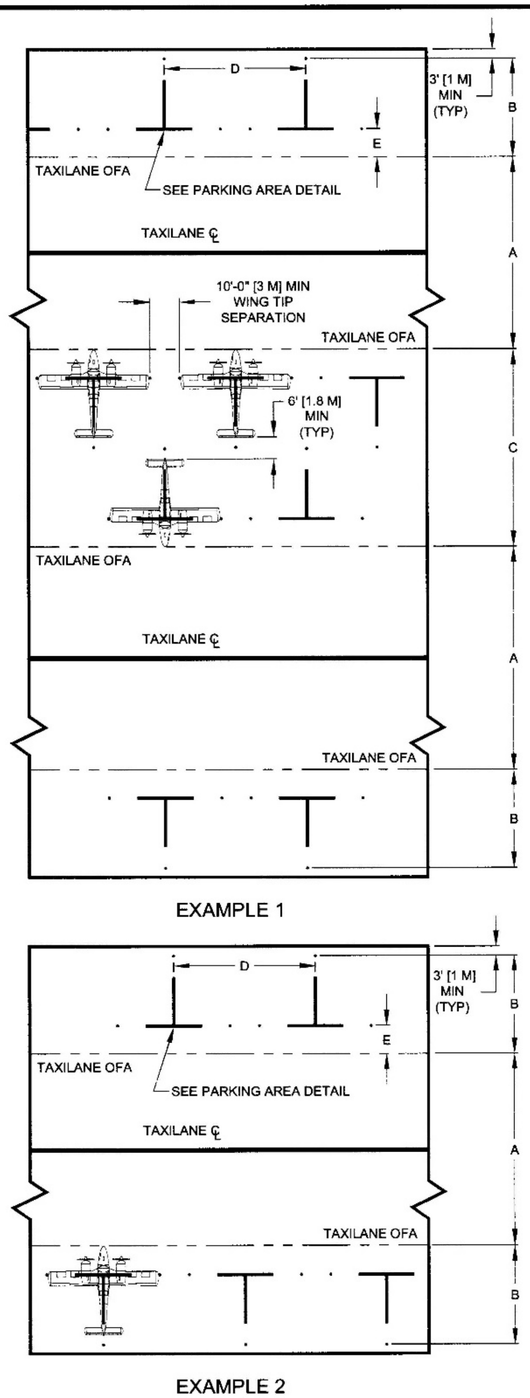
In addition, itinerant apron area required to meet itinerant general aviation demand was estimated using an approach suggested by the FAA in Advisory Circular 150/5300-13A, *Airport Design*. This approach indicates that the area needed for transient aircraft parking will differ by airport, but principles should include an allowance for an appropriate amount of apron area per transient aircraft. For this analysis, it was assumed that 50 percent of the daily itinerant operations on a busy day (a busy day is 10 percent busier than the average day) will represent aircraft on the ground at any one time. Transient apron requirements for general aviation aircraft varied between 400-1,500 square yards per itinerant aircraft. This will permit the accommodation of aircraft ranging from single engine piston aircraft to large business jets.

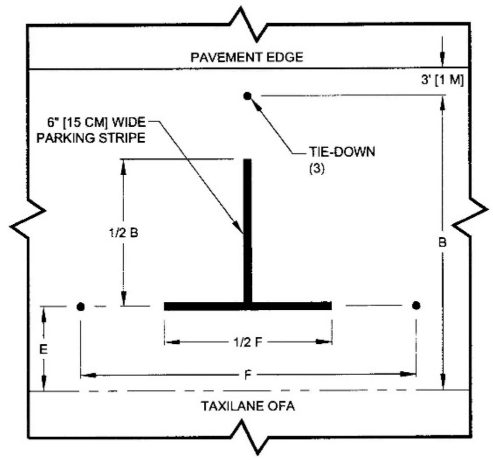
Hangar Apron

A third apron area requirement comes from the development of conventional hangars. In this regard, a general rule is to include a hangar apron area that is the same size as the enclosed hangar floor. Thus, a large conventional hangar would have an apron area so that aircraft entering and exiting the building would have a location to maneuver or to be readied for flight.

9/28/2012

AC 150/5300-13A
Appendix 5





PARKING AREA DETAIL

NOTES:

1. APRON LAYOUT WILL VARY BASED ON THE DESIGN AIRCRAFT SELECTED FOR THE LAYOUT AND THE NUMBER OF STAND SIZES INCLUDED IN THE LAYOUT. THE LAYOUT SHOULD MAXIMIZE THE NUMBER OF PARKING STANDS WHILE PROVIDING THE REQUIRED TAXILANE OFA AND WINGTIP CLEARANCE. ALL DIMENSIONS MUST BE SUFFICIENT TO ENSURE:
   - THE NOSE OF THE DESIGN AIRCRAFT DOES NOT PENETRATE THE TAXILANE OFA WHEN THE AIRCRAFT IS PARKED AND SECURED WITH TIE DOWNS
   - DESIGN AIRCRAFT MAINTAIN A MINIMUM OF 10 FT [3 M] WING TIP SEPARATION BETWEEN ADJACENT PARKED AIRCRAFT
2. IF TURBINE-DRIVEN AIRCRAFT ARE TO USE THE APRON, THE DIMENSIONS SHOWN MUST BE EVALUATED FOR JET BLAST AND ADJUSTED, IF NECESSARY.

NOT TO SCALE

DIM	EXPLANATION
A	WIDTH OF TAXILANE OFA FOR THE DESIGN AIRCRAFT THE APRON IS DESIGNED TO SERVE. SEE PARAGRAPH 404 AND TABLE 4-1.
B	OVERALL LENGTH OF THE DESIGN AIRCRAFT
C	TWICE THE OVERALL LENGTH OF THE DESIGN AIRCRAFT PLUS 6 FT [1.8 M] FOR NESTED TIE-DOWNS
D	THE WINGSPAN OF THE DESIGN AIRCRAFT PLUS 10 FT [3 M] MINIMUM
E	DISTANCE FROM MAIN GEAR TO NOSE OF THE DESIGN AIRCRAFT. ASSUMES MAIN GEAR OF DESIGN AIRCRAFT AT OR BEHIND THE HEAD OF THE PARKING TEE.
F	WINGSPAN OF THE DESIGN AIRCRAFT

Figure 4-1 – Apron Area Layout from FAA Guidance

Lighting Systems and Approach Aids

Airport lighting is used help maximize the utility of airports during day, night and adverse weather conditions. Advisory Circular 150/5300-13A, *Airport Design*, contains guidance for runway lighting types and approach lighting as related to instrument approach capabilities at airports. FAA Order 7021.2C, *Airport Planning Standard Number One - Terminal Air Navigation Facilities and Air Traffic Control Services* specify minimum activity levels to qualify for visual and electronic navigational aids and equipment.

For Delaware airports, the following lighting aids were recommended:

- ***Runway End Identifier Lights (REIL)*** were recommended for all paved and lighted runways except those with MALS, since they are not compatible.
- Visual approach aids such as ***Precision Approach Path Indicators (PAPI) or Visual Approach Slope Indicators (VASI)*** were recommended for all B-I or larger airport runways not already equipped.

In addition to these lighting systems and approach aids, certain standards for instrument approach procedures require airport runway lights and approach lights. **Table 4-6** presents a list of these requirements, along with some other required features (taxiways, minimum runway lengths, etc.) Based on these criteria, visibility minimums play the most significant role in dictating the following requirements:

Table 4-6 - Standards for Instrument Approach Procedures (Partial List)[1]

Visibility Minimums	< 3/4 Mile	3/4<1 Mile	≥ 1 Mile Straight-In	Circling
Minimum Runway Length	4,200	3,200	3,200	3,200
Runway Edge Lights	HIRL/MIRL	HIRL/MIRL	MIRL/LIRL	MIRL/LIRL
Approach Lights	MALSR, SSALR, or ALSF	Recommended - ODALS, MALS, SSALS, or SALS	Recommended - ODALS, MALS, SSALS, or SALS	Not Required
Parallel Taxiway	Required	Required	Recommended	Recommended
Obstacle Clearance	34:1	20:1	20:1	20:1

Legend: HIRL=High Intensity Runway Lights; MIRL=Medium Intensity Runway Lights; LIRL= Low Intensity Runway Lights; MALSR=Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights; SSALR=Simplified Short Approach Lighting System with Runway Alignment Indicator Lights; ALSF=Approach Lighting System with Sequenced Flashing Lights; ODALS=Omnidirectional Approach Lighting System; MALS=Medium Intensity Approach Lighting System; SSALS=Simplified Short Approach Lighting System; SALS=Short Approach Lighting System

As shown, High Intensity Runway Lighting (HIRL) is available to qualifying airports with visibility minimums of one mile or less. Medium and Low Intensity Lighting Systems (MIRL/LIRL) are available to qualifying airports with visibility minimums greater than one mile. Medium Intensity

[1] Source: Advisory Circular 150/5300-13A, *Airport Design*

Taxiway Lights (MITL) are recommended for taxiways at airports that have nighttime operations. For turf airports, low intensity runway lights (LIRL) are considered sufficient.

Instrument approach aids were recommended at B-I or larger airports as follows:

- ***A Non-Precision Instrument Approach Aid*** was recommended for public-use airports with qualifying airfield facilities (paved runways, proper separation standards for runways and taxiways, lighted obstructions, etc.).
- ***GPS-based Wide Area Augmentation System (WAAS), Vertical Navigation (VNAV), or LPV***[1] approaches were recommended at airports with qualifying forecasts of operations or instrument approaches or where safety concerns or training activity levels dictated a need.

If an airport has an Instrument Landing System (ILS), those were assumed to remain as long as FAA will service them. Currently, New Castle Airport is the only civilian airport in Delaware with an ILS (Runway 1).

Buildings

Hangar space requirements at system airports were based upon industry standards and experience with aircraft owner preferences in Delaware. These consider the relative value of each type of aircraft and thus, the relative importance of protecting that investment. Year 2040 hangar space requirements were calculated for each airport as follows:

Percent of Aircraft Type	Type of Storage
100% of Jet Aircraft	Conventional Hangar
50% of Multi Engine Aircraft	Conventional Hangar
50% of Multi Engine Aircraft	T-Hangar
80% of Single Engine Aircraft	T-Hangar
20% of Single Engine Aircraft	Apron Tie-Down

Conventional hangar space requirements assumed 3,600 square feet per based jet aircraft and 1,600 square feet per multi engine aircraft, while T-hangar units for single engine aircraft were

1 LPV stands for Localizer Performance with Vertical Guidance and can only be used with a WAAS receiver. It is similar to LNAV/VNAV except it is much more precise enabling a descent to as low as 200-250 feet above the runway.

assumed to average 1,200 square feet. General aviation terminal space was recommended for system airports in differing degrees. B-I airports were recommended to have at least 500 square feet for pilot shelter, phone, and restrooms. B-II airports were recommended to have a minimum 800 square feet, while C-II and larger airports were recommended to have a minimum of 1,000 square feet.

T-Hangar Units at Chorman Airport

Auto Parking

Auto parking areas were recommended for all classifications of airports. Auto parking space requirements are a function of the number of passengers, employees, and pilots expected to use an airport during the daily peak hour. At general aviation airports, planning standards indicate that roughly 1.3 auto parking spaces per total number of peak day general aviation pilots and passengers is adequate.

For larger business airports, space for rental cars may be needed, as will spaces for airport employees and visitors. Auto parking space requirements will be estimated separately for the various system airports. In addition, if commercial service is introduced to New Castle Airport, there will be a requirement for airline passenger parking. A potential estimate of those requirements will be made as a part of this analysis.

Miscellaneous

All public use airports were recommended to have both a rotating beacon and a lighted wind indicator. **Table 4-7** presents a summary of minimum facility need standards used for the general aviation airports in the Delaware system.

Table 4-7 - General Aviation Minimum Facility Needs Standards

FACILITIES	B-I Airports[1]	B-II Airports[1]	C-II & Larger Airports[1]
Land			
Airfield	35 Acres	53 Acres	109 Acres
Runway Protection Zones	28 Acres	63 Acres	79 Acres
Landside	16 Acres	24 Acres	32 Acres
TOTALS	79 Acres	140 Acres	220 Acres
Runways			
Length	3,000 Feet[2]	4,200 Feet[3]	5,500 Feet
Width	60 Feet[2]	75 Feet	100/150 Feet
Strength	12,500 Lbs.	12,500 Lbs.[3]	Over 12,500 Lbs.

Table 4-7 - General Aviation Minimum Facility Needs Standards			
FACILITIES	**B-I Airports[1]**	**B-II Airports[1]**	**C-II & Larger Airports[1]**
Taxiways			
Parallel (Width)	25 Feet	35 Feet	35/50/75 Feet
Aircraft Parking Apron			
Based Aircraft (Area)	300-400 s.y.	300-400 s.y.	400 s.y.
Itinerant Tiedown (Area)	400 s.y.	400-800 s.y.	400-1,500 s.y.
Hangar Apron	Size of Conventional Hangars	Size of Conventional Hangars	Size of Conventional Hangars
Lighting and Approach Aids			
HIRL	No	w/Precision Instrument Approach	w/Precision Instrument Approach
MIRL	Yes	Yes	Yes
MITL	Yes	Yes	Yes
LIRL	Optional for B-I Airports and Turf Airports		
ILS/GPS[4]	No	Conditional	Conditional
NPIA	Demand Driven	Demand Driven	Yes
Visual Approach Aids	Yes	Yes	Yes
ODALS, MALS, SSALS, SALS	Not Required	Optional w/Visibility Mins of ¾ to 1 mile	Optional w/Visibility Mins of ¾ to 1 mile
MALSR, SSALR, or ALSF	No	Required w/Visibility Mins less than ¾ mile	Required w/Visibility Mins less than ¾ mile
REIL	Yes	Yes (not w/any ALS)	Yes (not w/any ALS)
Buildings			
GA Terminal (Minimum)[5]	500 s.f.	750 s.f.	1,500 s.f.
Conventional Hangar	As Required	As Required	As Required
T-Hangar[6]	As Required	As Required	As Required
Auto Parking			
Area per Space	35 s.y.	35 s.y.	35 s.y.
Miscellaneous			
Fencing	As Required	As Required	As Required
Rotating Beacon	Yes	Yes	Yes
Wind Indicator	Yes	Yes	Yes
Pavement Overlay[7]	As Required	As Required	As Required

Legend

HIRL: High Intensity Runway Lights

MIRL:	Medium Intensity Runway Lights
MITL:	Medium Intensity Taxiway Lights
LIRL:	Low Intensity Runway Lights
GPS:	Global Positioning System Approach
ILS:	Instrument Landing System
NPIA:	Non-Precision Instrument Approach
MALS:	Medium Intensity Approach Light System
REIL:	Runway End Identifier Lights

[1] U.S. Department of Transportation, Federal Aviation Administration, Airport Design, AC No. 150/5300-13A, with Changes.
[2] B-I runways have a minimum length of approximately 3,000 feet, and a minimum width of 60 feet. Turf runways (less than B-I) must have a minimum 60-foot width.
[3] B-II airports that accommodate small planes with 10 or more seats can have a runway length of up to 5,000' and runway strengths up to 30,000 pounds. Assume one instrument approach not lower than ¾ mile. Others not lower than 1 mile.
[4] FAA Order 7031.2C, November 1994, Airway Planning Standard Number One - Terminal Air Navigation Facilities and Air Traffic Control Services, FAA Order 8260.3B, United State Standard for Terminal Instrument Procedures (TERPS) with Changes.
[5] Delaware recommended standard.
[6] Hangar space dictated by fleet mix: Jets - 100% stored in conventional hangars; Multi Engine - 50% stored in conventional hangars, 50% stored in T-hangars; Single Engine - 80% stored in T-hangars.
[7] Maximum pavement life assumed to be 20 years.

2.4 AIRFIELD FACILITY NEEDS

Having stated the dimensional requirements of the airfield facilities, the next step was to apply these standards to the airports in Delaware. The runway extensions indicated by the master plan input, the locational standards, or the fleet mix forecast are included as "needed" facilities. It should be understood that the designation of an upgrade or improvement for an airport indicates a future aviation need for the general area and does not represent a decision to upgrade that particular airport. Such a decision must be made by the airport Sponsor, using the results of master planning and appropriate environmental studies as a basis. **Table 4-8** presents the airfield improvements suggested by the analysis.

Table 4-8- Suggested Airfield Improvements to System Airports: Year 2040

Airport Name	Existing Primary Runway Dimensions	Future Primary Runway Dimensions	Dimensional Upgrade
Chandelle Estates Airport	2,533' x 28'	2,533' x 60'	32' in width
Chorman Airport	3,030' x 50'	3,030' x 60'	10' in width
Civil Air Terminal, Dover AFB[1]	12,903' x 150'	N/A	N/A
Delaware Airpark	4,201' x 75'	4,201' x 75'	None
Delaware Coastal Airport[2]	5,500' x 150'	6,000' x 150'	500' in length
Jenkins Airport	2,035' x 70'	Pending	Pending
Laurel Airport	3,175' x 270'	3,175' x 270'	None
New Castle Airport	7,275' x 150'	7,275' x 150'	None

Table 4-8- Suggested Airfield Improvements to System Airports: Year 2040			
Airport Name	**Existing Primary Runway Dimensions**	**Future Primary Runway Dimensions**	**Dimensional Upgrade**
Smyrna Airport	2,600' x 125'	2,600' x 125'	None
Summit Airport[2]	4,488' x 65'	Pending	Pending

Pending: Indicates extra-system factors being considered for expansion projects
[1] Recommendations for military runway lengths are made solely by the military.
[2] Recommendations from airport master plans, current ALPs, and discussions with airport owners.

In addition to these potential projects, all of the paved airports will need pavement overlay projects for runways and taxiways sometime during the 20-year planning period. This is due to the generally accepted 20-year life cycle of airport pavement. The only airports excepted from this requirement are the turf facilities (Jenkins, Laurel, and Smyrna).

2.5 LANDSIDE FACILITY NEEDS

The landside facility needs for Delaware airports were developed on a generalized basis using the demand/capacity relationships developed earlier in this Chapter. For the purposes of this analysis, landside facility requirements refer to the aircraft or passenger processing capability of an airport. As such, landside facility needs were identified for the hangar and apron areas of the general aviation areas of all airports. It should be remembered that facility needs outlined in this section are simply suggestions and cannot be implemented at any of the system airports without airport owner/sponsor support (particularly the privately owned airports). **Table 4-9** presents a summary of additional terminal, hangar, or apron facility needs.

In addition, it should be noted that this analysis is meant to identify potential capacity constraints within the system regarding landside passenger handling and aircraft processing capability. That is why the focus of the analysis is on terminal, hangar, and apron area facilities. In Phase 2 of the System Plan, the entire range of airport facilities including land acquisition, pavement overlays, airfield lighting, and miscellaneous items will be considered using the facility requirements standards outlined in this chapter.

Table 4-9 - Suggested Additional Landside Facility Needs (Year 2040)				
Airport Name	**Additional Apron Area (s.y.)**	**Additional T-hangar Units[1]**	**Additional C-Hangar Space (s.f.)**	**Terminal Building Improvements**
Chandelle Estates Airport	1,500 s.y.	4 Units	None	None
Chorman Airport	Pending	Pending	Pending	Pending
Civil Air Terminal, Dover AFB[2]	Pending	N/A	Pending	4,000 s.f.
Delaware Airpark	None	15 Units	4,500 s.f.	None
Delaware Coastal Airport	Pending	None	Pending	None
Jenkins Airport	None	None	None	500 s.f.

Table 4-9 - Suggested Additional Landside Facility Needs (Year 2040)				
Airport Name	Additional Apron Area (s.y.)	Additional T-hangar Units[1]	Additional C-Hangar Space (s.f.)	Terminal Building Improvements
Laurel Airport	None	None	None	None
New Castle Airport	None	None	Pending	Pending
Smyrna Airport	None	2 Units	None	None
Summit Airport	None	None	None	None

Pending: Indicates extra-system factors being considered for expansion projects
[1] Aircraft that require T-hangars were assumed to move to any unused conventional hangar space before additional T-hangar units would be built.
[2] The Civil Air Terminal work would be undertaken with State, local, and private funding and reflects economic development activities to increase usage by NASCAR race teams and FBO/MRO firms.

In addition to these potential projects, all of the paved airports will need pavement overlay projects for apron areas sometime during the 20-year planning period. This is due to the generally accepted 20-year life cycle of airport pavement. The only airports excepted from this requirement are the turf facilities (Jenkins, Laurel, and Smyrna).

2.5 SURFACE TRANSPORTATION NEEDS

Because there are a number of planned developments at system airports, the needs for surface access differ by facility. From a demand/capacity standpoint, there are only two anticipated shortfalls or constraints. These deal with on-airport access or parking issues. In addition to these, there are a number of improvements that are planned, particularly where new airport development must be integrated into the surface transportation system. When improvements are undertaken, they will be for improved convenience or operational efficiency rather than for capacity reasons.

Summit Airport Access from Highway 301

Airport-generated surface vehicle traffic was projected to the year 2040 to determine whether or not hourly roadway capacities at each facility would be exceeded. These peak hour vehicle trips were estimated using a general aviation industry standard of 2.35 times the number of peak hour aircraft operations.[2] This number accounts for employees, passengers, and pilots using the airport.

[2] Source: Originally published in **Aviation Demand and Airport Facility Requirement Forecasts for Medium Air Transportation Hubs Through 1980**. This standard is still applicable at GA airports.

In addition to airport-generated trips, an existing hourly roadway capacity was estimated for each airport. From a system planning level of detail, the estimation process used the minimum hourly roadway capacity of 200 vehicles for turn lanes into and out of system airports. As shown in Table 4-8, projected peak hour vehicle trips will not exceed minimum levels of highway capacity during the period. As shown, the statewide capacity usage is 19.1 percent. The Civil Air Terminal is projected to reach 66 percent of its capacity (only during race weekends), while Delaware Airpark is projected to reach 44 percent of its peak hour highway capacity by 2040. Other airports remain at 20 percent or less of their surface access hourly capacity.

Table 4-10 - Forecast Surface Access Demand

Airport Name	Access Road	2040 Peak Hour Vehicle Trips*	Existing Hourly Roadway Capacity*	2040 Surplus or (Deficit)
Chandelle Estates	Route 9	9	200	191
Chorman	Nine Foot Road	24	200	177
Civil Air Terminal at Dover AFB	Horsepond Road	132	200	68
Delaware Airpark	State Route 42	87	200	113
Delaware Coastal Airport	Airport Road, S Railroad Ave	80	400	320
Jenkins	Westville Road	5	200	195
Laurel	State Route 24	21	200	179
New Castle Airport***	US 13 and 40, State Routes 273, 58, 141	221	1,200	979
Smyrna	State Route 6	7	200	193
Summit	US 301	66	400	334
TOTALS		**652**	**3,400**	**2,749**

* Vehicle trips estimated from general aviation industry averages of 2.35 times peak hour operations. This number accounts for pilots, passengers, and employees at the airport.

** Estimated minimum capacity of 200 hourly vehicles for airport ingress and egress turn lanes.

*** Does not include potential airline traffic, which could create 200 or more peak hour vehicle trips by the year 2040. This still leaves more than 700 hourly vehicle trip capacity to Airport access roads.

2.6 PRIVATELY OWNED, PUBLIC-USE AIRPORT FACILITY REQUESTS

As a part of the Facility Needs Analysis, a letter was sent to all public-use airports requesting information on desired capital facility projects (Figure 4-2). Because the NPIAS airports have access to FAA grants and State matching funds, they did not produce lists of projects. Rather, most indicated the desire for the State to match their local share of federal projects. They also indicated a desire to participate in a "routine airport maintenance program" (RAMP) style of matched funding (described in the Phase 2 report).

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

JENNIFER COHAN
SECRETARY

November 15, 2019

Airport Owner/Manager
Airport Address
Public-Use, DE 19901

The Delaware Department of Transportation, Office of Aeronautics, is seeking information on airport capital needs at all public-use airports statewide in order to update its State Aviation System Plan (SASP). Delaware last updated the SASP in 2012; this plan is regularly updated every five to seven years. New to the SASP, available to the public in Spring 2021, will be a detailed listing of all projected capital projects at Delaware's public-use airports during the plan's 20 year horizon (through 2040).

In July 2019, Governor Carney signed House Bill 86, which levies a $0.05 per gallon excise tax on jet fuel effective July 1, 2019. Revenues generated by this Act will be directed toward the improvement and capital maintenance at Delaware's system of public-use airports. For the first time, the Office of Aeronautics will have a dedicated source of funds available for supporting airport capital needs. We anticipate funding projects listed in the SASP on a priority basis. This priority will be determined as part of the SASP development process. We anticipate using the priority list in the SASP to select annual projects for funding through 2025.

To help us quantify the needs of our public-use airport system, we would like your input on capital projects you envision for your airport. **Please send us a list of projects you anticipate at the airport you manage for the next ten years, at a minimum.** This can be a combination of maintenance projects which are required to keep your airport operational, as well as capital needs which will improve your airport's ability to operate more effectively as a business and leverage new investment and operations during the planning period. It is anticipated that this program will have similar airport commitment requirements as the existing State obstruction removal process. These require a 10-year sponsor commitment with a declining pro-rated pay back should the airport cease being a public-use airport.

DelDOT

Should you need assistance determining possible capital needs at your airport, our office is available to assist. Requests for assistance, as well as questions can be directed to Nate Attard, Planner and Aeronautics Coordinator at nathan.attard@delaware.gov or 302-760-2174. Responses would be appreciated prior to December 31, 2019.

Sincerely,

Josh Thomas
Planning Supervisor and Aeronautics Program Manager

JT: na
cc: Drew Boyce, Director, Planning
Mike DuRoss, Assistant Director, Planning
Nate Attard, Planner, Planning and Aeronautics Coordinator

Figure 4-2 – Letter to Public-use Airports

Privately owned airports, on the other hand, do not have access to public funding, other than the newly developed State funding program. To date, one response was received from Chorman Airport, and follow-up contacts are being made with the other airport owners. It is anticipated that a series of projects will be added to the list of system planning improvements as described in Tables 4-6 and 4-7. These will be evaluated and ranked by priority in the Phase 2 study. As an example, projects requested by Chorman include:

1. Complete the Gate/Fencing project to include fencing along Nine Foot Road
2. Install pilot-controlled runway lighting
3. Install an AWOS
4. Build 3 more hangars of 8 units of nested T-hangars
5. Seal cracks in blacktop runway and taxiways as needed
6. Minor obstruction removal

It is anticipated that a full list of similar projects will be collected from other privately owned, public-use airports in Delaware as the study progresses. Although these projects did not trigger system planning level requirements based strictly on demand and capacity, these projects are the normal improvements and capital maintenance needed for continued individual airport operation.

3. SUMMARY OF FINDINGS

IT IS IMPORTANT AT THIS POINT IN the study to assess the findings that have resulted from the analysis. Further, these findings will have implications on the direction and focus of the alternatives analysis. This chapter has centered around the needs of the aviation system based on the goals and objectives of the plan. As such there were four main criteria used to assess the "system" needs of Delaware airports.

- Demand/Capacity Relationships
- Airport Locational Standards
- Airport Master Planning Recommendations
- Discussions with Airport Owners

Airport upgrades and facility needs based on these criteria affect 9 of the 10 public-use airports carried through this analysis. Of these airports, 6 have runway or taxiway upgrades or overlays listed or pending as needed, while 9 airports have landside improvement needs listed. For airfield improvements, suggested runway extensions or upgrades were made for the following Delaware airports:

- Chandelle Estates
- Chorman
- Delaware Coastal
- Jenkins
- Summit Airport

Other airfield upgrades involved pavement overlays at New Castle Airport and Delaware Airpark.

Landside improvements focused mostly upon aircraft storage hangar and apron area improvements at various system airports. Because a number of airports have pending requirements, no statewide totals could be generated. However, seven of the 10 airports show some type of landside development – either in specific facilities or "pending."

From the overall analysis, it was shown that no airfield demand/capacity shortfalls are expected to develop over the planning period. The only improvements needed will be in upgrades for meeting standards and critical aircraft needs. The aviation system requirements estimated for each airport represent normal improvements to provide safety and meet demand increases over the planning period. The focus of the landside analysis was upon the passenger and aircraft processing capabilities of the individual airports. The alternatives analysis in Phase 2 of the system plan (Chapter 6) will consider the entire range of facility requirements and associated costs including land acquisition, pavement overlays, airfield lighting, and miscellaneous items.