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Chapter 1. Goals and Objectives

I. Introduction

A. Overview

The overall goal of the *Pennsylvania Statewide Airport System Plan (PA SASP)* is to provide the Pennsylvania Department of Transportation (PennDOT), Bureau of Aviation (BOA) with the tools necessary to make decisions about the preservation, enhancement, and promotion of its air transportation system. Since the completion of the comprehensive 2002 PA SASP, significant economic, industry and regulatory changes have challenged Pennsylvania's System of Airports.

These changes along with the evaluation and update of the PA SASP's airport inventory data, forecast methodology and airport classification structure were the focus of the 2012 PA SASP Update. The specific project tasks included an:

- Evaluation of system needs, establishment of goals and recommend objectives to improve system performance.
- Assessment of industry wide issues affecting aviation and the impact on Pennsylvania airports.
- Update and Evaluation of the Statewide Airport System Inventory.
- Evaluation, modification and integration of the airport classification and performance criteria established in 2002 and updated in 2007.
- Update to the Aviation Forecasts to reflect statewide aviation activity.

The Technical Report documents all tasks associated with industry research, data collection and documentation. This chapter presents PA's Airport System goals and objectives. Chapter 2 summarizes updated airport specific, system wide inventory data. Chapter 3 outlines aviation forecast methodology and projections for commercial and general aviation. Chapter 4 describes the PA Airport Classification structure and performance criteria. Chapter 5 summarizes the top three of the twelve (3 of 12) airport issues researched as part of this system plan with full details contained in the Appendix. The Executive Summary is also included in the Appendix.

The System Requirements Task originally slated to be included as part of this project will be deferred until the significant Transportation Funding Reform Legislation recently passed has been implemented within the PA Department of Transportation. While not typical, the postponement of this critical PA SASP element will afford the Department sufficient time to solidify strategic executive direction and collaborate on key PA SASP recommendations.

B. Purpose and Study Approach

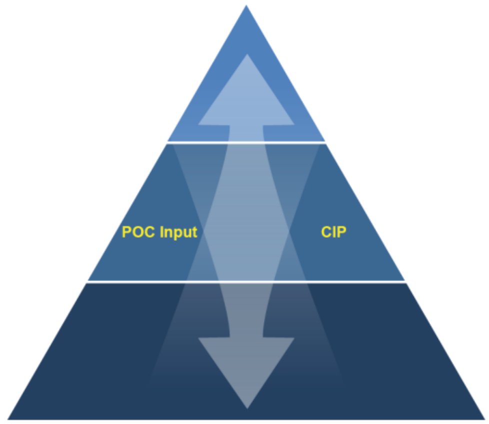
BOA has undertaken this Statewide Airport System Plan Update to analyze and assess Pennsylvania's airports both individually and as a whole. It identifies current conditions and lays out a plan for meeting the system's current and future needs as a vital part of the state's overall transportation system. The PA SASP will serve as a tool to help facilitate the continued successful development of Pennsylvania airports, with an emphasis on planning for the airport system as a whole.

Additionally, the PA SASP provides BOA with policy and decision-making guidelines consistent with its vision and mission. The plan illustrates how investments in airports yield returns, promotes accountability for funding decisions, and provides tools for prioritizing investments. This plan will help BOA determine how the Pennsylvania airport system should be developed to meet changes in demand and respond to future challenges in order to promote system sustainability. The baseline information provided for the existing system will allow BOA to track changes at commercial service and general aviation (GA) airports in future years and evaluate the impact of investments in the aviation system.

It is important to note that the PA SASP is not an explicit project programming document, and inclusion of improvement recommendations in this plan does not constitute a commitment of either state or federal funding. Rather, the PA SASP is a strategic look or "top-down" planning study from the statewide perspective. Its recommendations are implemented at the airport level (otherwise referred to as "bottom-up"), following airport-specific master planning, environmental analyses, and financial evaluations. Top-down and bottom-up planning can and should operate in concert with each other—top-down planning provides big-picture vision and direction, while bottom-up planning provides focus and identifies practical implications of implementation.

As shown in **Figure 1-1** below, this approach, when conducted with effective input from key stakeholders and with appropriate Capital Improvement Planning (CIP), is a cohesive and comprehensive planning model for PA SASP. Consistent with this approach, key stakeholders were involved through the Project Oversight Committee (POC). This Committee was formed to ensure each classification level of airport was represented in addition to participation by PennDOT, Federal Aviation Administration (FAA) and Metropolitan/Rural Planning Organizations (MPO/RPO).

Figure 1-1 System Planning Approach



In summary, the 2012 PA SASP follows a strategic approach for providing a blueprint to ensure that Pennsylvania's future system of airports meets the Commonwealth's existing and future air transportation and economic needs in a sustainable manner. The approach:

- Used proven methods consistent with the FAA's Advisory Circular on System Planning.
- Leveraged critical insights, experience, and goals from key project stakeholders.
- Established performance measures for system evaluation.
- Considered the implications of outside influences and issues that may impact the airport system.
- Analyzed potential changes in the FAA's National Plan of Integrated Airport Systems (NPIAS), known as ASSET.

II. System Plan Goals and Objectives

In the 2002 PA SASP, five airport system performance categories were established:

- Accessibility
- Optimization Potential
- Activity/Demand
- Support/Commitment
- Facilities

These categories were translated into goal statements with associated objectives and performance benchmarks.

As part of the 2012 PA SASP, the 2002 goals were reviewed, evaluated for relevance in 2012, and modified as appropriate. The updated draft system goals were then presented to and collaborated with the stakeholder Project Oversight Committee. The resulting 2012 performance measures and goals are highlighted in **Table 1-1** below.

Table 1-1: Performance Measures and Goals of the 2012 PASP

Performance Measure	Goal
Accessibility	Provide an airport system that is accessible from both the air and ground.
Optimization Potential	Support an airport system that is able to meet the demand of its users by optimizing facilities.
Activity/Demand	Support an airport system that maintains the flexibility to respond to changes in future demand.
Support/Commitment	Promote and preserve an airport system that is supported by airport sponsors and local communities.
Facilities	Support users by optimizing facilities while maximizing the system-wide benefit of aviation investments.

These goals further shaped a list of objectives with associated criteria, or benchmarks. **Table 1-2** presents the corresponding objectives and benchmarks. These benchmarks were used to establish the functional levels and roles for each system airport. The benchmarks were also used to analyze system performance and identify current system adequacies, deficiencies, and surpluses, which will shape subsequent system recommendations.

Table 1-2: Objectives and Benchmarks

Objective	Benchmark
Coverage of major business centers by commercial service or advanced airports.	These airports should be located within **30** minutes of major business centers (6,000 employees).
Coverage of major population centers by commercial service airports.	These airports should be located within **60** minutes of significant population centers (40,000).
Commercial service airports should be accessible from an interstate highway.	Commercial service and advanced airports within **5** miles of a limited access highway.
All-weather airport coverage should be provided throughout the Commonwealth.	Percent of population and area within **30** nautical miles of an instrument, all-weather runway (paved, instrument approach, on-site weather reporting).
Airports should be easily accessible to the Commonwealth's residents and visitors.	Percent of state, population, and business centers within **30** minutes of any system airport.
Plan for sufficient development to accommodate user demand and needs.	Percent of NPIAS airports with a current approved ALP (less than 10 years).

CHAPTER ONE

Objective	Benchmark
Identify environmental and/or land use concerns that limit the optimization of airport facilities.	Identify airports with potentially significant environmental\surrounding land use concerns.
Activity measures should be used to derive the function of the airports in the system.	Percent of system airports operating within airfield capacity ranges (less than 60%, between 60 and 80%, and greater than 80%).
Demand for cargo services and facilities should be met.	Percent of system airports supporting cargo/freight activities. Percent of system airports with dedicated cargo/freight transfer facilities
Adequate passenger service should be provided throughout the Commonwealth.	Percent of population and state within **60** minutes of a commercial service airport with one or more airline(s).
Recreational aviation needs should be recognized and met.	Percent of population within **30** minutes of a system airport with a flight school/flight instructor.
Facilities should be provided in the system to meet demand.	Percent of system airports that have sufficient aircraft storage capacity (no hangar waiting list).
Communities should adopt airport zoning and land use controls to support the airport's development.	Percent of municipalities impacted by a system airport that has implemented Airport Hazard Zoning.
Communities should adopt airport zoning and land use controls to support the airport's development.	Percent of municipalities located within the inner approach area of an airport with Airport Hazard Zoning.
Local and regional support should be provided to the airports.	Percent of system airports that are acknowledged in local and regional comprehensive plans.
Facilities should be provided to meet the various needs of the airports depending on the functional role in the system.	Percent of system airports in compliance with facility objectives.
Airports should provide appropriate amenities to accommodate user needs.	Percent of system airports in compliance with service objectives.
Airports should have hazard-free approaches to their runways.	Percent of system airports with clear VFR Threshold Siting Surfaces to all runways according to latest inspection/ALP information.
NPIAS airports should meet FAA design standards.	Percent of NPIAS airports in compliance with FAA RSA design standards.
Primary runway pavements should be maintained to protect the Commonwealth's investment.	Percent of system airports with a Pavement Condition Index (PCI) of **70** or greater on their primary runway.

Chapter 2. Inventory

I. Introduction

The purpose of the inventory chapter is to record the current facilities and conditions at the airports included in the 2012 PA SASP. The inventory data collected provide a solid foundation for understanding the existing system's current conditions and enable a comparison to the facilities inventoried in the 2002 PA SASP. Further, the data collected will be used for future analysis, evaluations and recommendations.

PennDOT licenses and the FAA site approves 131 public-use aviation facilities in the Commonwealth of Pennsylvania. The existing airport system shown in **Figure 2-1** is comprised of both publicly- and privately owned airports. These range in size from single turf-runway facilities to large, multi-runway hub facilities. In this study "airport" and "aviation facility" may be used interchangeably. Furthermore, the term "airport" refers to the Commonwealth's public-use:

- Airports
- Heliports
- Seaplane Bases
- Ultra-light Airfields
- Glider Ports

As discussed in Chapter 1, the adequacy of the aviation system in Pennsylvania is largely based on the type of facilities that are provided to the public and airport users. Therefore, it is extremely important to determine the physical attributes and services available at each airport.

This chapter of the PA SASP documents details for each facility. These details are provided primarily in the form of tables that present the information in a logical form for analysis.

II. Inventory Process

There is a large volume of information available describing the airports in the Pennsylvania airport system. This includes information accumulated by BOA and the FAA. The inventory collection and evaluation process was developed by BOA to allow for electronic data exchange and verification during and after the project. In August 2012, BOA conducted on-site visits to each airport and updated the BOA airport inventory database. The data contained in this Chapter is current as of year-end 2012 unless otherwise noted.

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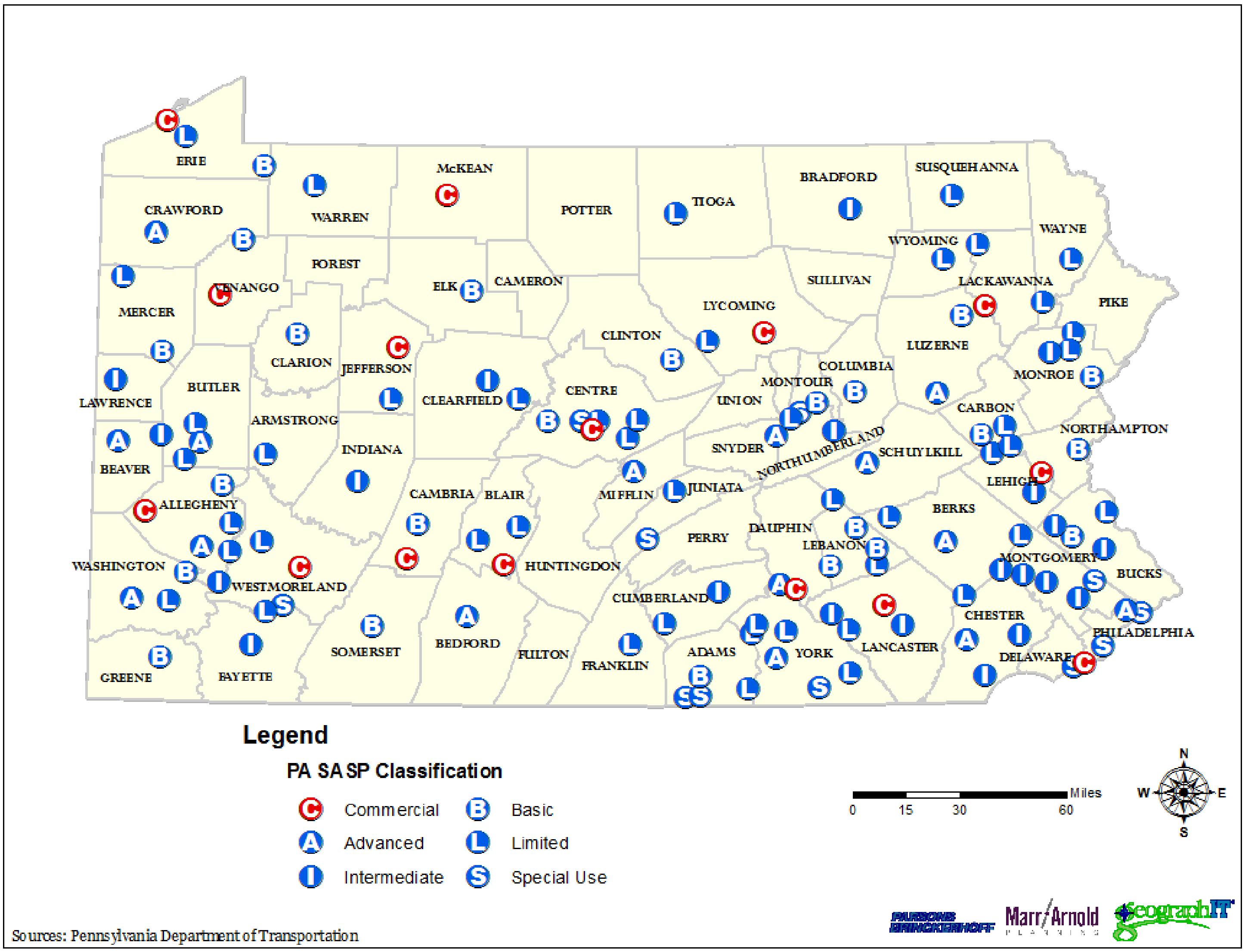
That data also forms the basis for the tables that follow in this chapter. It should be noted that the airports are grouped by commercial service airports or general aviation airports. Within those categories, airport-specific data is presented alphabetically by associated city.

Figure 2-1: PA SASP Airports based on 2002/2007 Classifications



III. Facilities

The tables described below are presented in Appendix B, beginning on page 123.

Table B-1: Airport Ownership presents data on airport ownership and includes the airport identifier, the listed airport sponsor, whether the airport is publicly or privately owned, and whether the airport is currently included in the National Plan of Integrated Airport Systems (NPIAS).

Table B-2: Airport Plans is organized to present the existence of airport planning studies and, if available, the year the plan was developed. The date the official airport layout plan was approved is also listed.

Table B-3: Airside Facilities summarizes the airside facilities that exist at each airport. The facilities that are identified include elevation above Mean Sea Level (MSL), runway designation, length, width, surface type, strength, and lighting type; the existence of a parallel taxiway; and the width, surface type, and lighting type for the parallel taxiway.

Table B-4: Landside Facilities contains information on the buildings that currently exist on each airport. The information shown includes square footage of the air carrier terminal, general aviation terminal and administration building; the number of T-hangar units; and square footage of conventional hangar space.

Table B-5: Landside Facilities Parking summarizes the parking facilities that currently exist at each airport for based and itinerant aircraft and for automobiles. The information includes apron size, surface type, and use; the number of paved and unpaved aircraft tie-downs; and the size or number of automobile parking areas.

Table B-6: Fuel Facilities presents information on the fuel facilities that currently exist at each airport. It includes a listing for AvGas, Jet A, and MoGas. The information includes the number of tanks, type of tanks (above or below ground), total available fuel capacity, and the type of distribution.

Table B-7: Air Cargo Facilities shows the current and planned air cargo building and apron space at each commercial service airport. There are no existing or planned cargo facilities at Pennsylvania's general aviation airports.

IV. Airspace and Navigational Aids

Various types of navigational aids (NAVAIDs) and approaches are available at the 131 airports included in the Commonwealth's system. This portion of the SASP inventory is intended to provide information concerning the airspace/approach types of navigational aids available to the flying public at each facility.

Table B-8: Navigational Aids depicts the availability of each type of navigational aid, approach, weather reporting system, or air traffic control at each of the airport facilities. Among the information that is depicted is the existence of any of the following: Precision Approach Path Indicators (PAPI), Visual Approach Slope Indicators (VASI), Runway End Identifier Lights (REIL), airport beacon, wind cone, segmented circle, Instrument Landing System (ILS), localizer, Approach Lighting System (ALS), Distance Measuring Equipment (DME), Very high Omnidirectional Range approach (VOR), Global Positioning System approach (GPS), Non-Directional Beacon approach (NDB), Circling Approach (CA), weather reporting system, and air traffic control tower.

The presence of a full ILS ground-based system (glide slope and localizer) indicates a precision approach to the airport. Instrument approaches with vertical guidance based GPS are considered "near precision" approaches, and as part of NEXTGEN, the FAA plans for these to become precision approaches. The presence of a localizer only, or an NDB, VOR, or GPS non-vertically guided approach, indicates a non-precision approach to the airport. The absence of NAVAIDs indicates that there is only a visual approach to the airport.

There are several GPS approach procedures that the FAA offers for airports based on the Wide Area Augmentation System (WAAS). WAAS is an air navigation aid developed to augment GPS and enable aircraft to rely on GPS for all phases of flight. In addition to a standard GPS approach there are currently four types of GPS/WAAS related approaches:

- ✓ Lateral navigation (LNAV) providing lateral direction only and not in the vertical direction;
- ✓ LNAV/VNAV Procedures with added Vertical Navigation guidance;
- ✓ Localizer Performance with Vertical guidance (LPV), which are the highest precision GPS/WAAS approach procedure currently available without specialized aircrew training requirements; and
- ✓ Required Navigation Performance (RNP), which is a type of performance-based navigation that allows an aircraft to fly a specific path between two 3D-defined points in space and requires specialized aircrew training and equipment.

Pennsylvania airports have procedures for all these types of approaches except RNP, which is initiated by an airline as opposed to being requested by an airport. **Table 2-1** summarizes the types of GPS approaches available at Pennsylvania airports, and also the number of procedures available as of January 9, 2013.

Table 2-1: WAAS-Capable PA Airports (by procedure type)

	Total PA Airports*	Total Procedures at PA Airports*
RNAV/LNAV Procedures	76	155
RNAV/VNAV Procedures	34	76
LPV Procedures	42	87
RNP Procedures	2	18
GPS Standalone Approaches	3	4

Effective January 9, 2014

*Note: Number of GPS standalone approaches will continue to decrease as they are replaced by RNAV procedures.

V. Activity Statistics

The aviation activity at Pennsylvania's airports provides one of the most important factors in determining an airport's role within the statewide airport system. Activity information indicates how busy the airport is and what type of use occurs there. Understanding aircraft activity also helps to determine which airports may need to be expanded to meet future demand, as well as locations where additional airports may be necessary.

Table B-9: Airport Activity Statistics depicts the airport activity statistics that were provided by the airport management. The table presents based aircraft, the 2010 aircraft operations, the busiest month for aviation activity, an estimate of the number of peak-hour operations, the percentage of flight training operations that is included in the total number of operations, and the 2012 enplanements for the scheduled service airports.

VI. Land Use

One of the most important issues facing airports in Pennsylvania today is the effect of urban sprawl on the continued development or protection of airports. As population bases move further from the cities, development is occurring around active airports at an increasing rate. This shift to residential development can not only inhibit the airport's activity and growth due to incompatible land uses, but may also pose a hazard to the continued safe operation of an airport. In 2010, the Bureau of Aviation kicked-off a project to significantly increase statewide compliance with Pennsylvania's Airport Hazard Zoning Law, Act 164 of 1984. While this law was designed to prevent hazards around airports through local implementation of protective ordinances, only twenty percent of impacted municipalities were in compliance. The "Action Plan for Implementing Airport Hazard Zoning Ordinances" project, conducted in partnership with URS, set out to address the reasons municipalities were not complying. As a result a number of new tools were developed including a new streamlined model ordinance; electronic airport hazard zoning overlay maps depicting Part 77 surfaces for each airport; and educational materials which was used to train over 550 zoning and local government staff. Today, compliance with Act 164 of 1989 has increased to nearly **forty-five percent.** Currently, there are 768 municipalities impacted by FAR Part 77 surfaces from Pennsylvania's airports. In some instances, the same municipality may be impacted by more than one airport. Of this number, 344 municipalities have enacted an Airport Hazard Zoning Ordinance.

Table B-10: Land Use lists the impacted municipality, its associated county, and whether they have enacted Airport Hazard Zoning to protect their airport(s).

VII. Airport/Aviation Services

Table B-11: Airport Aviation Services depicts the services available at each airport in Pennsylvania. These services are important to the pilots and flying public who utilize the airport, as well as to the general public. The services that are listed are as follows:

- Air Carrier Service
- Air Taxi Service
- Commuter Service
- Hangar Rental
- Air Charter Service
- Tie downs
- Aircraft Rental
- Aircraft Sales
- Flight Instruction
- Jet Fuel
- AvGas
- Aircraft Repair
- Avionics Repair
- Avionics Sales
- U.S. Customs
- Public Telephone
- Restaurant
- Vending
- Car Rental
- Loaner Car
- Skydiving
- Foreign Trade Zone
- Industrial Park
- Keystone Opportunity Zone
- FAA Test Center
- Aircraft Deicing
- Auxiliary Power Unit

Table B-12: Airport/Aviation Activities depicts the aviation activities that take place at each airport. These activities include the following:

- Recreational Flying
- Agricultural Spraying
- Corporate/Business Activity
- Aerial Inspections
- Just-in-Time Shipping
- Gateway for Resort Visitors
- Prisoner Transport
- Police/Law Enforcement
- Community Events
- Community Facilities
- Career Training/Education
- Civil Air Patrol (CAP)
- Environmental Patrol
- Emergency Medical Evacuation
- Medical Shipments/ Patient Transfer
- Forest Fire Fighting
- Aerial Photography/ Surveying
- Real Estate Tours
- Banner Towing
- Traffic/News
- Air Shows
- Fly-ins

For the 2012 PA SASP, BOA also collected data on environmental considerations at airports to better understanding potential issues associated with future development projects. The environmental categories there were collected and summarized in include non-attainment area/air quality, floodplains, hazardous waste, threatened and endangered species, water bodies, wetlands and historic resources. The details are not included in the report due to the potential sensitivity associated with some of the data.

VIII. Summary

The last Pennsylvania Statewide Airport System Plan was published in 2002; now more than 10 years later, some airports have changed significantly. Fifteen public-use aviation facilities have closed and thus are no longer included in the PA SASP. These are Blue Swan Airport, Culmerville Airport, Gwin Airport, Miller Airport, Moorhead Airport, New Hanover Airport, Scandia Airpark, Valley Forge Heliport, Huntington County Airport, Keystone Heliport, Kutztown Airport, Millard Airport, Seven Springs Airport, Cherry Springs Airport, and Erie County Airport. Five public-use aviation facilities have opened since 2002, plus the Rock Airport of Pittsburgh which was reconstructed 0.3 miles from the original airport that it replaced. These are Stottle Memorial Heliport, Rocky Hill Ultralight Flight Park, Husky Haven Airport, Lazy B Ranch Airport and Thermal G Glider Port which became a public-use aviation facility shortly after the inventory was completed in late 2012. Thus, the number of airports in the PA SASP decreased from 141 airports in 2002 to 131 airports in 2012. Despite the fact that commercial and general aviation operations have declined at Pennsylvania airports, some positive changes are noteworthy. Since 2002, five general aviation airports have extended their runways. As of 2012 there are 15 general aviation airports with runways of 5,000 feet or longer. The number of commercial runways over 5,000 feet remained unchanged during this 10-year period. Although, conventional hangar space declined by 335,670 square feet at the 15 Pennsylvania commercial service airports, resulting in a total of 1,301,353 square feet in 2012, 451,000 square feet was attributed to hangars that were demolished and not replaced at Harrisburg International Airport. On the other hand, the general aviation airports built 355 new T-hangar units. The numbers of fuel facilities changed slightly since 2002. Despite the number of AvGas tanks which remained unchanged (126), six more Jet A tanks have been added. Many of the underground tanks have been converted to above ground tanks.

The changes in airport facilities between 2002 and 2012 are summarized in **Table 2-2.**

Table 2-2: Summary of Inventory Changes, 2002-2012

Items	2002	2012	Change
Number of Airports in PA SASP	141	131	-10
Runways over 5,000 ft.	40	45	5
Commercial Airports Conventional Hangars (sq. ft.)	1,637,023	1,301,353	-335,670
Number of T-Hangars (GA Airports)	2,275	2,630	355
ILS	22	21	-1
PAPI	28	52	24
VASI	38	19	-19
REIL	49	55	6
GPS	64	82	18
NDB	22	9	-13
AvGas Tanks	126	126	0
AVGas Total Capacity (gal.)	911,700	998,200	86,500
Jet A Tanks	105	111	6
Jet A Total Capacity (gal.)	1,431,200	1,217,700	-213,500
Mogas Tanks	15	13	-2
GA Terminals	56	55	-1
Total Operations	4,359,434	3,144,196	-1,215,238
Based Aircraft	5,855	4,866	-989

CHAPTER THREE

Chapter 3. Aviation Trends and Projections

I. Introduction

As a context for preparing and analyzing aviation demand forecasts for the comprehensive statewide plan for the public-use airports in the Pennsylvania airport system, it is important to have an understanding of recent and anticipated trends for both commercial service and general aviation demand. Some trends in the aviation industry will undoubtedly have a greater impact on Pennsylvania (PA) airports than others; some trends may have no significant impact on air traffic in the Commonwealth.

The trends examined consider commercial service airports separately from general aviation airports. These trends provide information and insight which were applied to the development of the aviation demand forecasts provided in this chapter. The forecasts include projections for commercial service airport enplanements and commercial operations, as well as general aviation operations and based aircraft.

Because the trends (both recent and projected) in commercial service activity and general aviation activity are slightly different, varying methodologies were used to develop the forecasts for each. For commercial service airports, the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) available as of July 2013 was used and applied to actual 2012 activity data. The general aviation forecasts were prepared by reviewing various industry forecasts and applying growth rates to the total activity for the airports grouped by district.

The following sections are included in this chapter:

I. Industry Trends
  - A. Commercial Service Trends
    - i. Recent Commercial Trends
    - ii. Anticipated Commercial Trends
  - B. General Aviation Trends

II. Projections of Pennsylvania Aviation Demand
  - A. Passenger Enplanements
  - B. Commercial Aircraft Operations
  - C. All Pennsylvania Public-Use Airports
    - i. Based Aircraft
    - ii. Non-Commercial and General Aviation Aircraft Operations

II. Industry Trends

Trends in the commercial airline industry could substantially impact air service in Pennsylvania, particularly as they relate to how the Commonwealth's demand for commercial airline travel will be served in the future. Trends in general aviation are also important to consider because almost every airport in the Pennsylvania system, even the air carrier airports, accommodates some segment of general aviation activity. In fact, the vast majority of Pennsylvania airports support only general aviation aircraft operations. Having an understanding of general aviation trends is important in considering the future demand for this component of the industry.

This section reviews trends for both commercial service airports and general aviation airports. Trends presented in this chapter are generally for the U.S. as a whole, and are intended to provide insight into the factors that have recently and are anticipated to influence aviation activity. The trends analysis sets the stage for an understanding of how aviation activity in Pennsylvania compares to aviation in the country, and it establishes a basis for predicting how aviation may be expected to grow and change in the future.

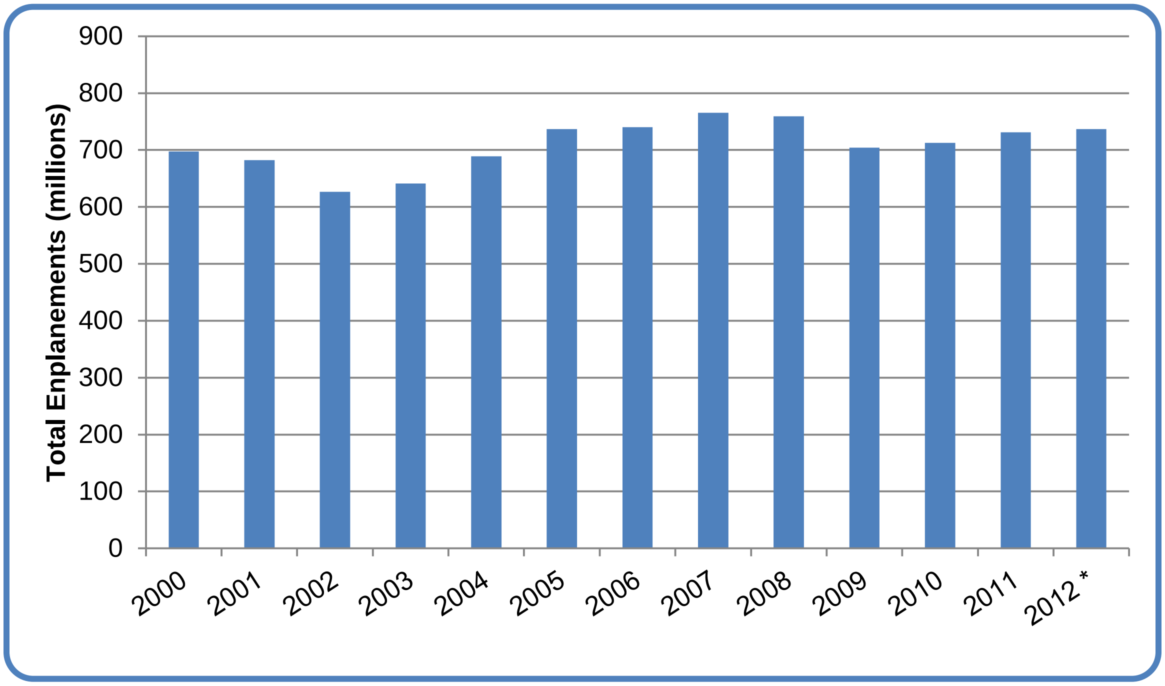
The demand for commercial service and general aviation over time has remained strong. During 2004 and 2005, demand returned to pre-September 11, 2001 levels, with additional growth through 2007. However, the economic crises which began in 2008 caused aviation activity levels to fall once again. Since that time aviation demand has increased steadily, but at rates much slower than during previous recoveries.

A. Commercial Trends

Recent Commercial Trends

Following the events of September 11, 2001, aviation forecasters anticipated that it would take about five years for commercial demand to return to levels experienced in 2000. However, by 2005, commercial traffic levels at almost all commercial airports exceeded 2000 levels and continued to grow through 2007. After the 2008 collapse of the financial markets, commercial traffic levels again dropped and were not expected to recover until the economy as a whole recovered. **Figure 3-1** presents the trend in total U.S. enplanements since 2000.

Figure 3-1: Historical U.S. Enplanements



** 2012 data is an FAA Estimate.*
Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033

The economic impacts to the airlines following the events of September 11, 2001 and the economic recession of 2008 resulted in major changes to the airline industry. These factors are discussed below.

- **Economic Cycles:** There is a strong relationship between growth in enplanements and the U.S. Gross Domestic Product. This trend clearly indicates that the airline industry and commercial passenger traffic are significantly impacted by upturns and downturns in the U.S. economy. The economic downturn subsequent to 9/11 and the economic recession beginning in 2008 both had a profound effect on the level of air traffic in the U.S.

  Economic conditions have also spurred numerous airline mergers and acquisitions over the past decade. **Table 3-1** presents an overview of the mergers and acquisitions that have occurred in the U.S. airline industry since 2000.

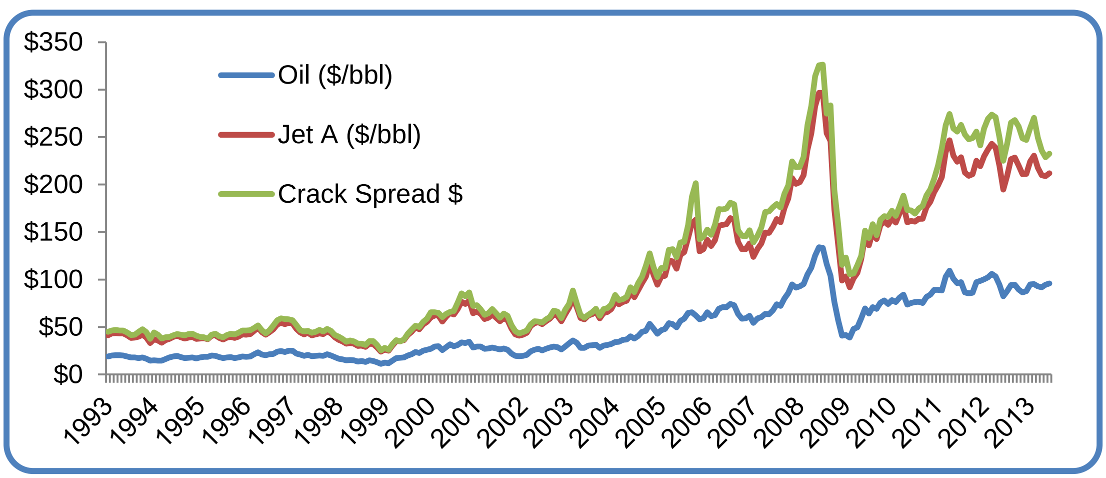
Table 3-1: U.S. Mainline Carriers, 2000-2012

Airline	Airline Acquired	Acquired By	Currently Operating
American Airlines	TWA - 2001	U.S. Airways - Pending	Yes
Continental Airlines	-	United - 2011	No
Delta Air Lines	Northwest - 2008	-	Yes
Northwest Airlines	-	Delta - 2008	No
Trans World Airlines (TWA)	-	American - 2001	No
United Airlines	Continental - 2011	-	Yes
U.S. Airways	American - Pending	-	Yes

Source: Parsons Brinckerhoff; Prepared July 2013

- **Fuel Prices:** Despite a continuing increase in passenger demand, the cost of fuel continues to disrupt the financial stability of commercial airlines and their ability to maintain profitability. **Figure 3-2** presents the pricing trends of crude oil and jet fuel (referred to as Jet A). Since 1991, there have been three major spikes in the price of oil. In the 1990s, the price fluctuated between $20 and $30 per barrel increasing to $35 per barrel briefly after 9/11. Oil prices continued to steadily climb until late 2005 when Hurricane Katrina hit the U.S. Gulf Coast, sending oil prices to nearly $70 per barrel. Leading up to the collapse of the financial markets in fall 2008, the price of oil climbed to an all-time high of around $140 per barrel. After the collapse and onset of the ensuing recession, oil prices fell to below $30 per barrel. Since that time, oil prices have made a fairly steady recovery and as of July 2013 were in the range of $90 per barrel. In addition, the difference between crude and jet fuel cost per barrel, known as the “crack spread,” increased as well, from a historical average of $5 to just over $20 in mid-2013.

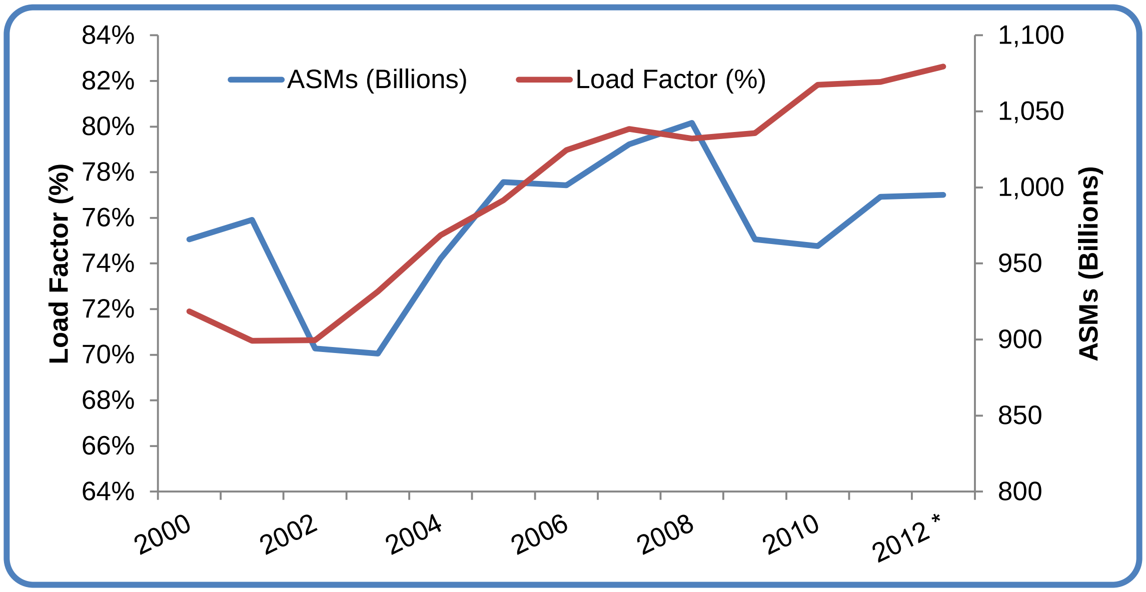
Figure 3-2: Monthly Average U.S. Oil and Jet A Prices



Source: U.S. Energy Information Administration; Compiled by Parsons Brinckerhoff, July 2013

- **Airline Capacity and Load Factors:** One way to evaluate the revenue drivers of the airline industry is to look at airline capacity and load factors. Airline capacity is often measured by available seat miles (ASMs), which is a measure of an airline flight's passenger carrying capacity. It is equal to the number of seats available multiplied by the number of miles flown. Load factors are the percentage of available seats that are occupied. **Figure 3-3** presents historical and projected ASMs and load factors for U.S. commercial carriers. Throughout the late 1990s and early 2000s, load factors were approximately 70 percent. However, beginning in 2002, the U.S. domestic load factor increased, reaching more than 80 percent by 2012. Capacity (ASMs) has decreased due to airline mergers and acquisitions. As shown, growth in ASMs decreased after 9/11 and again after 2008 to pre-9/11 levels.

Figure 3-3: Historical and Projected U.S. Commercial Carrier Capacity and Load Factors



** 2012 data is an FAA Estimate.*
Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033

Anticipated Commercial Trends

The preceding descriptions of historical commercial airline trends are the background upon which the FAA has developed forecasts of future levels of commercial passenger activity. The most recent forecasts of commercial passenger activity presented by the FAA in *FAA Aerospace Forecasts, Fiscal Years 2013-2033* indicate anticipated growth over the study period in both domestic and international passenger activity at U.S. airports. The following paragraphs summarize the FAA's forecasts of future commercial airline passenger activity.

Based on the FAA's 2012 forecast of slight economic recovery in 2013 and steady economic expansion in the U.S. for the remainder of the forecast period, commercial passenger enplanements in the U.S. are anticipated to experience sustained growth throughout the forecast period. The FAA projects that total domestic passenger enplanements on large U.S. carriers and regional/commuter carriers combined will increase from approximately 736.7 million in 2012 to approximately 953.8 million in 2024, representing an average annual growth rate of approximately 2.0 percent.

FAA forecasts of international passenger activity are based on the assumption that the world economy (based on international GDPs) will grow at a pace that exceeds the U.S. GDP growth over the forecast period. Based on this assumption, international passenger enplanements on U.S. carriers are projected to increase from approximately 82.9 million in 2012 to approximately 131.0 million in 2024. This growth represents a relatively robust forecasted average annual growth rate of approximately 3.9 percent. The strongest growth in total international passenger traffic on U.S carriers is anticipated to be experienced in the Latin American and Pacific markets, which are both forecast to grow at an average annual rate of approximately 4.4 percent. The average annual growth rate in the European market is projected at approximately 2.6 percent between 2012 and 2024.

Table 3-2 presents a summary of historical passenger enplanement levels at U.S. airports and the FAA's most recent domestic and international passenger enplanement forecasts on U.S. carriers (large air carriers and regional/commuter carriers) for each year in the forecast period.

Table 3-2: Projection of U.S. Enplanements (Millions)

Fiscal Year	Domestic Enplanements	International Enplanements	Total [1]
Historical			
2007	690.1	75.3	765.3
2008	680.7	78.3	759.1
2009	630.8	73.6	704.4
2010	635.2	77.4	712.6
2011	650.1	81.0	731.1
2012 [2]	653.7	82.9	736.7
Average Annual Growth Rate (2007-2012)	***-1.1%***	***2.0%***	***-0.8%***
Forecast			
2013	653.2	83.5	736.7
2014	670.5	86.7	757.2
2015	691.6	91.0	782.6
2016	710.3	95.1	805.4
2017	724.8	99.1	823.9
2018	736.9	103.1	839.9
2019	749.4	107.2	856.6
2020	763.5	111.6	875.1
2021	778.2	116.1	894.4
2022	793.6	120.9	914.5
2023	809.1	125.9	934.9
2024	822.8	131.0	953.8
Average Annual Growth Rate (2012-2024)	***1.9%***	***3.9%***	***2.2%***

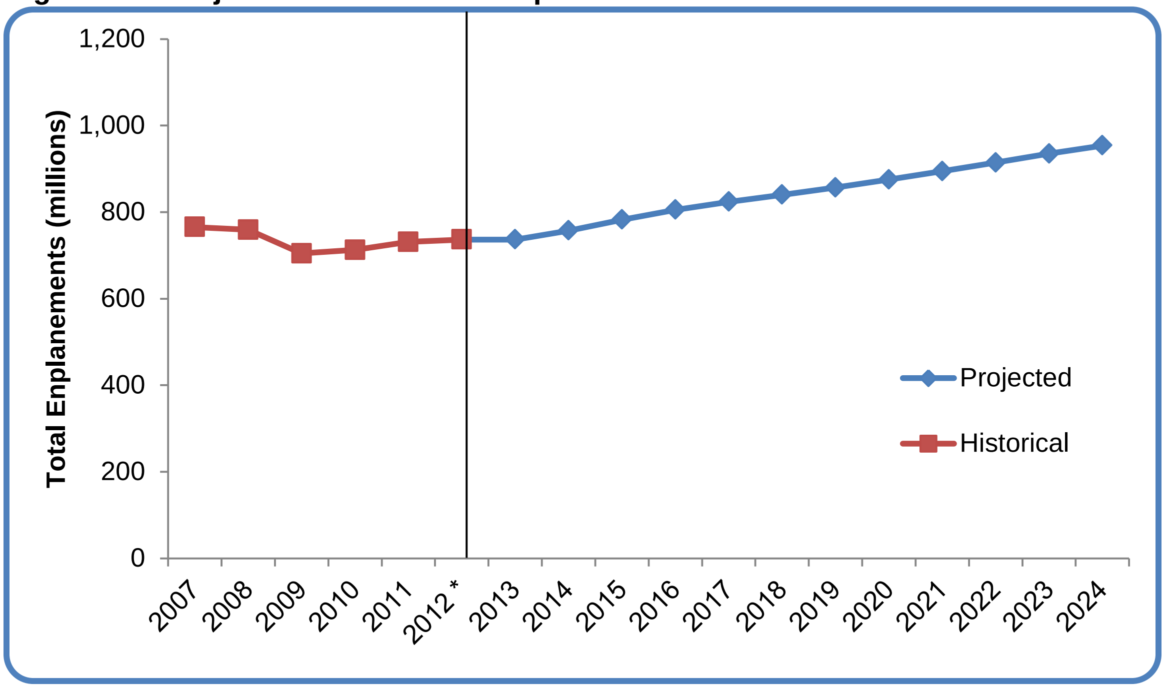
[1] Totals may not add up due to individual rounding.

[2] 2012 data is an FAA estimate.

Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033

U.S. carrier total passenger enplanement data presented in Table 3-2 is depicted in **Figure 3-4.**

Figure 3-4: Projection of Total U.S. Enplanements



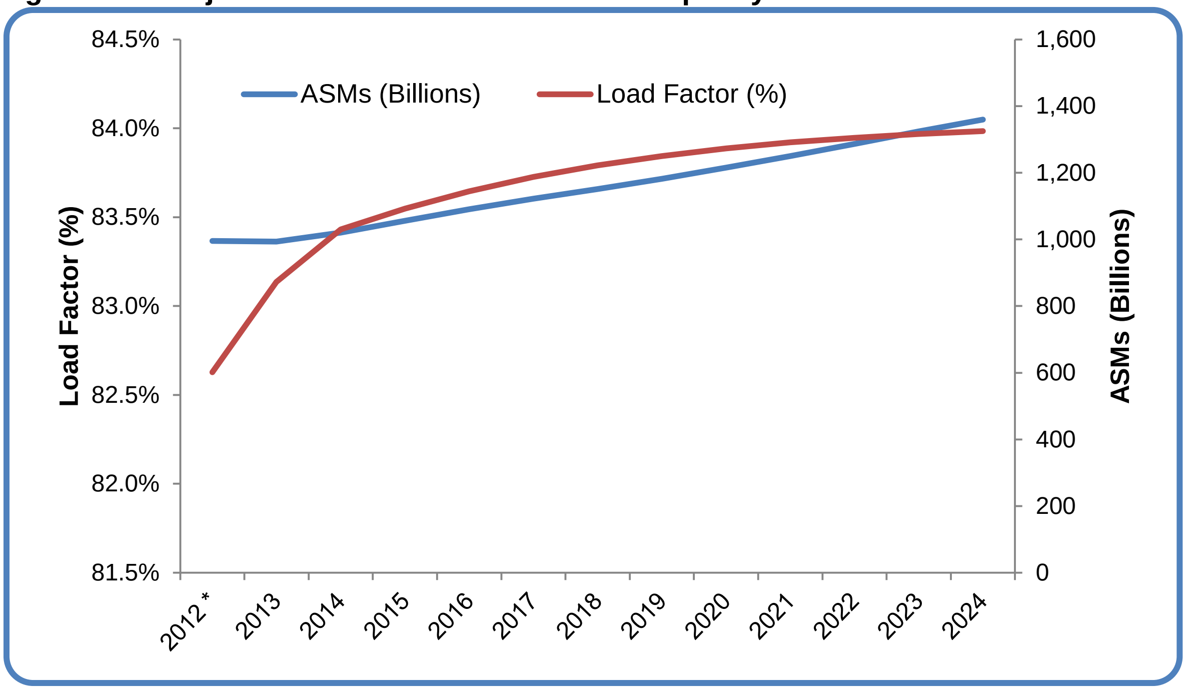
** 2012 data is an FAA Estimate.*
Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033

The FAA projects near-term commercial passenger activity for U.S. carriers to be stable and reflect modest but steady growth in both domestic and international enplanements at U.S. airports. Domestic passenger enplanements are projected to increase at an average annual rate of approximately 1.9 percent from 2012 to 2024, which is much greater than the growth experienced at U.S. airports between 2007 and 2012 during the economic recovery. International passenger enplanements are projected to increase at an average annual rate of approximately 3.8 percent over the forecast period, a rate double the 1.9 percent average annual growth rate experienced in this category of enplanements between 2007 and 2012.

Figure 3-5 presents projected ASMs and load factors through 2024. The FAA also forecasts other factors related to U.S. commercial air carrier passenger activity. According to *FAA Aerospace Forecasts, Fiscal Years 2013-2033*, between 2012 and 2024 ASMs are projected to increase from 995.2 billion to 1,359.8 billion, average passenger trip length is expected to increase from 1,116.2 to 1,197.4 miles, average seats per aircraft mile will increase from 141.5 to 148.3, and the average load factor is expected to increase slightly from 82.6 percent to 84.0 percent. The FAA also forecasts that ASMs for regional/commuter carriers will increase from

98.5 billion to 138.5 billion between 2012 and 2024, average passenger trip length will increase from 470.3 to 518.1 miles, average seats per aircraft mile will increase from 56.2 to 61.3, and the average load factor will increase from 77.3 percent to 78.4 percent.

Figure 3-5: Projected U.S. Commercial Carrier Capacity and Load Factors



** 2012 data is an FAA estimate.*
Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033

B. Trends Affecting General Aviation Activity

General aviation includes all civil aviation except scheduled passenger or air cargo operations. It includes personal transportation, business and corporate flights, air taxi (defined as "any common carrier for hire that holds an air taxi operating certificate and primarily operates small aircraft without fixed routes"[1]), and helicopter operations.

Across the U.S., general aviation aircraft are flown for a wide variety of uses including business travel, agricultural spraying, flight instruction, emergency airlift, firefighting, recreation, and search and rescue. These aircraft include home-built/experimental, glider, agricultural, military surplus, antique and classic/warbirds, ultra-light airplanes, helicopters, single and multi-engine aircraft, and corporate and private jets.

[1] Wells, Alexander T., Ph.D., and John G. Wensveen, Ph.D. *Air Transportation: A Management Perspective, Fifth Edition*. Belmont: Brooks/Cole, 2004.

Specific trends related to general aviation activity, as identified in the *FAA Aerospace Forecasts, Fiscal Years 2013-2033,* developed by the U.S. Department of Transportation and other national groups, are identified in following sections. These anticipated future trends are discussed in terms of the number of aircraft shipments and billings, active aircraft and pilots, changes in the active aircraft fleet mix, and business use of general aviation aircraft.

1. Aircraft Shipments and Billings

The General Aviation Manufacturers Association (GAMA) tracks and reports total shipments and billings of general aviation aircraft. GAMA statistics for 2011 indicate a decrease in the sales of general aviation aircraft, both piston and turbojet. During 2011, general aviation aircraft shipments totaled 2,120 aircraft, a decrease of approximately 50 percent over sales in 2007 prior to the economic recession. This represents the fourth consecutive year of decreased or relatively flat demand for general aviation aircraft.

In addition, GAMA tracks total billings of general aviation aircraft, for both domestic and international customers. During 2011, aircraft billings totaled more than $19 billion, a decrease of approximately 12.8 percent over total billings in 2007. Total billings, however, have increased from approximately $2 billion in the early 1990s and nearly doubled from levels in the early 2000s. In 2011, North American general aviation shipments represented 54.3 percent of all general aviation shipments in the world, and nearly 70 percent of all world general aviation aircraft shipments were manufactured in the U.S.

Table 3-3 presents total general aviation aircraft shipments and billings, on an annual basis, from 2001 through 2011.

Table 3-3: Historical General Aviation Aircraft Shipments and Billings

Year	Total General Aviation Shipments	Total General Aviation Aircraft Billings ($ millions)
2001	2,994.0	$13,866.6
2002	2,532.0	$11,797.1
2003	2,686.0	$9,994.8
2004	2,963.0	$11,903.8
2005	3,580.0	$15,140.1
2006	4,053.0	$18,807.5
2007	4,276.0	$21,837.0
2008	3,970.0	$24,766.0
2009	2,279.0	$19,474.1
2010	2,020.0	$19,715.1
2011	2,120.0	$19,041.5

Source: GAMA

The statistics presented by GAMA indicate a decline in the overall general aviation aircraft manufacturing industry. It is important to note that even with the decline in general aviation aircraft manufacturing, the strongest growth appears to be occurring in the jet and turboprop segments of the market. Despite the significant decreases in total shipments during and since the economic recession, the share of this market increased from 40 percent in 2001 to nearly 60 percent in 2011. The growth in these segments can be attributed to increased business use of aircraft, and the demand of corporations for safe, efficient, high performance aircraft. These high performance aircraft require airport facilities to be developed to a relatively higher and more demanding standard—a factor that will be considered as system development plans are identified in this analysis.

2. Active Pilots

In 2012, the four largest segments of the pilot population were student pilots, private pilots, commercial pilots, and airline transport pilots. With the exception of private pilots, each group experienced growth. As a result, the total number of active pilots increased to approximately 611,000 pilots in 2012, an increase of almost 20,000 pilots compared to 2007. One of the strongest average annual growth rates was experienced in the student pilot population, which increased by approximately 7.3 percent during the same period. This increase was primarily due to an increase in the duration of validity for student pilot certificates for pilots under the age of 40 from 36 months to 60 months. According to the FAA the long-term effects of this change are still undetermined and this category of pilots is projected to decrease at an average annual rate of 0.4 percent through 2024. Also noteworthy is the 6.8 percent average annual growth rate in the number of instrument-rated pilots from 2007 to 2012. Currently, approximately 51 percent of the total active pilot population is instrument-rated—another reflection of the increased sophistication of aircraft and pilots.

The FAA has developed forecasts of the future pilot population, by certificate type, based on historical trends, as well as anticipated future trends. These projections estimate that the total active pilot population in the U.S. will increase from approximately 611,000 in 2012 to 626,000 by 2024, representing an average annual growth rate of approximately 0.2 percent.

Table 3-4 presents the FAA forecasts of the active pilot population, by pilot certificate type, on an annual basis over the forecast period.

CHAPTER THREE

Table 3-4: Projection of Active Pilots by Certificate Type

Fiscal Year	Student [1]	Sport	Private	Commercial	Airline Transport	Other [2]	Total [3]
Historical							
2007	84,339	2,031	211,096	115,127	143,953	33,803	590,349
2008	80,989	2,623	222,596	124,746	146,838	35,954	613,746
2009	72,280	3,248	211,619	125,738	144,600	36,800	594,285
2010	119,119	3,682	202,020	123,705	142,198	36,864	627,588
2011	118,657	4,066	194,441	120,865	142,511	36,588	617,128
2012 [4]	119,946	4,493	188,001	116,400	145,590	36,146	610,576
Average Annual Growth Rate (2007-2012)	***7.3%***	***17.2%***	***-2.3%***	***0.2%***	***0.2%***	***1.3%***	***0.7%***
Forecast							
2013	120,200	5,100	189,500	111,200	146,100	36,215	608,315
2014	119,850	5,650	188,250	115,950	143,800	36,470	609,970
2015	119,200	5,950	187,400	116,400	144,700	36,810	610,460
2016	118,450	6,250	186,950	117,600	146,400	37,230	612,880
2017	117,750	6,600	186,700	118,400	147,000	37,745	614,195
2018	117,100	6,950	186,400	118,850	147,000	38,315	614,615
2019	116,550	7,300	186,400	119,250	147,200	38,955	615,655
2020	116,050	7,700	186,350	119,600	147,900	39,620	617,220
2021	115,600	8,100	186,450	120,000	148,700	40,255	619,105
2022	115,300	8,500	186,700	120,500	149,300	40,940	621,240
2023	115,050	8,900	187,000	121,050	149,800	41,630	623,430
2024	114,950	9,350	187,600	121,700	150,500	42,295	626,395
Average Annual Growth Rate (2012-2024)	***-0.4%***	***6.3%***	***0.0%***	***0.4%***	***0.3%***	***1.3%***	***0.2%***

[1] In July 2010, the FAA issued a rule that increased the duration of validity for student pilot certificates for pilots under the age of 40 from 36 to 60 months. This resulted in the increase in active student pilots to 119,119 from 72,280 at the end of 2009.

[2] Includes pilots with recreational, rotorcraft-only, and glider-only certificates.

[3] Totals may not add up due to individual rounding.

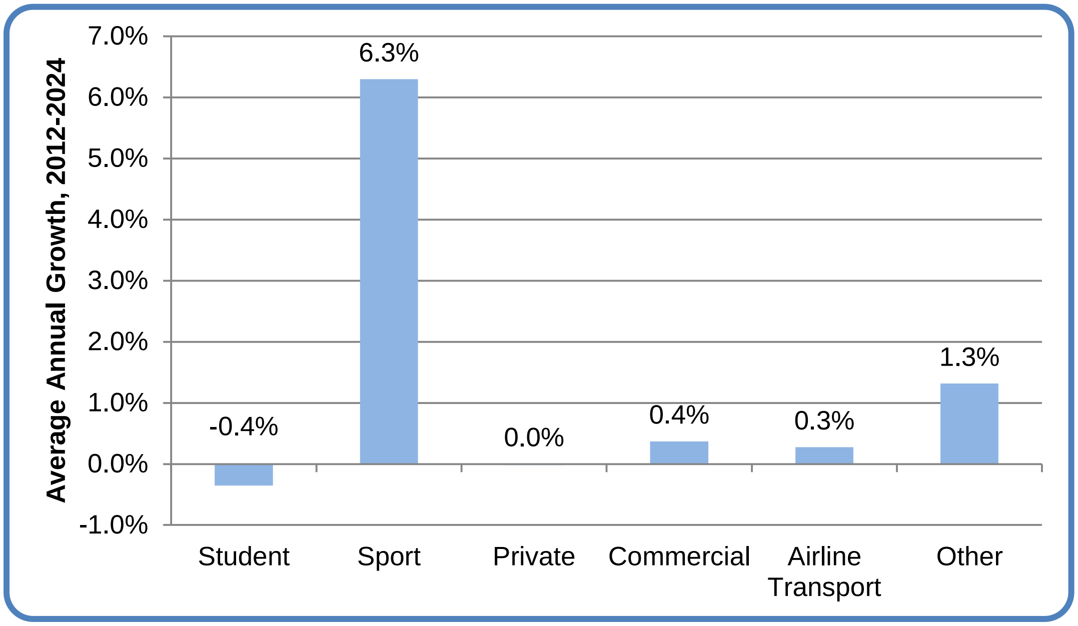
[4] 2012 data is an FAA estimate.

Source: FAA Civil Airman Statistics; FAA Aerospace Forecasts, Fiscal Years 2013-2033

As shown in Table 3-4, the largest categories of pilots (student, private, commercial and airline transport) are anticipated to remain relatively stable over the 12-year forecast period.

Figure 3-6 compares the average annual growth rate projected for each pilot type during the study period of 2012 to 2024. As shown in the figure, there is little growth in the number of active pilots, with the highest growth rates being in the sport and other categories.

Figure 3-6: Projected Growth of Active Pilots, 2012 to 2024



Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033

3. Aircraft Fleet

The FAA tracks the number of active aircraft by year in the U.S. Active aircraft are registered and fly at least one hour per year. By tracking this information, the FAA is able to identify trends in the total number of active aircraft, as well as the types of aircraft operating in the active fleet. Based on FAA estimates, the active general aviation aircraft fleet is anticipated to increase from 220,670 aircraft in 2012 to 229,060 in 2024, an average annual growth rate of approximately 0.3 percent. FAA forecasts for the total active aircraft fleet, as well as each major type of aircraft, are summarized in **Table 3-5.**

Table 3-5: Projected General Aviation Fleet

Aircraft Type	2012 [1]	2024	Average Annual Growth Rate
Single-engine piston	135,935	127,790	-0.5%
Multi-engine piston	15,600	14,495	-0.6%
Turbine	9,670	11,810	1.7%
Jet	11,890	17,490	3.3%
Rotocraft	10,665	14,970	2.9%
Other [2]	36,910	42,505	1.2%
TOTAL [3]	***220,670***	***229,060***	***0.3%***

[1] 2012 data is an FAA estimate.

[2] Includes aircraft classified by the FAA as sport, experimental and other.

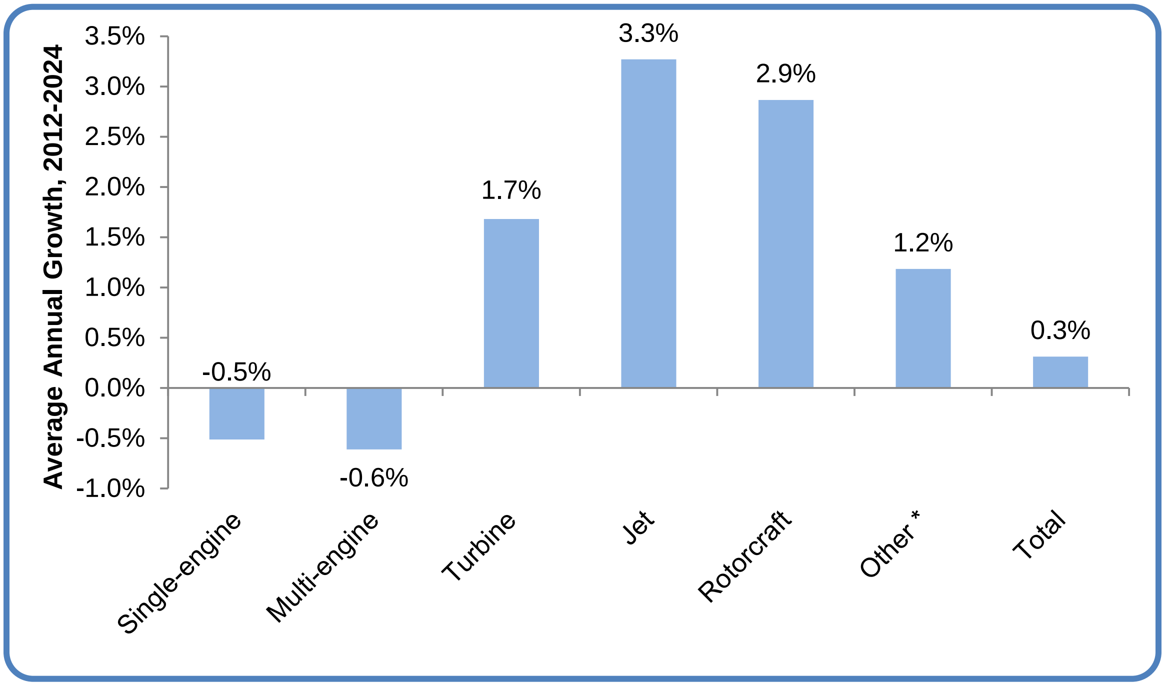
[3] Totals may not add up due to individual rounding.

Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033

As shown in Table 3-5, the total active aircraft fleet is forecast to experience an average annual growth rate of well below 1 percent. One of the most important trends identified in these forecasts is the relatively strong growth anticipated in active jet aircraft. This trend illustrates a movement in the general aviation community toward higher performing, more demanding aircraft. This trend will impact the types of activities occurring at general aviation airports and the types of facilities that may be required at those airports.

Figure 3-7 compares the projected average annual growth rate for each type of aircraft in the fleet mix over the period 2012 through 2024. The figure illustrates the extent to which the growth in jet aircraft is projected to significantly outpace growth in all other components of the aircraft fleet. As shown, the categories with the highest growth rates are jet and rotorcraft aircraft, with growth rates of 3.3 percent and 2.9 percent, respectively. The number of active single- and multi-engine piston aircraft is anticipated to decrease over the forecast period.

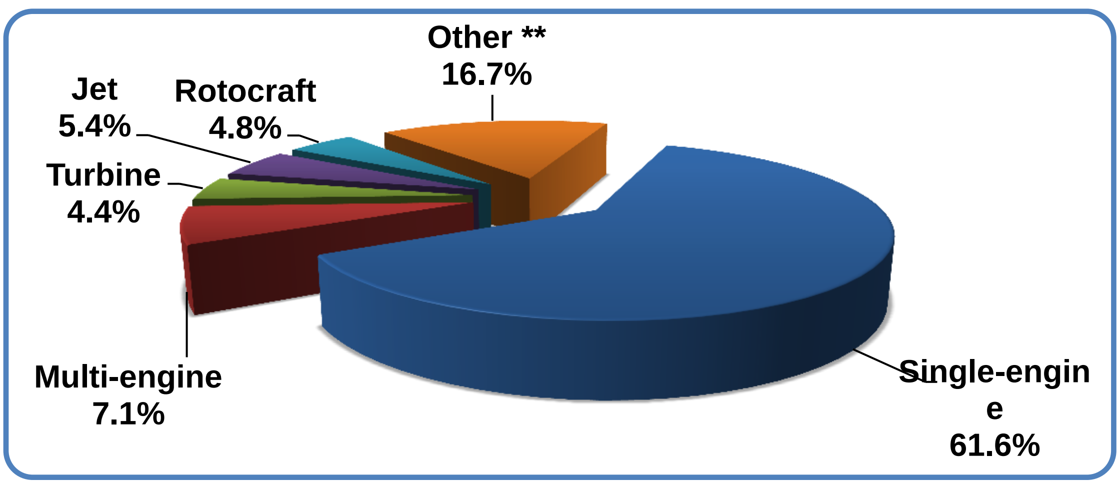
Figure 3-7: Projected Growth of General Aviation Aircraft, 2012 to 2024



** Includes aircraft classified by the FAA as sport, experimental and other.*
Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033

It is also useful to examine the existing and anticipated active aircraft fleet in terms of the percentage of the total fleet that each aircraft class represents. **Figure 3-8** presents the existing mix of the 2012 active fleet and **Figure 3-9** presents the projected fleet mix for 2024.

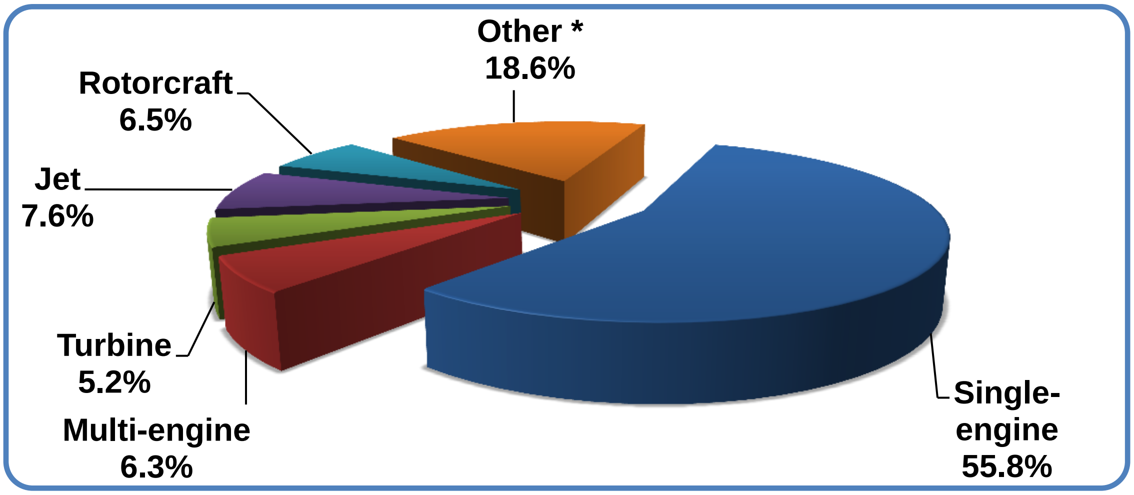
Figure 3-8: General Aviation Fleet Mix, 2012 *



* 2012 data is an FAA estimate.
** Includes aircraft classified by the FAA as sport, experimental and other.
Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033

As shown in **Figure 3-8**, the majority of the active aircraft in the current fleet is single-engine piston aircraft. As shown in **Figure 3-9**, it is anticipated that the percentage of single-engine piston aircraft will decline from approximately 62 percent (2012) to 56 percent (2024) of the active fleet, as older aircraft are retired and replaced with more demanding general aviation aircraft.

Figure 3-9: General Aviation Fleet Mix, 2024



** Includes aircraft classified by the FAA as sport, experimental and other.*
Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033

Forecast data presented by the FAA indicates that each component of the general aviation aircraft fleet mix will either remain relatively steady (multi-engine piston and turbine) or grow in terms of total number of active aircraft. Data depicted in the previous exhibits indicates that jet, rotorcraft, and other aircraft will be the components of the general aviation aircraft fleet mix that will see the largest growth in share of the active fleet over the forecast period. Jet aircraft are anticipated to grow from approximately 5 percent of the active general aviation fleet mix in 2012 to approximately 8 percent of the active fleet by 2024, indicating the relative increase in sophistication that is anticipated in the active aircraft fleet and pilot population. The “other” category of aircraft is also forecast to become a larger component of the active fleet, primarily because of expected growth in experimental aircraft, from approximately 17 percent of the fleet to 19 percent of the fleet by 2024.

Current and/or forecasted trends affecting general aviation can be summarized as follows:

- The number of annual general aviation aircraft shipments will stabilize.
- The overall number of licensed pilots will stabilize; relatively strong growth is expected in the number of sport and “other” pilots.
- Moderate growth is expected in the active aircraft fleet, with a trend toward more demanding and sophisticated jet aircraft, as opposed to piston or turboprop aircraft.

C. Pennsylvania Aviation Trends

Data regarding historical activity levels at Pennsylvania airports is presented in the following sections. Airport activity data typically provides a good indication of the total amounts of activity occurring at an airport as well as recent increases or declines in activity levels at Pennsylvania facilities. Data will be presented for the following components of airport activity:

- Enplanements
- Commercial Aircraft Operations
- Based Aircraft
- Non-Commercial and General Aviation Aircraft Operations

Enplanement, based aircraft and aircraft operations data from airports included in the Pennsylvania Statewide Airport System Plan are reported annually to the FAA. The FAA publishes the information and provides projections of activity for each airport in its Terminal Area Forecast, which are typically published in March each year. Historical based aircraft and operations data was obtained from the Pennsylvania Department of Transportation (PennDOT) Bureau of Aviation, which collected the data during periodic visits to the airports. This section presents historical comparisons of public-use airports in Pennsylvania for the five-year period from 2007 to 2012, with 2007 being the date of the previous system plan update.

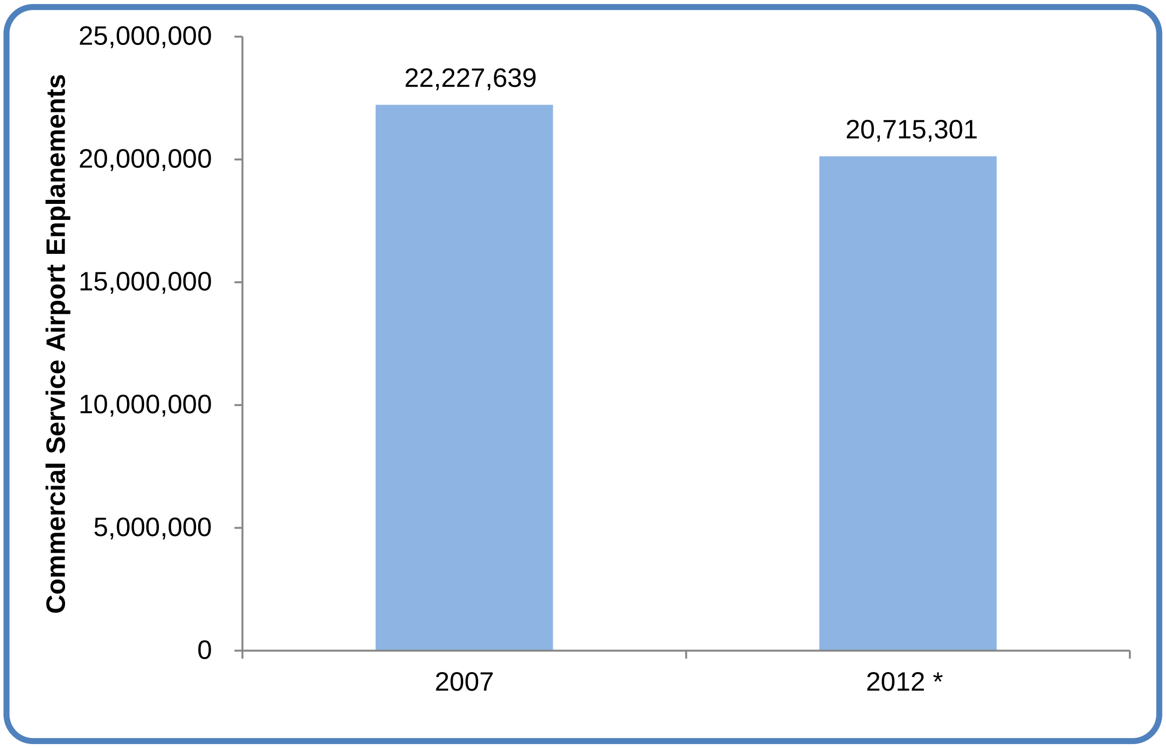
A summary of the findings related to a comparison of U.S. trends with the trends in Pennsylvania are as follows:

- Enplanements at Pennsylvania's commercial service airports decreased at an average annual rate that was more than twice the rate of decrease for the U.S. between 2007 and 2012.
- Commercial aircraft operations decreased at an average annual rate of 4.3 percent compared to an average annual decrease of 2.7 percent for the U.S. between 2007 and 2012. These rates of decrease are both higher than the respective rates of decrease for enplanements during the same time period, indicating a trend toward higher aircraft load factors and increased seats per departure.
- Recent trends in based aircraft indicate decreases both in Pennsylvania and the U.S., primarily due to the economic recession and the impacts of September 11, 2001.
- Non-commercial and general aviation aircraft operations in Pennsylvania decreased at virtually the same average annual rate as general aviation operations in the U.S. from 2007 to 2012.

1. Enplanements

Figure 3-10 presents enplanement data for Pennsylvania's commercial service airports. An enplanement is a passenger boarding a commercial service flight. The number of enplanements is largely reflective of the population, employment, and income of an airport's primary market area. In addition, enplanement levels can also be influenced by decisions by the air carriers to use an airport facility as a hub for connecting passengers.

Figure 3-10: Historical Enplanements at Pennsylvania Commercial Service Airports



** 2012 data is an FAA estimate.*

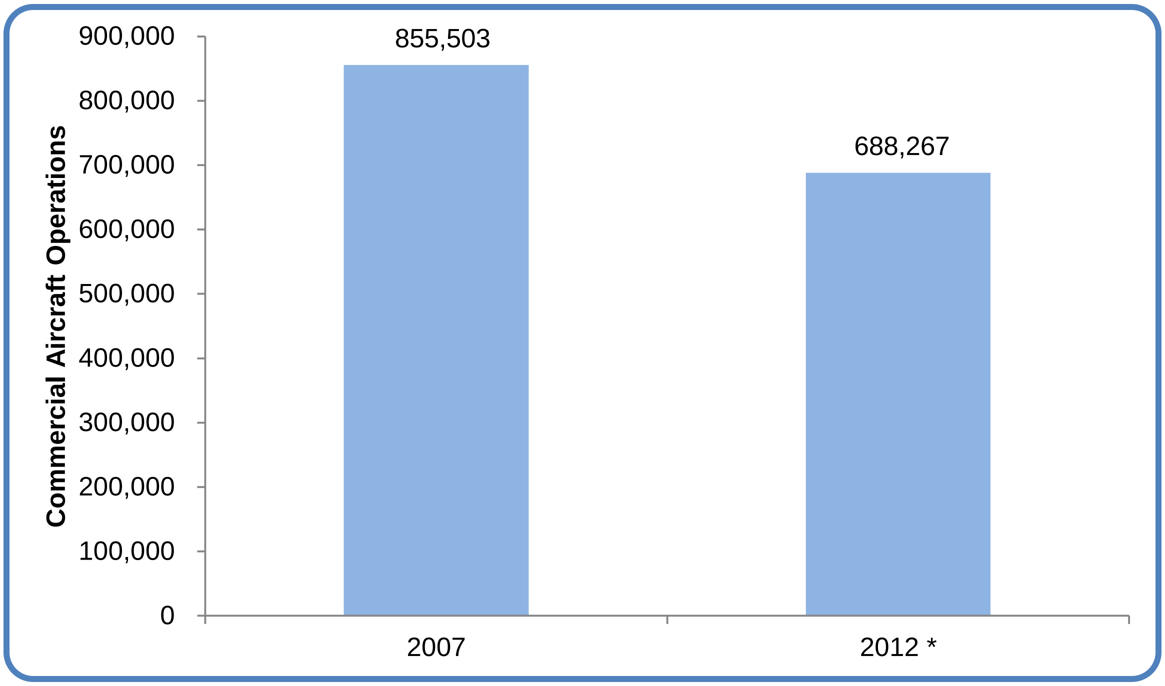
Source: BOA database (2007) and FAA Terminal Area Forecast (March 2013), compiled by Parsons Brinckerhoff

There are 15 airports that are considered commercial service airports in Pennsylvania. Total enplanements were approximately 22.2 million in 2007, decreasing to 20.1 million estimated in 2012. Enplanements at Pennsylvania's commercial service airports have decreased at an average annual rate of 2.0 percent from 2007 to 2012, compared to a decrease of 0.8 percent for the U.S. during the same time period.

2. *Commercial Aircraft Operations*

Figure 3-11 presents a comparison of 2007 and 2012 commercial aircraft operations (air carrier and commuter/air taxi) at the commercial service airports in Pennsylvania, according to the FAA TAF. As shown in the figure, commercial aircraft operations have followed the same trend as enplanements, decreasing from approximately 856,000 in 2007 to 688,000 estimated in 2012, an average annual decrease of 4.3 percent, compared to an annual decrease of 2.7 percent estimated in the FAA TAF for the nation. The decrease in operations is greater than the decrease in enplanements primarily due to the decreases in available seat miles during the same time period.

Figure 3-11: Historical Commercial Aircraft Operations at Commercial Service Airports in Pennsylvania



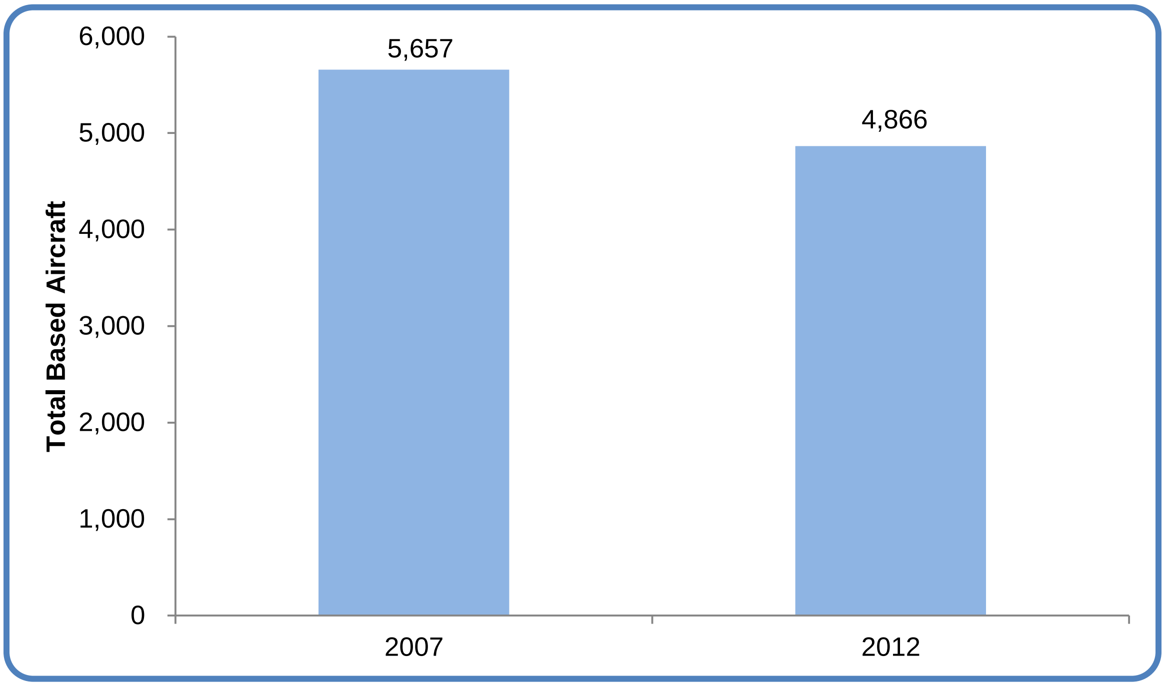
** 2012 data is an FAA estimate.*
Source: BOA database (2007) and FAA Terminal Area Forecast (March 2013), compiled by Parsons Brinckerhoff

3. Based Aircraft

Figure 3-12 presents based aircraft data for Pennsylvania's airports. Based aircraft are general aviation aircraft that are permanently stored at an airport, either in aircraft storage hangar units or tied down. Based aircraft numbers at airports frequently fluctuate due to a number of factors, including pilot preferences and availability of aircraft storage hangar units. The FAA recently implemented a based aircraft website to allow airport operators/managers to report actual based aircraft numbers. This process has helped bring the reported based aircraft numbers into National Plan of Integrated Airport Systems (NPIAS) reporting developed by the FAA.

The total number of based aircraft at PA SASP airports was 5,647 in 2007. Over the five-year period ending in 2012, total based aircraft in the Commonwealth has decreased by 14 percent to 4,866. On an average annual basis, the number of total based aircraft has decreased at a rate of approximately 3 percent.

Figure 3-12: Historical Based Aircraft in Pennsylvania



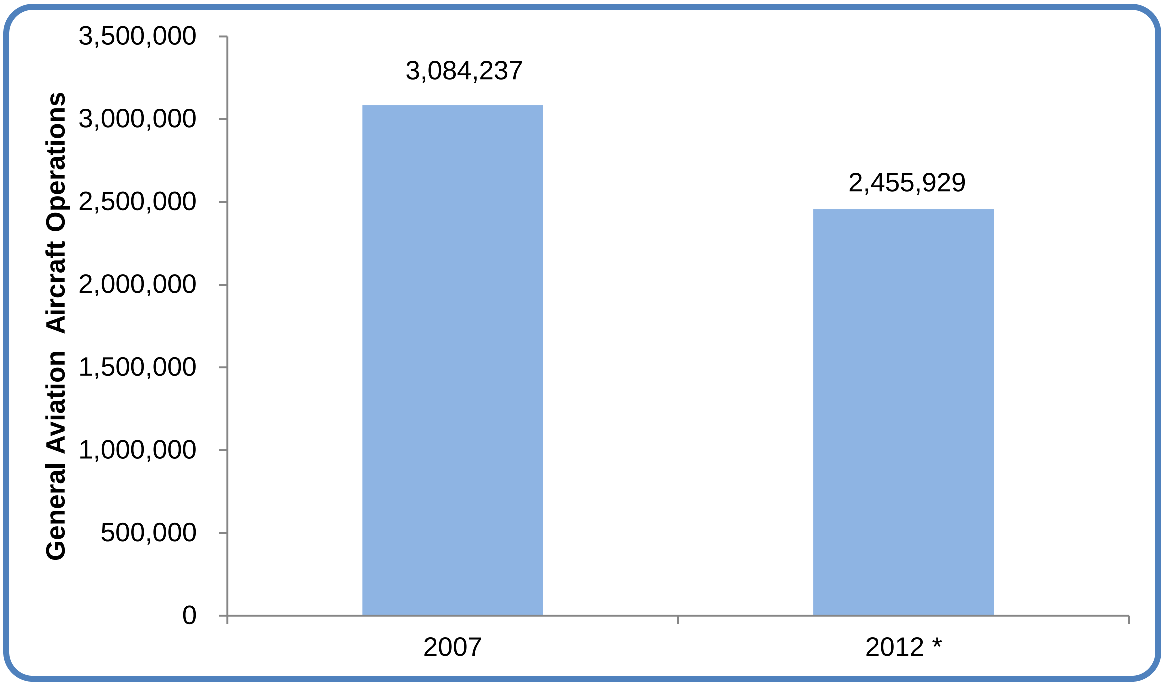
Source: BOA Data

The FAA tracks active general aviation aircraft nationally through its "General Aviation and Air Taxi Activity Survey." The most recent survey shows that as of 2010, the active fleet in the U.S. had decreased for two consecutive years, primarily as a result of the economic recession. In the four years prior to 2008 the number of general aviation aircraft increased steadily. From 1999 to 2009, general aviation aircraft increased at an average annual rate of only 0.2 percent. This was primarily due to the impacts of September 11, 2001, and the economic recession.

4. Non-Commercial and General Aviation Aircraft Operations

Historical total non-commercial and general aviation operations data for Pennsylvania public-use airports is presented in **Figure 3-13**. These consist of primarily general aviation aircraft activity at all Pennsylvania public-use airports coupled with comparatively minor amounts of non-scheduled aircraft charter/air taxi aircraft activity at general aviation airports and military aircraft operations at all airports statewide. Note that for airports without an FAA Tower, aircraft operations data represents "best guess" estimates made by airport managers/operators.

Figure 3-13: Historical Non-Commercial and General Aviation Aircraft Operations in Pennsylvania



** 2012 data is an estimate based on BOA and FAA data.*

Source: BOA database (2007) and FAA Terminal Area Forecast (March 2013); compiled by Parsons Brinckerhoff

Non-commercial and general aviation aircraft operations at PA SASP airports were approximately 3.1 million in 2007. Over the five-year period ending in 2012, it is estimated non-commercial and general aviation aircraft operations in the Commonwealth decreased by 20.4 percent to 2.5 million. On an average annual basis, non-commercial and general aviation aircraft operations have decreased at a rate of approximately 4.5 percent, which is greater than the average annual decrease of 3 percent for based aircraft during the same time period. Comparatively, aircraft operations recorded by the FAA at U.S. towered airports decreased at an average annual rate of 4.6 percent between 2007 and 2012.

III. Projections of Pennsylvania Aviation Demand

Developing aviation activity projections for Pennsylvania's aviation system is a critical step in assessing the need for and phasing of future development requirements. For the purpose of the PA SASP projections, the airports in the Commonwealth have been grouped into 11 districts. The 11 districts correspond to PennDOT's Engineering Districts. The districts and the associated counties, as well as the airports that are located in each district grouped as either a commercial or general aviation airport, are graphically depicted in **Figure 3-14. Table 3-6** lists the counties and airports in each district.

The methodologies used to prepare aviation demand projections for the districts as part of the PA SASP are discussed in the following sections:

- Forecast Assumptions
- Enplanement Projections
- Commercial Aircraft Operations Projections
- Based Aircraft Projections
- Non-Commercial and General Aviation Aircraft Operations Projections
- Forecast Summary

A. Forecast Assumptions

There are several approaches used to develop aviation forecasts. One is to develop the forecast based on historical growth trends and relationships between the growth in aviation demand and growth in other factors such as population, income, and employment. This methodology typically uses regression analysis to determine the strength of these relationships and to produce equations that weight the various factors that contribute to aviation demand.

Another methodology involves comparing the historical aviation demand in a particular area with the activity during the same time period in a larger region. For example, the activity at a particular airport or subset of airports would be compared to the activity in its region or the entire nation. The mathematical relationship between the airport (or a subset of airports) and airports in the region or nation is then applied to the projections of aviation demand for the larger area to calculate a forecast for the airport or subset of airports.

To develop the forecasts contained herein, various applications of the above described methodologies were used. The review of historical and projected aviation trends for the nation discussed in previous chapters is included to provide a context for the aviation demand forecast presented in the following sections.

Figure 3-14: Pennsylvania 2012 SASP Airports by District

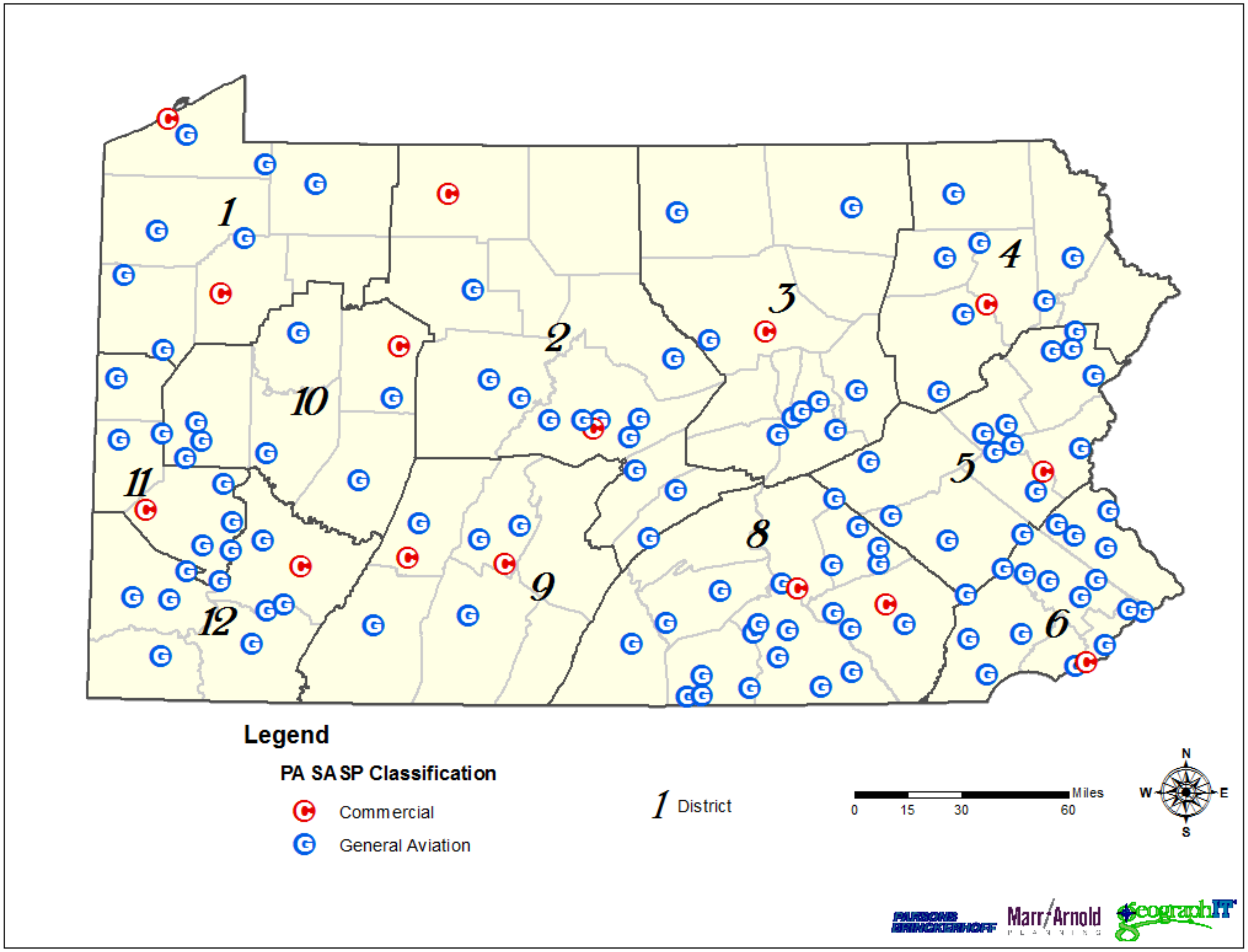


Table 3-6: Pennsylvania 2012 SASP Airports

District	PA County	Airport(s) in District
District 1	Crawford	Port Meadville
	Erie	Corry-Lawrence; Erie International *; Thermal G Gliderport
	Mercer	Greenville Municipal; Grove City Regional
	Venango	Titusville; Venango Regional *
	Warren	Brokenstraw
District 2	Center	Bellefonte; Centre Airpark; Mid-State; Penns Cave; Ridge Soaring Gliderport; University Park*
	Clearfield	Albert; Clearfield-Lawrence
	Clinton	William T. Piper Memorial
	Elk	St. Marys Municipal
	Juniata	Mifflintown; Stottle Memorial
	McKean	Bradford Regional *
	Mifflin	Mifflin County
	Potter	
District 3	Bradford	Bradford County
	Columbia	Bloomsburg Municipal
	Lycoming	Jersey Shore; Williamsport Regional *
	Northumberland	Danville; Northumberland County; Sunbury; Sunbury Seaplane
	Snyder	Penn Valley
	Tioga	Wellsboro-Johnston
District 4	Lackawanna	Seamans
	Luzerne	Hazleton; Wilkes-Barre/Scranton International *; Wilkes-Barre/Wyoming Valley
	Susquehanna	Husky Haven
	Wayne	Cherry Ridge; Spring Hill
	Wyoming	Sky Haven
District 5	Berks	Grimes; Morgantown; Reading Regional
	Carbon	Beltzville; Jake Arner Memorial
	Lehigh	Flying M Aerodrome; Lehigh Valley International *; Queen City Municipal; Slatington
	Monroe	Flying Dollar; Pocono Mountains Municipal; Rocky Hill Ultralight; Stroudsburg-Pocono
	Northampton	Braden Airpark
	Schuylkill	Schuylkill County
District 6	Bucks	Doylestown; Pennridge; Quakertown; Total RF Heliport; Van Sant
	Chester	Brandywine; Chester County; New Garden Flying Field
	Delaware	Philadelphia Seaplane Base
	Montgomery	Butter Valley Golf Port; Heritage Field; Horsham Valley Airways Heliport; Perkiomen Valley; Pottstown Municipal; Wings Field
	Philadelphia	Northeast Philadelphia; Penns Landing - Pier 36 Heliport; Philadelphia International *
District 8	Adams	Gettysburg Regional; Hanover; Mid-Atlantic Soaring Center; Southern Adams Co. Heliport
	Cumberland	Carlisle; Shippensburg
	Dauphin	Bendigo; Harrisburg International *
	Franklin	Franklin County Regional
	Lancaster	Donegal Springs Airpark; Lancaster *; McGinness Field; Smoketown
	Lebanon	Deck; Farmers Pride; Keller Brothers; Reigle Field;
	York	Baublitz Commercial; Bermudian Valley Airpark; Capital City; Kampel; Lazy B Ranch; Shoestring Aviation Airfield; York
District 9	Bedford	Bedford County
	Blair	Altoona-Blair County *; Blue Knob Valley; Cove Valley
	Cambria	Ebensburg County; John Murtha Johnstown-Cambria County *
	Huntingdon	
	Somerset	Somerset County
District 10	Armstrong	McVille
	Butler	Butler County; Butler Farm Show; Lakehill
	Clarion	Clarion County
	Indiana	Indiana County/Jimmy Stewart
	Jefferson	Dubois Regional *; Punxsutawney Municipal
District 11	Allegheny	Allegheny County; Pittsburgh International*; Pittsburgh-Monroeville; Rock
	Beaver	Beaver County; Zelienople Municipal
	Lawrence	New Castle Municipal
District 12	Fayette	Joseph A. Hardy-Connellsville; Mt. Pleasant/Scottdale; W.P.H.S. Heliport
	Greene	Greene County
	Washington	Bandel; Finleyville Airpark; Washington County
	Westmoreland	Arnold Palmer Regional *; Greensburg-Jeannette Regional; Inter County; Rostraver

* Commercial Service Airport

Source: BOA; compiled by Parsons Brinckerhoff

1. Enplanement Trends

Table 3-7 presents the TAF growth rates for each of the 15 commercial service airports in Pennsylvania. For comparative purposes, the historical and projected growth rates for the Eastern Region and the U.S. are also presented. As shown, the historical annual decrease for Pennsylvania of 2 percent from 2007 to 2012 compares to annual decreases of 0.6 percent and 0.8 percent for the Eastern Region and the U.S., respectively. Projections for Pennsylvania enplanements are driven by activity at Pittsburgh International Airport and Philadelphia International Airport as they currently have over a 90 percent share of the total enplanements for the Commonwealth. According to the TAF, this trend is expected to continue in the future.

Table 3-7: Comparison of Enplanement Growth Rates

Growth Rate Source	Historic Growth			Projected Growth		
Area Included in Forecast	Base Year	Out Year	AAG	Base Year	Out Year	AAG
FAA Terminal Area Forecasts						
U.S.	2007	2012	-0.8%	2012	2032	2.2%
Eastern Region	2007	2012	-0.6%	2012	2032	2.3%
Pennsylvania	2007	2012	-2.0%	2012	2032	2.2%
Altoona-Blair County	2007	2012	-5.9%	2012	2032	0.2%
Arnold Palmer Regional	2007	2012	26.7%	2012	2032	1.0%
Bradford Regional	2007	2012	-5.9%	2012	2032	0.0%
Dubois Regional Airport	2007	2012	-6.6%	2012	2032	1.0%
Erie International/Tom Ridge Field	2007	2012	-5.5%	2012	2032	1.0%
Harrisburg International	2007	2012	0.9%	2012	2032	0.1%
John Murtha Johnstown-Cambria Co. Reg.	2007	2012	-7.0%	2012	2032	0.3%
Lancaster	2007	2012	0.7%	2012	2032	0.0%
Lehigh Valley International	2007	2012	-1.0%	2012	2032	0.9%
Philadelphia International	2007	2012	-1.4%	2012	2032	2.3%
Pittsburgh International	2007	2012	-4.5%	2012	2032	2.4%
University Park	2007	2012	0.4%	2012	2032	1.2%
Venango Regional	2007	2012	-4.6%	2012	2032	0.4%
Wilkes-Barre/Scranton International	2007	2012	0.8%	2012	2032	1.5%
Williamsport Regional	2007	2012	-0.2%	2012	2032	1.6%

Source: FAA Terminal Area Forecasts (March 2013)

2. Based Aircraft Trends

Table 3-8 shows a number of sources that have developed projections of based aircraft. FAA projections have been prepared on national, regional, and state levels, based largely on historical growth trends, as well as industry trends. Each projection is discussed briefly below.

Table 3-8: Comparison of Based Aircraft Growth Rates

Growth Rate Source	Historic Growth			Projected Growth		
Area Included in Forecast	Base Year	Out Year	AAG	Base Year	Out Year	AAG
FAA Aerospace Forecasts						
U.S. - Active GA Aircraft	2007	2012	-1.0%	2012	2024	0.3%
FAA Terminal Area Forecasts						
U.S.	2007	2012	-4.1%	2012	2024	0.9%
Eastern Region	2007	2012	-4.5%	2012	2024	0.8%
PA Airports	2007	2012	-3.9%	2012	2024	1.0%

Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033; FAA Terminal Area Forecasts (March 2013)

FAA Aerospace Forecasts

The *FAA Aerospace Forecasts Fiscal Years 2012-2033* provides projections of the total U.S. active general aviation fleet. For any given year, the U.S. fleet is defined as the sum of new production flowing into the fleet, the fleet size carried over from the previous year, and the attrition of existing aircraft during the current year. A detailed summary of the FAA's projected aircraft fleet and fleet mix was previously presented. An estimated 220,670 active general aviation aircraft were based at U.S. airports in 2012. Between 2007 and 2012, active general aviation aircraft decreased approximately 1.0 percent per year, on average. This decline was less than that experienced at Pennsylvania airports during the same time period. The national growth in aircraft fleet is expected to slow over the 12-year forecast period, increasing at an average annual growth rate of 0.3 percent per year, reaching 229,060 active general aviation aircraft in 2024.

FAA Terminal Area Forecasts

Terminal Area Forecasts (TAF) are the official projections of aviation activity at individual FAA facilities, including FAA towered airports, federally-contracted towered airports, nonfederal towered airports, and non-towered airports. Many of the smaller general aviation airports, as well as privately owned public-use airports, do not submit their aviation activity to the FAA. In Pennsylvania, 47 percent of the airports in the system were included in the NPIAS and were therefore required to report to the FAA's TAF. Between 2007 and 2012, the number of based aircraft at all U.S. airports reporting to the TAF declined at an average annual rate of 4.1 percent.

Airports in the FAA-defined Eastern Region declined at a rate just slightly higher than the national rate (4.5 percent per year, on average). The Eastern Region includes airports in Pennsylvania, New York, New Jersey, Maryland, Delaware, West Virginia, and Virginia. Pennsylvania airports reporting to the TAF experienced an average annual decline at an annual rate of 3.9 percent.

The FAA projected similar rates of growth for based aircraft at all airports in the U.S., FAA's Eastern Region, and Pennsylvania, expecting them to grow at an average annual rate of 0.9 percent, 0.8 percent, and 1.0 percent, respectively. Again, it is important to note that only 47 percent, or 63 of the 134 airports in Pennsylvania's airport system, were included in the latest TAF.

3. Operations Trends

Table 3-9 compares historical and projected aircraft operations growth rates. The FAA has prepared national operations projections in conjunction with its Aerospace Forecasts, as well as annual airport projections as part of its Terminal Area Forecasts. These projections provide a basis for the PA SASP operational forecasts.

FAA Aerospace Forecasts Fiscal Years 2013-2033

As part of the *FAA Aerospace Forecast Fiscal Years 2013-2033*, the FAA projected aviation activity at combined FAA and contract towered airports only. Between 2007 and 2012, total operations at towered airports decreased at an average annual rate of 3.7 percent, which was less than the annual decrease experienced in general aviation operations—down 4.6 percent per year on average. Total operations are projected to experience moderate growth between 2013 and 2024, up 2.0 percent per year, on average. The FAA has projected general aviation operations to grow at an average annual rate of 0.9 percent.

The FAA also projects the hours flown by general aviation aircraft—another indicator of general aviation activity. General aviation hours flown decreased between 2007 and 2012 at a rate of 2.5 percent annually, on average. While active aircraft is projected to grow just 0.3 percent annually between 2012 and 2024, general aviation hours flown are projected to increase 1.1 percent annually over the 12-year period.

Table 3-9: Comparison of Operations Growth Rates

Growth Rate Source	Historic Growth			Projected Growth		
Area Included in Forecast	Base Year	Out Year	AAG	Base Year	Out Year	AAG
FAA Aerospace Forecasts						
U.S. Towered Airports (All Ops)	2007	2012	-3.7%	2012	2024	2.0%
U.S. Towered Airports (GA Ops Only)	2007	2012	-4.6%	2012	2024	0.9%
U.S. GA Hours Flown	2007	2012	-2.5%	2012	2024	1.1%
FAA Terminal Area Forecasts						
U.S. Total Ops	2007	2012	-2.5%	2012	2024	0.6%
U.S. GA Ops Only	2007	2012	-2.7%	2012	2024	0.4%
Eastern Region Total Ops	2007	2012	-3.4%	2012	2024	0.7%
Eastern Region GA Ops Only	2007	2012	-3.8%	2012	2024	0.6%
PA Airports Total Ops	2007	2012	-3.2%	2012	2024	1.0%
PA Airports GA Ops Only	2007	2012	-3.0%	2012	2024	0.9%

Source: FAA Aerospace Forecasts, Fiscal Years 2013-2033; FAA Terminal Area Forecasts (March 2013)

FAA Terminal Area Forecast

The FAA also annually forecasts operations by airport as part of the Terminal Area Forecasts. For U.S. airports reporting to the FAA TAF, operations at airports in FAA's Eastern Region declined between 2007 and 2012 at an average annual rate of 3.4 percent. General aviation operations declined at annual rate slightly greater (faster) than the decline for total operations. According to the TAF, between 2012 and 2024, total operations at all U.S. airports are projected to increase at an average annual rate of 0.6 percent.

Total operations at airports in the FAA's Eastern Region are expected to increase 0.7 percent per year, on average. General aviation operations are projected to grow at 0.4 nationally and 0.6 percent regionally between 2012 and 2024. Between 2007 and 2012, total aircraft operations at the Pennsylvania airports that reported to the FAA TAF (47 percent) decreased at an average annual rate of 3.2 percent. General aviation operations at these airports decreased 3.0 percent annually over the five-year period. The FAA TAF projects total operations at Pennsylvania airports to grow at 1.00 percent between 2012 and 2024. General aviation operations are projected to increase slightly below that rate, at 0.9 percent per year, on average.

B. Enplanement Projections

To develop a forecast of enplanements for the commercial service airports in Pennsylvania, the growth rates contained in the TAF were used. Rather than using an overall growth rate for the 20-year projection period, the growth rates for each of the individual time frames was used. Growth rates from the TAF were developed for each of the commercial service airports and then applied to actual 2012 traffic to develop the projections. **Table 3-10** presents the forecasted growth rates and the enplanement projections for 2017, 2022, and 2032.

Numerous occurrences can impact the actual outcomes related to the enplanement forecasts. These items could be either localized or widespread. For example, startup service (such as Spirit Airlines serving Arnold Palmer Regional Airport) could impact a regional airport, airline mergers (such as the recently approved merger of US Airways and American Airlines) could impact the overall future activity at commercial service airports, and trends in overall airline capacity, could impact the overall system in both Pennsylvania and the nation.

Table 3-10: Enplanement Forecast

Airport	Projected Growth			Historical Enplanements	Enplanement Forecast		
	2012-2017	2017-2022	2022-2032	2012	2017	2022	2032
Altoona-Blair County	0.2%	0.2%	0.2%	4,101	4,135	4,169	4,238
Arnold Palmer Regional	1.0%	1.0%	1.0%	31,500	33,093	34,766	38,372
Bradford Regional	0.0%	0.0%	0.0%	2,962	2,962	2,962	2,962
Dubois Regional Airport	1.0%	1.0%	1.0%	5,728	6,021	6,323	6,980
Erie International/Tom Ridge Field	1.0%	1.0%	1.0%	127,184	133,671	140,484	155,178
Harrisburg International	-1.6%	0.6%	0.6%	655,294	605,675	624,238	663,267
John Murtha Johnstown-Cambria Co. Reg.	0.3%	0.3%	0.3%	7,956	8,078	8,200	8,467
Lancaster	0.0%	0.0%	0.0%	7,575	7,575	7,575	7,575
Lehigh Valley International	0.9%	0.9%	0.9%	428,332	447,337	467,201	509,670
Philadelphia International	2.0%	2.4%	2.5%	14,883,180	16,406,461	18,495,566	23,569,222
Pittsburgh International	3.1%	2.1%	2.1%	4,160,024	4,846,446	5,378,625	6,624,769
University Park	1.2%	1.2%	1.2%	144,054	153,075	162,677	183,762
Venango Regional	0.4%	0.4%	0.4%	2,219	2,262	2,305	2,392
Wilkes-Barre/Scranton International	1.5%	1.5%	1.5%	228,367	245,649	264,248	305,829
Williamsport Regional	3.5%	1.0%	1.0%	24,508	29,081	30,562	33,755
Other [1]	0.0%	0.0%	0.0%	2,317	2,317	2,317	2,317
TOTAL [2]	***2.0%***	***2.3%***	***2.3%***	***20,715,301***	***22,933,838***	***25,632,219***	***32,118,755***

[1] Includes airports that are not considered commercial service, but reported minimal enplanements in 2011.

[2] Totals may not add up due to individual rounding.

Sources: FAA Terminal Area Forecasts (March 2013); BOA; compiled by Parsons Brinckerhoff

C. Commercial Aircraft Operations Projections

Similar to the forecast for enplanements, the TAF was used for the commercial aircraft operations forecast at Pennsylvania's commercial service airports. Rather than use an overall growth rate for the 20-year projection period or an average growth rate for Pennsylvania, the growth rates for each of the individual time frames for each airport was used. Growth rates were calculated from the TAF and then applied to actual 2012 traffic to develop the projections. **Table 3-11** presents the forecasted growth rates and the enplanement projections for 2017, 2022, and 2032.

Table 3-11: Commercial Aircraft Operations Forecast

Airport	Projected Growth			Historical Commercial Operations	Commercial Operations Forecast		
	2012-2017	2017-2022	2022-2032	2012	2017	2022	2032
Altoona-Blair County	0.5%	0.5%	0.7%	5,246	5,370	5,498	5,898
Arnold Palmer Regional	0.6%	0.6%	0.9%	4,863	5,008	5,162	5,655
Bradford Regional	1.9%	1.7%	2.4%	4,162	4,562	4,962	6,267
Dubois Regional Airport	0.1%	0.1%	0.2%	6,226	6,271	6,316	6,461
Erie International/Tom Ridge Field	0.8%	0.8%	1.2%	7,962	8,286	8,621	9,711
Harrisburg International	-2.1%	-0.4%	-0.2%	40,281	36,282	35,556	34,960
John Murtha Johnstown-Cambria Co. Reg.	1.1%	1.1%	1.7%	3,498	3,692	3,901	4,617
Lancaster	1.0%	1.0%	1.6%	4,781	5,031	5,297	6,207
Lehigh Valley International	0.5%	0.5%	0.7%	22,205	22,734	23,279	25,001
Philadelphia International	1.5%	1.8%	2.8%	433,127	465,485	508,926	671,152
Pittsburgh International	2.6%	1.2%	2.1%	119,595	135,755	144,428	177,116
University Park	0.8%	0.8%	1.2%	13,228	13,764	14,320	16,126
Venango Regional	0.5%	0.5%	0.7%	2,507	2,567	2,627	2,819
Wilkes-Barre/Scranton International	0.8%	0.8%	1.3%	16,356	17,058	17,792	20,189
Williamsport Regional	2.0%	0.8%	1.1%	4,230	4,662	4,845	5,428
TOTAL [1]	***2.0%***	***2.3%***	***2.3%***	***688,267***	***736,527***	***791,530***	***997,609***

[1] Totals may not add up due to individual rounding.

Sources: FAA Terminal Area Forecasts (March 2013); BOA; compiled by Parsons Brinckerhoff

D. Based Aircraft Projections

To ensure a reasonable forecast, two methodologies were used to project based aircraft for each district in Pennsylvania. Both methodologies are bottom-up approaches. The first methodology used the historical trend experienced in each district to forecast future based aircraft. The second methodology projected based aircraft for each district using historical population growth in each district. Each of these methodologies, their resultant projections, as well as the preferred based aircraft projections, is discussed in the following sections.

1. Projections Based on Historical District Based Aircraft Growth

The first methodology used to project based aircraft for each of the districts in Pennsylvania was a bottom-up approach based on historical growth in based aircraft in each district. As shown in **Table 3-12**, the historical data for each district shows varying degrees of decline. Overall, statewide based aircraft decreased from 2007 to 2012 at an average annual rate of 3.0 percent.

To project based aircraft using this methodology, the combined average annual growth between 2007 and 2012 at all airports in each district was used. Because of the swings in historical growth and decline, airports were categorized into ranges of average annual growth to project future based aircraft by district. Growth rates were developed for the various ranges based on the FAA's projection of based aircraft in the FAA-defined

Eastern Region between 2012 and 2024. The FAA TAF, published in March 2013, forecasts that based aircraft at airports in the Eastern Region will experience an average annual growth rate of 0.8 percent between 2012 and 2024.

To forecast based aircraft for each district in the Pennsylvania system, variations of the FAA's Eastern Region projected average annual growth rate were used. Airports in districts that lost based aircraft between 2007 and 2012 were given a 0.4 percent average annual growth rate, one-half of the FAA Eastern Region growth rate. For airports that had between 0.1 percent and 1.0 percent average annual growth during the 2007 through 2012 time frame, the FAA's rate of 0.8 percent was applied. For those airports that experienced growth greater than 1.0 percent, a growth rate of 1.6 percent, or double the FAA's projected growth rate, was applied. Table 3-12 presents the district based aircraft projections developed using this methodology. As shown, statewide based aircraft are projected to increase from 4,866 in 2012 to 5,440 in 2032, an average annual growth rate of 0.6 percent. Although this rate shows growth rather than the decline experienced statewide between 2007 and 2012, the rate of growth is slightly lower than the FAA's Eastern Region projected average annual growth rate.

Table 3-12: Based Aircraft Projections (Bottom-Up Calculated from Aircraft Growth)

District	Pennsylania Counties	Historic Based Aircraft			Applied AAG	Projected Based Aircraft		
		2007	2012	AAG		2017	2022	2032
District 1	Crawford, Erie, Forest, Mercer, Venango, Warren	257	213	-3.7%	0.4%	217	222	231
District 2	Cameron, Centre, Clearfield, Clinton, Elk, Juniata, McKean, Mifflin, Potter	282	284	0.1%	0.8%	296	308	333
District 3	Bradford, Columbia, Lycoming, Montour, Northcumberland, Snyder, Sullivan, Tioga, Union	286	212	-5.8%	0.4%	216	221	230
District 4	Lackawanna, Luzerne, Pike, Susquehanna, Wayne, Wyoming	273	309	2.5%	1.6%	335	362	424
District 5	Berks, Carbon, Lehigh, Monroe, Northampton, Schulykill	691	666	-0.7%	0.4%	679	693	721
District 6	Bucks, Chester, Delaware, Montgomery, Philadelphia	1,417	1,082	-5.3%	0.4%	1,104	1,126	1,172
District 8	Adams, Cumberland, Dauphin, Franklin, Lancaster, Lebanon, Perry, York	934	845	-2.0%	0.4%	862	879	915
District 9	Bedford, Blair, Cambria, Fulton, Huntingdon, Somerset	168	187	2.2%	1.6%	202	219	257
District 10	Armstrong, Bulter, Clarion, Indiana, Jefferson	363	258	-6.6%	0.4%	263	269	279
District 11	Allegheny, Beaver, Lawrence	456	379	-3.6%	0.4%	387	394	411
District 12	Fayette, Greene, Washington, Westmorland	530	431	-4.1%	0.4%	440	449	467
TOTAL [1]		**5,657**	**4,866**	**-3.0%**		**5,001**	**5,141**	**5,440**

[1] Totals may not sum due to individual rounding.

If historic based aircraft growth:

< 0.0%, apply 1/2 of Eastern Region FAA-TAF growth rate (0.4%)

>0.1%<1.0%, apply Eastern Region FAA-TAF growth rate (0.8%)

>1.0%, apply 2 times Eastern Region FAA-TAF growth rate (1.6%)

Source: Parsons Brinckerhoff

2. Projections Based on Historical District Population Growth

Table 3-13 presents projected based aircraft for Pennsylvania also using a bottom-up approach. This methodology is similar to the first methodology explained above. However, the projected growth rate is based on historical population growth rather than historical based aircraft growth. As shown in Table 3-13, according to recent U.S. Census data, the population in the Commonwealth has grown slightly, up 0.4 percent per year, on average, between 2001 and 2011 (the most recent year for which population estimates are available). The population of each district in Pennsylvania shows varying degrees of growth and decline. Districts 2, 4, 5, and 8 demonstrated the greatest population growth between 2001 and 2011. On the other hand, Districts 1, 9 11, and 12 experienced a decline in population over the same period.

Table 3-13: Based Aircraft Projections (Bottom Up Based on Population Growth)

					Projected Based Aircraft		
District	Pennsylvania Counties	2012 Based Aircraft	2001-2011 Population Growth	Applied AAG	2017	2022	2032
District 1	Crawford, Erie, Forest, Mercer, Venango, Warren	213	-0.1%	0.4%	217	222	231
District 2	Cameron, Centre, Clearfield, Clinton, Elk, Juniata, McKean, Mifflin, Potter	284	0.3%	0.8%	296	308	333
District 3	Bradford, Columbia, Lycoming, Montour, Northcumberland, Snyder, Sullivan, Tioga, Union	212	0.1%	0.8%	221	230	249
District 4	Lackawanna, Luzerne, Pike, Susquehanna, Wayne, Wyoming	309	0.3%	0.8%	322	335	362
District 5	Berks, Carbon, Lehigh, Monroe, Northampton, Schuylkill	666	1.0%	1.6%	721	781	915
District 6	Bucks, Chester, Delaware, Montgomery, Philadelphia	1,082	0.4%	0.8%	1,126	1,172	1,269
District 8	Adams, Cumberland, Dauphin, Franklin, Lancaster, Lebanon, Perry, York	845	1.0%	1.6%	915	990	1,161
District 9	Bedford, Blair, Cambria, Fulton, Huntingdon, Somerset	187	-0.2%	0.4%	191	195	203
District 10	Armstrong, Bulter, Clarion, Indiana, Jefferson	258	0.1%	0.8%	268	279	303
District 11	Allegheny, Beaver, Lawrence	379	-0.4%	0.4%	387	394	411
District 12	Fayette, Greene, Washington, Westmoreland	431	-0.1%	0.4%	440	449	467
TOTAL [1]		**4,866**	**0.4%**		**5,102**	**5,353**	**5,902**

[1] Totals may not add up due to individual rounding.

If historic population growth:

< 0.0%, apply 1/2 of Eastern Region FAA-TAF growth rate (0.4%)

>0.1%<0.66%, apply Eastern Region FAA-TAF growth rate (0.8%)

>0.66%, apply 2 times Eastern Region FAA-TAF growth rate (1.6%)

Source: Parsons Brinckerhoff

Similar to the first methodology described above, the districts were categorized into ranges of historical growth in order to assign a projected rate of growth. However, for this methodology, historical population growth was used as the basis for based aircraft projections. The projected rate of growth is again based on the FAA's Eastern Region based aircraft projections published in the Terminal Area Forecasts. Based aircraft in the Eastern Region are projected to grow at 0.8 percent per year, on average, between 2012 and 2024.

Variations of the FAA Eastern Region growth rate were then used to project based aircraft in Pennsylvania by district. For those districts in Pennsylvania that experienced a decline in population between 2001 and 2011, a growth rate of 0.4 percent, half of the FAA Eastern Region growth rate, was used. For the districts that had population growth between 0.0 percent and 0.66 percent annually, the FAA's Eastern Region annual average growth rate of 0.8 percent was applied. Districts that had average annual population growth greater than 0.66 percent were assigned a projected based aircraft growth rate of 1.6 percent, double the FAA's Eastern Region projected average annual growth rate. As shown in Table 3-13, using this methodology, statewide based aircraft are projected to increase from 4,866 in 2012 to 5,902 in 2032—an average annual growth rate of 1.0 percent.

3. Preferred Based Aircraft Projection

The results from the two based aircraft projection methodologies developed in the PA SASP were compared for each district. In 2012, Pennsylvania airports accommodated 4,866 based aircraft. The first methodology, which uses historical based aircraft by district, produced a 2032 projection of 5,440 based aircraft—an average annual growth rate of 0.6 percent. The second methodology, based on historical population growth, produced a 2032 projection of 5,902 based aircraft—an average annual growth rate of 1.0 percent.

Although the methodologies produce similar projections of statewide based aircraft, the bottom-up methodology based on historical population growth was chosen as the preferred methodology. This projection takes district population changes into account, which can directly relate to the need for future based aircraft in the district. **Figure 3-15** presents the projected growth in based aircraft by district. This was the same rationale used for selection of the 2002 PA SASP based aircraft forecast that also utilized the population growth by district.

Figure 3-16 presents each district's share of statewide based aircraft in 2012 and 2032. Although none of the districts' market share of the statewide total changed dramatically over the forecast period, there are a few changes to note. Based on the results of the preferred based aircraft projection methodology, District 5 and District 8 each increased their share of Pennsylvania based aircraft by 2032. District 8 had the largest increase in projected based aircraft with 316 additional aircraft in 2032. Districts 1, 11, and 12 are each projected to lose an approximately 1 percent share of the based aircraft market by 2032.

Figure 3-15: Projected Growth Rates in Based Aircraft by District

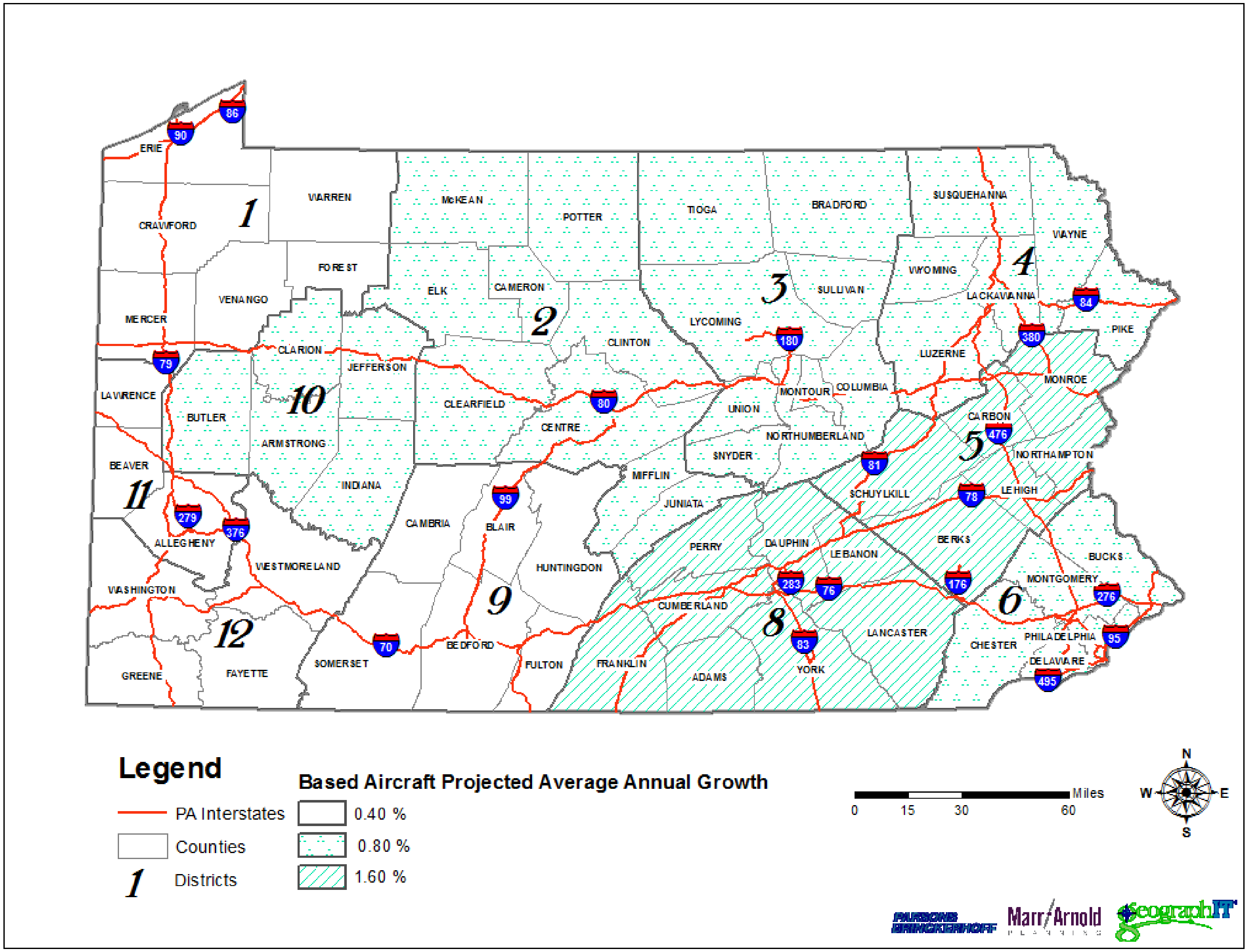
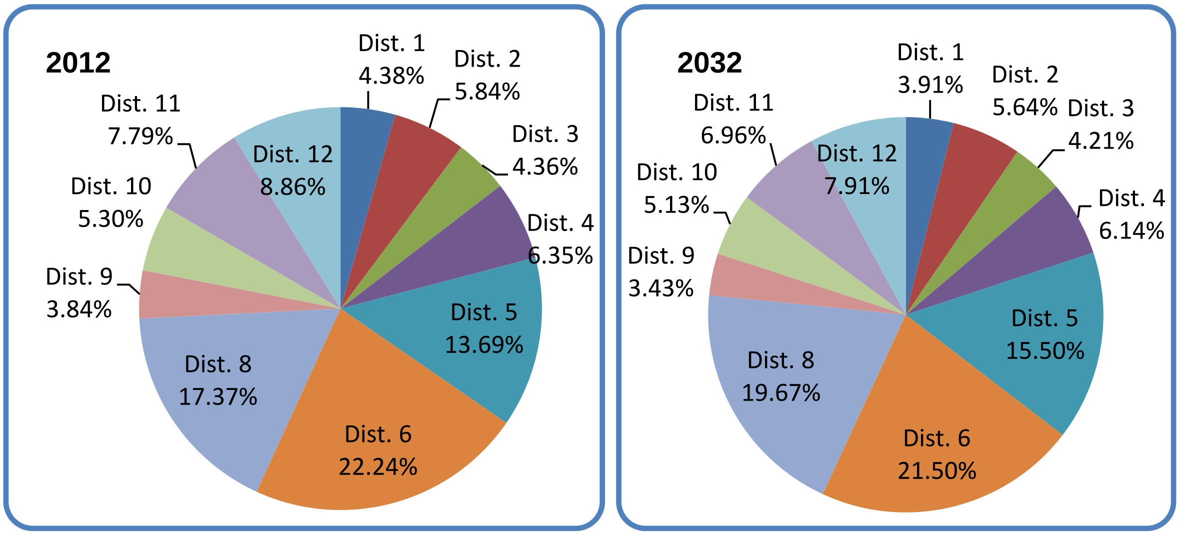


Figure 3-16: Share of Pennsylvania Based Aircraft by District



E. Non-Commercial and General Aviation Operations Projections

Similar to the based aircraft projections, two bottom-up methodologies were used to project non-commercial and general aviation aircraft operations for each district to ensure a reasonable forecast. One methodology examined the historical growth in total annual operations in each district in Pennsylvania, while the second methodology examined historical population growth in each district. For each of these methodologies, future growth rates were then assigned to each district's existing operational level based on historical operational growth or population growth, as well as anticipated national trends in aviation activity. These two methodologies are discussed below.

1. Projections Based on Historical District Operations Growth

The first methodology examined the historical growth in operations experienced at each of the districts in Pennsylvania. As shown in **Table 3-14**, non-commercial and general aviation aircraft operations at all Pennsylvania airports decreased at an average annual rate of 4.5 percent between 2007 and 2012. Districts 1 and 11 experienced the greatest declines over the period.

Table 3-14: Non-Commercial and GA Aircraft Operations Projections (Bottom-Up Based on Operations Growth)

District	Pennsylania Counties	Historic Operations 2007	Historic Operations 2012	Historic Operations AAG	Applied AAG	Projected Operations 2017	Projected Operations 2022	Projected Operations 2032
District 1	Crawford, Erie, Forest, Mercer, Venango, Warren	123,893	83,557	-7.6%	0.3%	84,818	86,098	88,716
District 2	Cameron, Centre, Clearfield, Clinton, Elk, Juniata, McKean, Mifflin, Potter	193,580	146,432	-5.4%	0.3%	148,642	150,885	155,473
District 3	Bradford, Columbia, Lycoming, Montour, Northcumberland, Snyder, Sullivan, Tioga, Union	165,238	131,427	-4.5%	0.3%	133,410	135,423	139,541
District 4	Lackawanna, Luzerne, Pike, Susquehanna, Wayne, Wyoming	207,913	174,694	-3.4%	0.3%	177,330	180,006	185,480
District 5	Berks, Carbon, Lehigh, Monroe, Northampton, Schulykill	481,760	421,945	-2.6%	0.3%	428,312	434,776	447,996
District 6	Bucks, Chester, Delaware, Montgomery, Philadelphia	659,160	463,349	-6.8%	0.3%	470,341	477,439	491,957
District 8	Adams, Cumberland, Dauphin, Franklin, Lancaster, Lebanon, Perry, York	464,454	414,056	-2.3%	0.3%	420,304	426,647	439,620
District 9	Bedford, Blair, Cambria, Fulton, Huntingdon, Somerset	131,795	121,761	-1.6%	0.3%	123,598	125,464	129,279
District 10	Armstrong, Bulter, Clarion, Indiana, Jefferson	125,104	112,063	-2.2%	0.3%	113,754	115,471	118,982
District 11	Allegheny, Beaver, Lawrence	346,090	222,502	-8.5%	0.3%	225,860	229,268	236,240
District 12	Fayette, Greene, Washington, Westmorland	185,250	164,143	-2.4%	0.3%	166,620	169,134	174,277
TOTAL [1]		**3,084,237**	**2,455,929**	**-4.5%**		**2,492,990**	**2,530,610**	**2,607,561**

[1] Totals may not add up due to individual rounding.

If historic operations growth:

< 0.0%, apply 1/2 of Eastern Region FAA-TAF growth rate (0.3%)

>0.1%<3.0%, apply Eastern Region FAA-TAF growth rate (0.6%)

>3.0%, apply 2 times Eastern Region FAA-TAF growth rate (1.2%)

Source: Parsons Brinckerhoff

The FAA's projected growth in general aviation aircraft operations in the FAA-defined Eastern Region was used to project annual non-commercial and general aviation aircraft operations in each district in Pennsylvania. In its most recent forecast, the FAA projected that general aviation operations in the Eastern Region would increase at an average annual rate of 0.6 percent per year, on average. To project total annual operations, the districts in Pennsylvania were categorized into ranges based on their estimated annual historical growth in non-commercial and general aviation aircraft operations.

Variations of the FAA's projected growth rate were applied to the ranges to develop operations projections for each district. Airports that experienced negative growth were assigned a growth rate of 0.3 percent, or one-half of the FAA's Eastern Region general aviation aircraft operations growth rate. For airports with an average annual growth rate of between 0.0 percent and 3.0 percent, the FAA's Eastern Region general aviation aircraft operations average annual growth rate (0.6 percent) was applied to project future operations. Those airports with growth rates greater than 3.0 percent were assigned a growth rate of 1.2 percent, or double the FAA Eastern Region general aviation aircraft operations growth rate. The results of this analysis are presented in Table 3-14.

This methodology results in statewide non-commercial and general aviation aircraft operations growing from approximately 2.5 million in 2012 to 2.6 million in 2032. The overall growth represents an average annual rate of approximately 0.3 percent, which is lower than the FAA's projected growth rate for general aviation aircraft operations in the Eastern Region.

2. Projections Based on Historical District Population Growth

The second operations projection methodology also uses a bottom-up approach. Similar to the second based aircraft methodology, this approach is based on population growth between 2001 and 2011 in each district. The districts are then categorized into ranges based on historical population growth reported by the U.S. Census Bureau. The population in Pennsylvania increased 0.36 percent per year, on average, between 2001 and 2011.

A variation of the FAA's Eastern Region growth rate for projected non-commercial and general aviation aircraft operations was then applied to each of the districts to develop individual operations projections. Districts that experienced a decline in historical population were assigned a growth rate of 0.3 percent, or one-half of the FAA's Eastern Region projected average annual growth rate. For a district experiencing historical population growth between 0.0 percent per year and 0.66 percent per year, a projected general aviation aircraft operations growth rate of 0.6 percent was applied (the FAA's Eastern Region projected growth rate). Districts with population growth greater than 0.66 percent were assigned an operations growth rate of 1.2 percent per year, or double the FAA's Eastern Region projected general aviation aircraft operations growth rate.

Table 3-15 presents the district non-commercial and general aviation operations projections using this methodology based on historical population growth. As shown, statewide operations are projected to increase from approximately 2.5 million in 2012 to 2.8 million in 2032. This represents an average annual growth rate of 0.7 percent over the period, just slightly higher than the FAA's projected growth rate for general aviation aircraft operations in the Eastern Region.

Table 3-15: Non-Commercial and GA Aircraft Operations Projections (Bottom Up Based on Population Growth)

District	Pennsylvania Counties	2012 Operations	2001-2011 Population Growth	Applied AAG	Projected Operations 2017	Projected Operations 2022	Projected Operations 2032
District 1	Crawford, Erie, Forest, Mercer, Venango, Warren	83,557	-0.12%	0.3%	84,818	86,098	88,716
District 2	Cameron, Centre, Clearfield, Clinton, Elk, Juniata, McKean, Mifflin, Potter	146,432	0.27%	0.6%	150,878	155,459	165,042
District 3	Bradford, Columbia, Lycoming, Montour, Northcumberland, Snyder, Sullivan, Tioga, Union	131,427	0.14%	0.6%	135,417	139,529	148,130
District 4	Lackawanna, Luzerne, Pike, Susquehanna, Wayne, Wyoming	174,694	0.29%	0.6%	179,998	185,463	196,896
District 5	Berks, Carbon, Lehigh, Monroe, Northampton, Schulykill	421,945	0.97%	1.2%	447,877	475,402	535,631
District 6	Bucks, Chester, Delaware, Montgomery, Philadelphia	463,349	0.43%	0.6%	477,417	491,913	522,237
District 8	Adams, Cumberland, Dauphin, Franklin, Lancaster, Lebanon, Perry, York	414,056	1.02%	1.2%	439,503	466,513	525,617
District 9	Bedford, Blair, Cambria, Fulton, Huntingdon, Somerset	121,761	-0.21%	0.3%	123,598	125,464	129,279
District 10	Armstrong, Bulter, Clarion, Indiana, Jefferson	112,063	0.09%	0.6%	115,465	118,971	126,305
District 11	Allegheny, Beaver, Lawrence	222,502	-0.38%	0.3%	225,860	229,268	236,240
District 12	Fayette, Greene, Washington, Westmorland	164,143	-0.14%	0.3%	166,620	169,134	174,277
TOTAL [1]		**2,455,929**	**0.36%**		**2,547,452**	**2,643,214**	**2,848,372**

[1] Totals may not add up due to individual rounding.

If historic population growth:

< 0.0%, apply 1/2 of Eastern Region FAA-TAF growth rate (0.3%)

>0.1%<0.66%, apply Eastern Region FAA-TAF growth rate (0.6%)

>0.66%, apply 2 times Eastern Region FAA-TAF growth rate (1.2%)

Source: Parsons Brinckerhoff

3. Preferred Operations Projection

The results from the two methodologies were compared for each district in Pennsylvania. Based on the review of the two methodologies, the bottom-up aircraft operations projection methodology based on population growth was selected as the preferred non-commercial and general aviation aircraft operations projection methodology. This methodology provided the closest projection to the FAA's Eastern Region average annual growth rate for general aviation operations. This replicates the rationale used for the selection of the preferred 2002 SASP operations projection methodology. The projections by district based on the preferred methodology are presented in **Figure 3-17**.

Figure 3-18 presents each district's share of statewide operations in 2012 and 2032 Based on the results of the preferred non-commercial and general aviation aircraft operations projection methodology, District 5 and District 8 each have an increased share of Pennsylvania non-commercial and general aviation aircraft operations by 2032. Both of these districts' share of aircraft operations is projected to increase approximately 2 percent. Districts 6, 11, and 12 are each projected to lose an approximately 1 percent share of the non-commercial and general aviation aircraft operations market by 2032.

Figure 3-17: Projected Non-Commercial and GA Aircraft Operations Growth by District

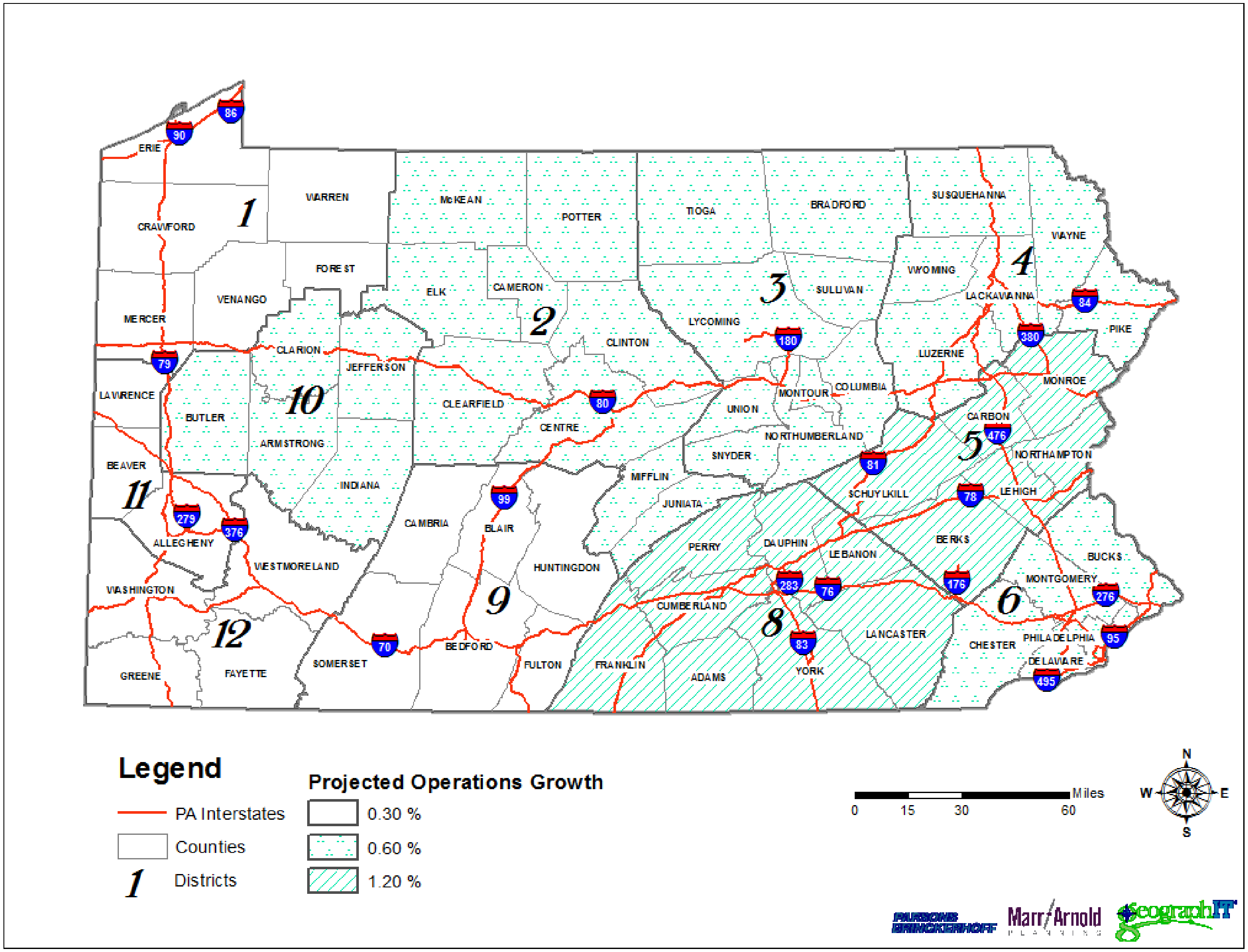
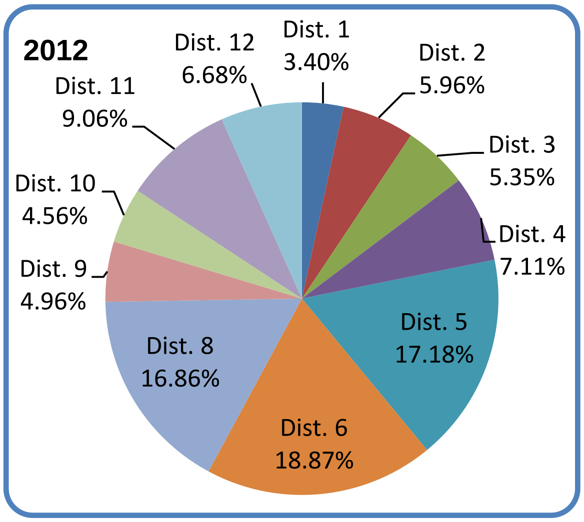
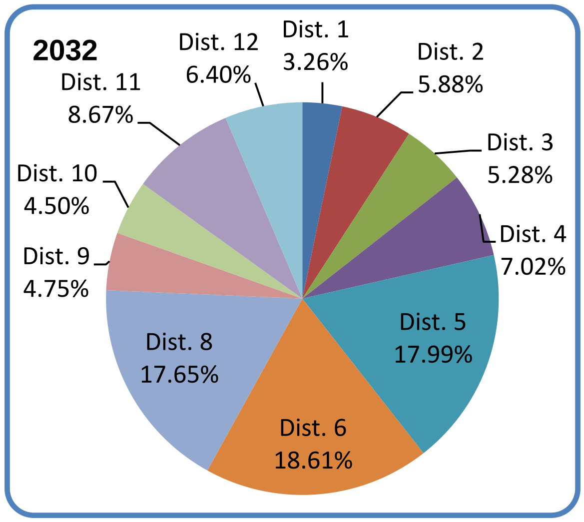


Figure 3-18: Share of Pennsylvania Non-Commercial and GA Aircraft Operations by District





IV. Summary

Aviation demand decreased for the PA SASP airports between 2007 and 2012. The primary reason for this decrease is the economic recession that began in 2008. Because aviation demand is so closely tied to economic trends, it is expected that aviation demand in Pennsylvania will increase as the economy recovers. Aviation demand is a key factor in determining the facilities that will be required in the future. As such, these forecasts will be used to evaluate existing facilities and determine the need for future facilities in a separate study. **Table 3-16** summarizes the components of the forecast.

Table 3-16: Aviation Demand Forecast Summary

Forecast Component	Historical 2012	Forecast 2017	Forecast 2022	Forecast 2032
Enplanements	20,715,301	22,933,838	25,632,219	32,118,755
Based Aircraft	4,866	5,102	5,353	5,902
Commercial Aircraft Operations	688,267	736,527	791,530	997,609
Non-Commercial & GA Aircraft Operations	2,455,929	2,547,452	2,643,214	2,848,372

Source: Parsons Brinckerhoff

Chapter 4. Airport Classifications

I. Introduction

The purpose of this chapter is to summarize the results of the airport classification criteria evaluation and the corresponding modification recommendations. In addition, this analysis includes a review of Federal Aviation Administration's (FAA) ASSET airport class structure and how it compares to the Pennsylvania Statewide Airport System Plan (PA SASP) classifications and definitions. Further details about the FAA ASSET classifications are described in the Appendix.

II. Classification Process

Pennsylvania's Statewide Airport Classification structure and the associated criteria form the foundation for defining the Commonwealth's airport system and for meeting system goals.

The criteria for each classification level established in 2002, as well as those modified during the 2007 PA SASP Update, were analyzed for consistency and relevance. Since notable classification criteria changes to the Commercial Service and Advance levels were made and applied as part of the 2007 PA SASP Update, criteria modification and reclassification of airports within the remaining levels was the primary focus of this update. It is important to note that if an airport was reclassified in 2007, it would only be considered for reclassification again if the airport realized significant improvement.

However, some adjustments to all classification levels were necessary to ensure key criteria are both relatively constant and measurable. All classification criteria modifications are depicted in **Table 4-1.**

Table 4-1: Classification Criteria Modifications Comparison

2002/2007 PA SASP	2012 PA SASP
NAVAIDS/Approach Minimums: Ceiling and Visibility	Type of Published Approach: i.e. ILS; Vertically Guided; Non-Precision; Circling
Basic Runway Length: 3000 ft.	Basic Runway Length: 3200 ft.
Two of three Facility Objectives met for reclassification consideration	Runway length plus one of remaining two Facility Objectives must be met for reclassification consideration
Sensitivity Test: NPIAS + steady or increasing operations and Based Aircraft	Sensitivity Test: NPIAS + steady or increasing IFR operations

Source: 2002 PA SASP, 2007 PA SASP Update, and BOA
Prepared: February 2014

Airports that were not reclassified in 2007 and do not meet the criteria for their existing classification were considered for reclassification. Those airports that did not meet the minimum criteria established for the Basic classification were classified as Limited. Airports having turf runways, regardless of length, were also included and classified as Limited. Special Use Facilities, such as heliports and seaplane bases, were not reclassified.

In terms of NAVAIDS, Approach and Visibility Minimums were changed to the "Type of Instrument Approach Procedure". Following the 2007 PA SASP Update, the BOA found that Approach and Visibility Minimums were being increasingly impacted by changes to the FAA Standards used in instrument procedure development. Utilizing the "Type of Procedure" will allow for a more simple, consistent, and stable criteria to measure airport performance as well as system-wide improvement trends.

The incorporation of a sensitivity analysis was adopted during the 2007 PA SASP Update to ensure that the operational state of an airport was also factored in, especially, if considering a reclassification of an airport to a higher level classification. During the 2012 evaluation, the data resource for measuring the "steady or increasing" level of activity was changed from based aircraft and annual operations to actual instrument flight rules (IFR) departure flight plan activity between 2007 and 2012. This newly available IFR activity data was obtained from the FAA's Traffic Flow Management System Counts (TFMSC) and has been utilized in other FAA studies including the 2011 ASSET Study. If an airport met the criteria of a higher level classification and IFR activity was steady or increasing, the sensitivity analysis would support an upgrade in classification. If IFR activity actually decreased at this same airport, an upgrade in classification would not be supportable. Steady activity is considered +/- 10% change during the 2007 to 2012 time period.

For airports currently undergoing improvements that would impact their 2012 reclassification, the reclassification results consider those improvements as being already in-place.

III. Airport Classification Descriptions

The 2002 PA SASP set the groundwork for the airport classifications that are used in Pennsylvania's system of airports. In 2007, the PA SASP was updated and it was determined that Commercial Service airports should have their own classification apart from the Advanced Airport classification. Similarly, this PA SASP Update reviewed the classification structure and determined that no additional levels were necessary. However, as previously noted, criteria used for classifying airports was necessary. The following sections describe each of the six airport classifications in the system, present the classification criteria, and summarize the 2012 Airport Classification results based on the criteria.

A. Commercial Service Airports

Commercial Service Airports include airports that are certified by the FAA as Part 139 operator with a Class I, II, or III designation. These airports meet the facility, service, safety, and standard requirements necessary to, and regularly, provide scheduled air service. There are currently 15 airports within the Commonwealth that meet this criterion. While Reading Regional Airport is a Part 139 airport, it does not have regular service and is therefore falls into a Class IV designation.

B. Advanced Airports

Advanced Airports accommodate high levels of activity and are typically located in or near significant population centers. These airports support corporate/executive operations, private pilot business and recreational activities, and flight training. Advanced airports are classified based on the following runway attributes:

- Runway length must be 4,500 feet and greater
- Runway lights must have either MIRLs or HIRLs
- Runway must have a vertically guided instrument approach

C. Intermediate Airports

Intermediate Airports support corporate aircraft and the operations of general aviation aircraft by private pilots for business or pleasure. These airports accommodate significant amounts of activity and are typically used as gateways for business and recreational travelers to reach county-wide or regional area in proximity to the airport. These airports are by the following runway attributes:

- Runway length must be 3,800 feet and greater
- Runway lights must be at least MIRLs
- Runway must have a published non-precision approach

D. Basic Airports

Basic Airports support smaller corporate aircraft and the operations of general aviation aircraft by private pilots for business and pleasure. This functional level of airport represents a typical general aviation airport that provides the system with operational and storage capacity for single- and multi-engine piston aircraft. These airports are by the following runway attributes:

- Runway length must be 3,200 feet and greater

- Runway lights must be at least MIRLs
- Runway must have a published non precision circling approach

The runway length for Basic Airport was changed to 3,200 feet for this update; due to the following reasoning:

- 3,200 feet approximates the minimum recommended runway length for any airport using FAA AC 150/5325-4B - Runway Length Requirements for Airport Design, given the typical field elevation and mean daily maximum temperature in Pennsylvania.
- Airports with 3,200 feet and longer runways are more protected from encroachment and obstructions by 14 CFR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace.
- 3,200 feet is the minimum length required for a non-precision approach with vertical guidance.

Airports that are not classified as Advanced, Intermediate, or Basic are placed into the remaining categories of Limited or Special Use.

E. Limited Airports

Limited Airports include facilities with paved or turf runways that support small general aviation aircraft operations. This level of airport supports private pilots that may be flying for business or pleasure, and requires minimal support facilities and services. The classification criteria for this category are summarized below:

- Runway Length – 2,200 feet
- Published Approach – none
- Runway Lights – none

F. Special Use Facilities

Special Use Facilities include those aviation facilities, such as heliports, gliderports, seaplane bases, and ultralight facilities, that primarily support components of aviation demand other than fixed-wing aircraft. Special Use Facilities are not being re-classified in 2012.

Table 4-2 summarizes the 2012 PA SASP airport classifications criteria and **Table 4-3** presents the reclassification results for the Commonwealth's airports. The Appendix includes the detailed version of the spreadsheet listing the data used to determine the revised 2012 classifications.

Table 4-2: 2012 Airport Classifications Criteria

Commercial Service	
Class Criteria (Facility Objectives)	
Runway Length	5,000 feet and CFR Part 139 Cert (I, II, or III)
Published Approach	**ILS (Instrument Landing System)**
Runway Lights	HIRL
Performance Criteria (Service Objectives)	
Runway Width	100 feet
Runway Strength	60,000lbs SW
Parallel Taxiway	Full
Approach	Rotating Beacon, Lighted Wind Indicator, Segmented Circle, REILs, PAPI, MALSR
Weather Equipment	ASOS; AWOS
Services	Phone, Restroom, FBO, Maintenance, Jet Fuel, Ground Transportation
Facilities	Local and Itinerant Aircraft Parking, Apron, Storage, Terminal, Auto Parking
Advanced	
Class Criteria (Facility Objectives)	
Runway Length	4,500 feet
Published Approach	**Vertically Guided (VGA)**
Runway Lights	MIRL
Performance Criteria (Service Objectives)	
Runway Width	75 feet
Runway Strength	30,000lbs SW
Parallel Taxiway	Full
Approach	Rotating Beacon, Lighted Wind Indicator, Segmented Circle, REILs, PAPI, ALS
Weather Equipment	ASOS; AWOS
Services	Phone, Restroom, FBO, Maintenance, Jet Fuel, Ground Transportation
Facilities	Local and Itinerant Aircraft Parking, Apron, Storage, Terminal, Auto Parking

Table 4-2: 2012 Airport Classifications Criteria (continued)

Intermediate	
Class Criteria (Facility Objectives)	
Runway Length	3,800 feet
Published Approach	**Non-Precision (NP)**
Runway Lights	MIRL
Performance Criteria (Service Objectives)	
Runway Width	75 feet
Runway Strength	12,500lbs SW
Parallel Taxiway	Full
Approach	Rotating Beacon, Lighted Wind Indicator, Segmented Circle, REILs, VGSI
Weather Equipment	ASOS; AWOS
Services	Phone, Restroom, FBO, Maintenance, Jet Fuel, Ground Transportation
Facilities	Local and Itinerant Aircraft Parking, Apron, Storage, Terminal, Auto Parking
Basic	
Class Criteria (Facility Objectives)	
Runway Length	**3,200 feet**
Published Approach	**Circling (CA)**
Runway Lights	MIRL
Performance Criteria (Service Objectives)	
Runway Width	60 feet
Runway Strength	12,500lbs (Paved)
Parallel Taxiway	Partial
Approach	Rotating Beacon, Lighted Wind Indicator, Segmented Circle, VGSI
Weather Equipment	None
Services	Phone, Restroom, Fuel (AvGas)
Facilities	Aircraft Parking, Apron, Storage, Auto Parking

Table 4-2: 2012 Airport Classifications Criteria (continued)

Limited	
Class Criteria (Facility Objectives)	
Runway Length	**2,200 feet**
Published Approach	**None**
Runway Lights	**None**
Performance Criteria (Service Objectives)	
Runway Width	60 feet
Runway Strength	12,500lbs
Parallel Taxiway	None
Approach	Lighted Wind Indicator
Weather Equipment	None
Services	Phone, Restroom
Facilities	Aircraft Parking, Auto Parking

Class Criteria - Airports need to meet the runway length and at least one of the remaining Facility Objectives, AND pass the Sensitivity Test below to be considered for inclusion in a particular class.

Plus Sensitivity Test: 1) NPIAS Designation
2) Steady or Increasing IFR Activity from 2007 to 2012

Approach Types: VGA – ILS, LPV, LNAV/VNAV; NP- GPS, VOR; CA – Circling Approach

Note: Bold text indicates changes made the criteria since 2002/2007 PA SASP.
Prepared: February 2014

Table 4-3: 2012 PA SASP Airport Classifications Summary

Airport	2002/2007 Classification	2012 Classification	FAA ASSET Classification
Altoona-Blair County Airport	Commercial Service	Commercial Service	Regional
Arnold Palmer Regional Airport	Commercial Service	Commercial Service	Regional
Bradford Regional Airport	Commercial Service	Commercial Service	Regional
Dubois Regional Airport	Commercial Service	Commercial Service	Local
Erie International/Tom Ridge Field	Commercial Service	Commercial Service	Commercial Non-Hub
Harrisburg International Airport	Commercial Service	Commercial Service	Commercial Small-Hub
John Murtha Johnstown-Cambria County Airport	Commercial Service	Commercial Service	Regional
Lancaster Airport	Commercial Service	Commercial Service	Regional
Lehigh Valley International Airport	Commercial Service	Commercial Service	Commercial Small-Hub
Philadelphia International Airport	Commercial Service	Commercial Service	Commercial Large-Hub
Pittsburgh International Airport	Commercial Service	Commercial Service	Commercial Medium-Hub
University Park Airport	Commercial Service	Commercial Service	Commercial Non-Hub
Venango Regional Airport	Commercial Service	Commercial Service	Regional
Wilkes-Barre/Scranton Int'l Airport	Commercial Service	Commercial Service	Commercial Non-Hub
Williamsport Regional Airport	Commercial Service	Commercial Service	Commercial Non-Hub
General Aviation Airports			
Allegheny County Airport	Advanced	Advanced	National
Beaver County Airport	Advanced	Advanced	Regional
Bedford County Airport	Advanced	Advanced	Local
Butler County Airport	Advanced	Advanced	Regional
Capital City Airport	Advanced	Advanced	Regional
Chester County	Advanced	Advanced	National
Clarion County Airport	Basic	Advanced	Local
Hazleton Municipal Airport	Advanced	Advanced	Local
Indiana Co/Jimmy Stewart Airport	Intermediate	Advanced	Local
Mifflin County Airport	Advanced	Advanced	Local
Northeast Philadelphia Airport	Advanced	Advanced	National
Penn Valley Airport	Advanced	Advanced	Regional
Pocono Mountains Muni Airport	Intermediate	Advanced	Local
Port Meadville Airport	Advanced	Advanced	Regional
Reading Regional	Advanced	Advanced	National
Schuylkill County Airport	Advanced	Advanced	Local
Somerset County Airport	Basic	Advanced	Local
Titusville Airport	Basic	Advanced	Basic
Washington County Airport	Advanced	Advanced	Regional
York Airport	Advanced	Advanced	N/A
Zelienople Municipal Airport	Intermediate	Advanced	Local

Table 4-3: 2012 PA SASP Airport Classifications Summary (continued)

Airport	2002/2007 Classification	2012 Classification	FAA ASSET Classification
Grove City Regional Airport	Basic	Intermediate	Local
Bradford County Airport	Intermediate	Intermediate	Local
Clearfield-Lawrence Airport	Intermediate	Intermediate	Local
Corry-Lawrence Airport	Basic	Intermediate	Basic
Doylestown Airport	Intermediate	Intermediate	Regional
Heritage Field Airport	Intermediate	Intermediate	Regional
Joseph A. Hardy Connellsville Airport	Intermediate	Intermediate	Local
New Castle Municipal Airport	Intermediate	Intermediate	Local
Pennridge Airport	Basic	Intermediate	N/A
Queen City Municipal Airport	Intermediate	Intermediate	Regional
Rostraver Airport	Intermediate	Intermediate	Regional
St. Marys Municipal Airport	Basic	Intermediate	Local
Wings Field	Intermediate	Intermediate	Regional
Bellefonte Airport	Limited Use	Basic	N/A
Bloomsburg Municipal Airport	Basic	Basic	Local
Brandywine Airport	Intermediate	Basic	Regional
Carlisle Airport	Intermediate	Basic	N/A
Deck Airport	Basic	Basic	N/A
Donegal Springs Airpark	Intermediate	Basic	N/A
Ebensburg Airport	Basic	Basic	Basic
Franklin County Regional Airport	Basic	Basic	Local
Greene County Airport	Basic	Basic	N/A
Mid-State Airport	Basic	Basic	Unclassified
New Garden Flying Field	Intermediate	Basic	Local
Northumberland County Airport	Intermediate	Basic	Local
Quakertown Airport	Intermediate	Basic	Local
Rock Airport of Pittsburgh	Intermediate	Basic	N/A
Wellsboro-Johnston Airport	Basic	Basic	Basic
Wilkes-Barre/Wyoming Valley Airport	Basic	Basic	Local
William T. Piper Memorial Airport	Basic	Basic	Local
Albert Airport	Limited Use	Limited	N/A
Bandel Airport	Limited Use	Limited	N/A
Baublitz Commercial Airport	Limited Use	Limited	N/A
Beltzville Airport	Limited Use	Limited	N/A
Bendigo Airport	Limited Use	Limited	N/A
Bermudian Valley Airpark	Limited Use	Limited	N/A
Blue Knob Valley Airport	Limited Use	Limited	N/A
Braden Airpark	Basic	Limited	N/A
Brokenstraw Airport	Limited Use	Limited	N/A

Table 4-3: 2012 PA SASP Airport Classifications Summary (continued)

Airport	2002/2007 Classification	2012 Classification	FAA ASSET Classification
Butler Farm Show Airport	Limited Use	Limited	N/A
Butter Valley Golf Port	Limited Use	Limited	N/A
Centre Airpark	Limited Use	Limited	N/A
Cherry Ridge Airport	Limited Use	Limited	N/A
Cove Valley Airport	Limited Use	Limited	N/A
Danville Airport	Basic	Limited	N/A
Farmers Pride Airport	Basic	Limited	N/A
Finleyville Airpark	Basic	Limited	N/A
Flying Dollar Airport	Limited Use	Limited	N/A
Flying M Aerodrome	Limited Use	Limited	N/A
Gettysburg Regional Airport	Basic	Limited	Basic
Greensburg-Jeannette Regional Airport	Limited Use	Limited	N/A
Greenville Municipal Airport	Limited Use	Limited	Local
Grimes Airport	Limited Use	Limited	N/A
Hanover Airport	Limited Use	Limited	N/A
Husky Haven Airport	Limited Use	Limited	N/A
Inter County Airport	Limited Use	Limited	N/A
Jake Arner Memorial Airport	Basic	Limited	Local
Jersey Shore Airport	Limited Use	Limited	N/A
Kampel Airport	Limited Use	Limited	N/A
Keller Brothers Airport	Limited Use	Limited	N/A
Lakehill Airport	Limited Use	Limited	N/A
Lazy B Ranch	Limited Use	Limited	N/A
McGinness Field	Limited Use	Limited	N/A
McVille Airport	Limited Use	Limited	N/A
Mid-Atlantic Soaring Center	Limited Use	Limited	N/A
Mifflintown Airport	Limited Use	Limited	N/A
Morgantown Airport	Limited Use	Limited	N/A
Mount Pleasant/Scottdale Airport	Limited Use	Limited	N/A
Penns Cave Airport	Limited Use	Limited	N/A
Perkiomen Valley Airport	Intermediate	Limited	N/A
Pittsburgh-Monroeville Airport	Limited Use	Limited	N/A
Pottstown Municipal Airport	Intermediate	Limited	Local
Punxsutawney Municipal Airport	Limited Use	Limited	Unclassified
Reigle Field	Basic	Limited	N/A
Seamans Airport	Limited Use	Limited	N/A
Shippensburg Airport	Limited Use	Limited	N/A
Sky Haven Airport	Limited Use	Limited	N/A
Slatington Airport	Limited Use	Limited	N/A

Table 4-3: 2012 PA SASP Airport Classifications Summary (continued)

Airport	2002/2007 Classification	2012 Classification	FAA ASSET Classification
Smoketown Airport	Basic	Limited	N/A
Spring Hill Airport	Limited Use	Limited	N/A
Stroudsburg-Pocono Airport	Basic	Limited	N/A
Sunbury Airport	Limited Use	Limited	N/A
Van Sant Airport	Limited Use	Limited	N/A
Horsham Valley Airways Heliport	Special Use	Special Use	N/A
Penns-Landing- Pier 36 Heliport	Special Use	Special Use	N/A
Philadelphia Seaplane Base	Special Use	Special Use	N/A
Ridge Soaring Gliderport	Special Use	Special Use	N/A
Rocky Hill Ultralight Flight Park	Special Use	Special Use	N/A
Shoestring Aviation Airfield	Special Use	Special Use	N/A
Southern Adams County Heliport	Special Use	Special Use	N/A
Stottle Memorial Heliport	Special Use	Special Use	N/A
Sunbury Seaplane Base	Special Use	Special Use	N/A
Thermal G Glider Port	Special Use	Special Use	N/A
Total RF Heliport	Special Use	Special Use	N/A
W.P.H.S. Heliport	Special Use	Special Use	N/A

Source: BOA August 2013 Database, FAA ASSET 1 and 2 reports
Prepared: February 2014

Note: All commercial service airports were re-classified in 2007. General Aviation airports re-classified in 2007 that were NOT re-evaluated include Bedford County, Mifflin County, Washington County, Doylestown, Heritage Field formerly Pottstown-Limerick and Wings Field.

Chapter 5. State and Local Aviation Issues

I. Introduction

Gaining an understanding of current and future aviation issues/trends at the national, state, and local levels is an important step in Statewide Airport System Planning. The twelve issues listed below were first identified for detailed study consideration by the Bureau of Aviation and later prioritized to focus on the top three issues through collaboration with the Project Oversight Committee. This chapter presents the research findings for those issues related to fuel trends and costs, obstructions and runway approaches, and community involvement. The research findings for the remaining issues/trends are summarized and included in the Appendix.

A. Aviation Issues/Trends Studied

- Effect of increasing fuel costs on Commercial Airlines and General Aviation
- Airspace Obstructions and Approaches – benefits/costs of obtaining good minimums or qualifying for a preferred approach (i.e., LPV)
- Trends and Impacts of Community Opposition\Acceptance of Airport Development including land development and environmental permitting

B. Aviation Issues/Trends Summarized

- FAA's NextGen Program Impacts on Aviation Users and Airports
- Airline Industry Consolidation
- Marcellus\Utica Shale Impacts on Aviation Activity and Airport Land Use (Access, Sustainability, and Best practices using Private Public Partnerships)
- Airport Ground Accessibility to Population and Economic Generator Centers (Evaluate appropriate drive times)
- Leakage to Out-of-State Airports due to Accessibility, Pricing, Taxes, Airport Services and Convenience
- Best practices for improving cost estimating accuracy, project detail, and project delivery including factors (and remedies) that cause airport to delay grant acceptance (i.e., local permitting)
- Effect of reduced Essential Air Service at PA Airports
- Best Practices for linking the SASP goals with the Long Range Plans of MPO/RPOs
- Addressing the role of the FAA's new ASSET class structure within existing SASP classification structure

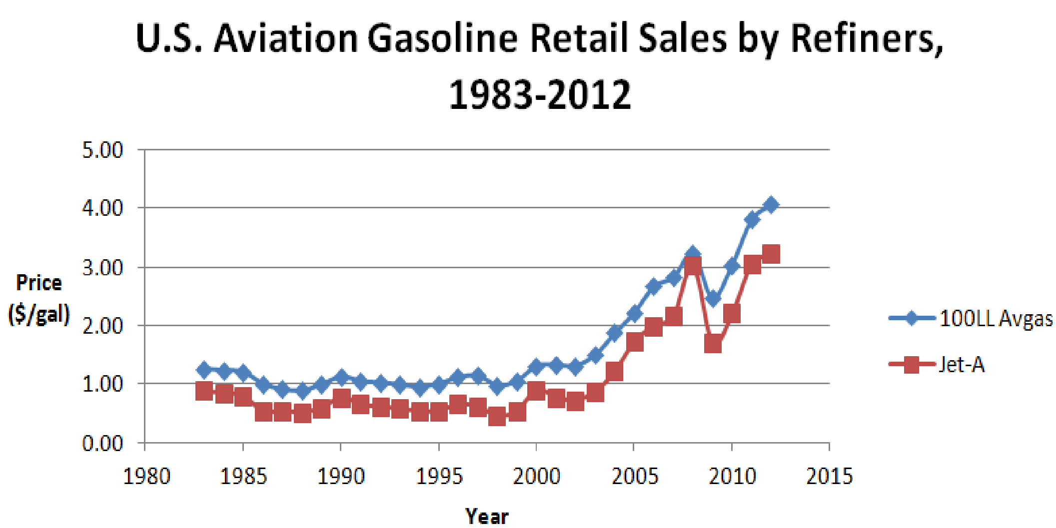
As shown above, there are a number of issues/trends facing the aviation industry that are likely to impact Pennsylvania airports now and for the foreseeable future. Understanding these issues/trends will provide insight to effectively plan for the development and preservation of PA's statewide system of airports.

II. Effect of Increasing Fuel Costs on Aviation

High fuel costs have directly impacted operating costs for not only airlines but airports as well. Airlines have passed these costs onto passengers, directly in ticket prices or indirectly by a reduction in available routes. These decisions in turn have impacted organizations and businesses using commercial aviation, including air service at PA airports. General Aviation has also been affected by high fuel costs resulting in reduced flight hours/operations by both corporate and recreational users. And less flying means less fuel sales which is a primary source of revenue at general aviation airports.

As seen in **Figure 5-1** below, fuel "sales" did decline temporarily in 2008 but mainly as a result of the Great Recession and the associated reduced demand. Prior to 2008, aviation fuel costs reached record heights, commensurate with crude oil at $149 per barrel, which impacted the aviation world dramatically. Recently, fuel costs have risen again as world economies improve and demand increases.

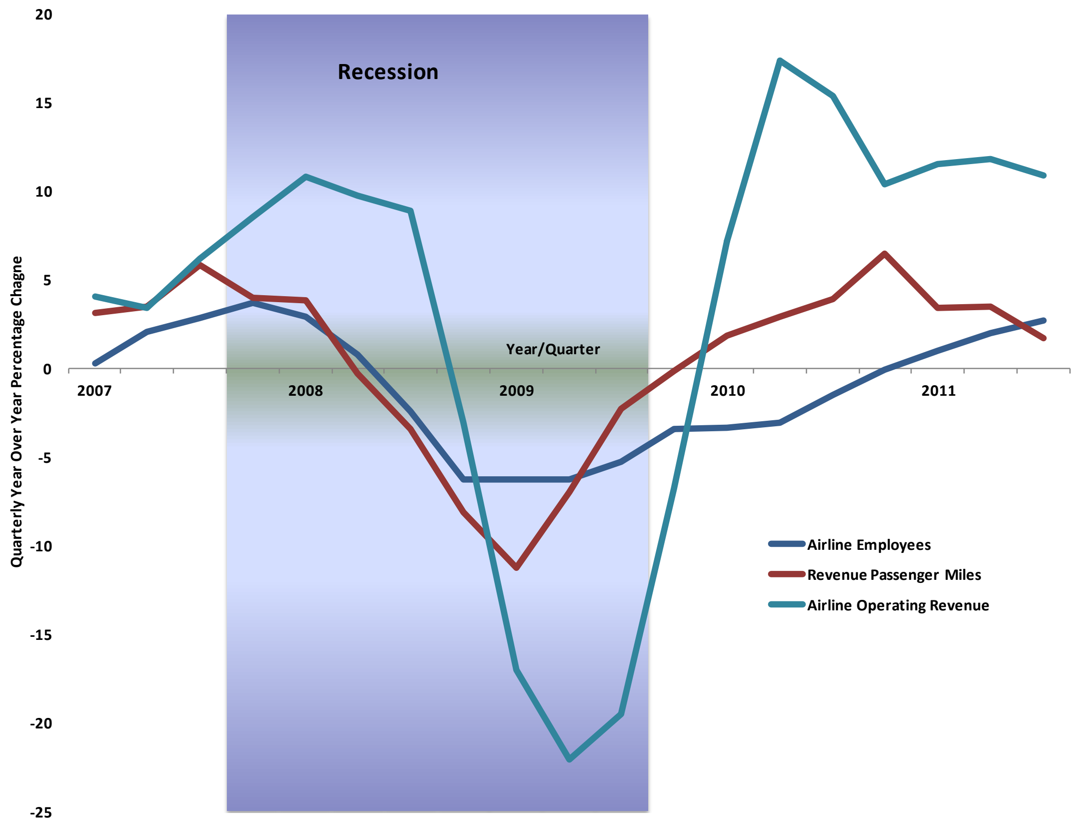
Figure 5-1: Historical Aviation Fuel Prices - US Dollars per Gallon



Source: U.S. Energy Information Administration

The financial crisis that began in the United States in 2007 quickly spread to the rest of the world, resulting in the “great” recession. The economic recovery in the aviation industry heavily depends on the economic recovery of the rest of the country's financial status and the willingness and financial ability of individuals and businesses to travel and use air cargo services. The recent growth in the economy is leading to increased travel demand and strong growth in airline operating revenues and Revenue Passenger Mile (RPM), but not industry employment. **Figure 5-2** below illustrates this.

Figure 5-2: Key Airline Economic Indicators during the Recent Recession and Recovery, Seasonally Adjusted at Annual Rates



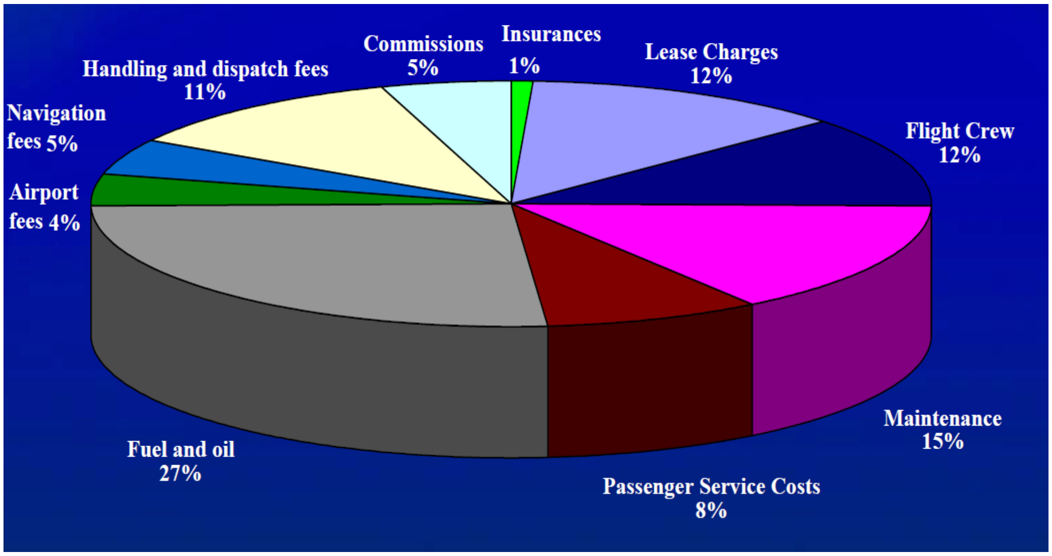
Source: US DOT, Bureau of Transportation Statistics

A. Changes

Commercial Airlines

Operating an aircraft is very costly and depends on many different factors. The recent recession led the airlines to reduce these operating costs significantly, impacting employment, passenger travel habits and new operating policies. **Figure 5-3** summarizes how total operating costs are compared for an airline.

Figure 5-3: Airline Direct Aircraft Operating Costs (ICAO)



As fuel prices have increased, Jet A's portion of operating costs has grown to more than 27%; therefore, airlines had to cut other costs to make up for these rising costs, by reducing flying, retiring older aircraft and replacing them with more fuel efficient models.

Different solutions to the high cost of fuel were implemented by various airlines to minimize their direct operating costs. These include:

- **Shrinking Service**: The practice of cutting capacity is another tool that airlines use to manage the impact of higher fuel prices. Airlines simply eliminate routes that are less profitable and replace larger, gas-guzzlers with smaller, lower capacity aircraft. Eliminating flights and grounding older, larger planes reduces operating costs and boosts profitability at the expense of some smaller communities. Many smaller communities have lost direct flights and now only have service to major hub airports or lost all air service. This results in reduced air travel in that region and those that must fly now must drive longer distances to the nearest commercial service airport.
- **Hedging**: Fuel hedging enable airlines to enter into a contract to pay a set price for their future fuel purchases. This strategy can help minimizing the impact of volatile fuel prices on their operating costs. Domestic airlines have different hedging strategies available to them, including the use of both over-the-counter and exchange-traded derivatives. Delta Air Lines is the first airline to purchase a refinery, in Philadelphia, to produce Jet A fuel and anticipates to save approximately 10% by cutting out the "middle man".

- **Greener Fleet**: the airlines are rapidly retiring older aircraft and investing in newer, more fuel-efficient aircraft. For example, Delta Air Lines has asked aircraft manufacturers for a proposal for a new single-aisle super efficient aircraft. The new, more fuel-efficient jet, would replace aging DC-9s, B737s, A320s and Boeing 757s. United Airlines, has acquired the new Boeing 787 which consumes 20% less fuel than the aircraft it replaces (including the B767) due to better aerodynamics and lighter weight due to the use of composite materials. All airlines have been asking the airframe manufactures for more efficient aircraft; they focused principally on all new replacements for the Airbus A-320s and Boeing 737s. Airlines could not wait on those and insisted on relief in the shorter term; this is why we now have the Boeing 737 MAX and Airbus A-320 NEO.
- **Fare Increases**: Usually higher fuel costs means higher ticket prices. According to FareCompare.com, in 2012 six fare increases have boosted prices by as much as $35 over what tickets cost on the same route in 2011. Traditional low-price leader Southwest Airlines joined in the fare increase instead of enjoying lower fuel costs once their fuel hedging advantage expired.
- **Extra Fees**: Most airlines are offsetting higher costs by charging passengers extra for everything from baggage to blankets. According to CIT's "Global Aerospace Outlook", nearly four in 10 airlines now charge passengers for food and their first checked bag. The trend is more common among U.S. carriers (75%) than European carriers (17%). Airlines have made over $2 billion in extra passenger fees in 2012, none of which is taxed nor funds the Aviation Trust Fund.
- **Fuel Surcharges**: In 2005, when oil prices hit $147 per barrel, airline sought refuge in tacking on hefty fuel surcharges, particularly on long haul international trips. Fuel surcharges on many international flights were from $200 to $500 for each round-trip ticket, particularly on U.S. - Asia routes.

General Aviation

The economic crisis and the rise of fuel costs also affected General Aviation (GA) significantly. GA has been decreasing since 1982 in terms of numbers of operations, hours flown, active pilots based on data tracked by the FAA. This can be linked to fuel costs since GA piston aircraft are becoming a smaller and smaller portion of the fleet and the demand for Avgas is decreasing. Consequently, as demand for Avgas decreases it becomes more expensive for refineries to produce so they run smaller batches. A recent survey of operators from across the country found the purchase of Avgas has dropped by 30% to 40% and the purchase of Jet-A fuel has fallen by 10% to 20%. In addition, according to FAA data, the hours flown by piston aircraft has continued to decline since 2002 while the use of turboprop and turbojet aircraft has risen. This can be seen below in **Table 5-1.**

Table 5-1: Hours Flown by Aircraft Type

		GENERAL AVIATION AND AIR TAXI *TOTAL HOURS FLOWN BY AIRCRAFT TYPE* 2002-2010 (HOURS IN THOUSANDS)								
AIRCRAFT TYPE	**% Chg**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
Fixed Wing Piston	-26%	13,979	13,634	15,074	16,257	16,525	16,434	18,142	19,013	18,891
Fixed Wing Turboprop	26%	2,325	2,215	2,457	2,661	2,162	2,106	2,161	1,922	1,850
Fixed Wing Turbojet	23%	3,375	3,161	3,600	3,938	4,077	3,771	3,718	2,704	2,745
Rotorcraft	82%	3,405	3,003	3,222	3,245	3,446	3,056	2,533	2,135	1,876
Other Aircraft	-46%	181	178	209	215	211	267	249	263	333
Experimental	-9%	1,226	1,286	1,155	1,275	1,218	1,339	1,322	1,292	1,345
All Aircraft	**-9%**	**24,491**	**23,477**	**25,716**	**27,592**	**27,639**	**26,973**	**28,126**	**27,329**	**27,040**

Source: Federal Aviation Administration

A recent study by MIT concluded that higher fuel prices lead to less flying. The study, "Current and Historical Trends in General Aviation in the United States," included a survey of pilots on their past and future flying habits and what affects it. The results of the survey confirm what the trends implied: economic recessions and fuel costs are major factors that impede the growth of aviation activity. It further confirms that the number of hours flown remains strongly related to the cost of fuel. This is a strong reason why pilots/airports are looking for ways to reduce their cost of flying.

Fuel costs are also changing operational behaviors; FAA recently reported that activity at general aviation airports is down significantly. An aviation consulting group conducted a recent informal survey of fixed base operators (FBOs) at general aviation airports, and found that the vast majority (98%) of those who continue to fly cite rising fuel costs as a concern and are taking measures to minimize consumption. Among those surveyed:

- 28% request more direct routings
- 15% have started tankering their fuel
- 40% reported flying at slower speeds to save fuel
- 19% have cut back on hours flown
- 76% reported customers switching airports/FBOs for lower priced fuel

Eighty-five percent of the companies that utilize business aviation in the United States are small and mid-size businesses, representing many different types of industries. A top-tier fractional provider recently announced layoffs due to fuel costs and reduced flying. In addition, FBOs on average now participate in four different fuel card or fuel discount programs to save money for their own flight operations and those of their aviation customers.

One solution to reducing fueling costs is the use of self-service fuel stations. According to AirNav, of the 3,600 FBOs listed, about one-third offer self-service fuel stations which have many benefits:

- Lower personnel and fuel truck costs for their owners.
- Preferred by most GA pilots for the convenience they offer.
- Generally available 24/7, increasing the total amount of fuel sold.
- Free up fuel trucks for an FBO’s larger clients that need truck refueling.
- Lower costs of acquisition and operation allow small airports to offer fuel.
- Result in lower fuel prices and hence more flying activity.

According AirNav data, self-service fuel is about $1 less per gallon than full-service fuel.

B. Effects on the Pennsylvania Airport System

The future of the most widely used aviation fuel used by piston aircraft, Avgas, is currently in question because of decreasing levels of demand limiting the available supply to airport. As of 2013, a gallon of Avgas in Pennsylvania averages $6.32 per gallon while the United States average is $6.15. For Jet A, the average price in Pennsylvania per gallon is $5.67 whereas the US average is $5.45. Along with increased fuel prices, the availability of Avgas fuel threatens older GA aircraft in the near future.

The imminent demise of leaded aviation fuel has been discussed, debated, and planned for more than 30 years. Avgas is becoming more and more unavailable and its price is rising and becoming very expensive for pilots. The Environmental Protection Agency (EPA) has proposed new rules to require the use of unleaded fuel. Rob Hackman, AOPA vice president for regulatory affairs explained that "Avgas will continue to be available for the near term, but the need to transition to an unleaded fuel is being driven by economic and environmental concerns." While the future of Avgas is being debated, there are other fuels already available across the world. Two of these are motor fuel such as Mogas/gasoline and diesel.

Opportunities/Issues

Studies and aviation experts all agree that in addition to being expensive, the availability of Avgas (100LL) is declining throughout North and South America. The primary reason for its decline stems from a consistent decline in Avgas sales throughout the US and Brazil as well as the cost of production at the refinery. According to data published by the US Energy Information Administration (EIA), Aviation Gasoline (100LL) sales in the US decreased from approximately 1,000 gallons sold each day in 1983 to about 500 gallons per day by 2010, an average annual decrease of 9 percent per year.   Many aviation gasoline producers such as Shell Mobile continue to reduce the amount of 100LL refined each year. This is both a result of supply and demand economics as well as a strategy used to continue an increasing trend in 100LL fuel prices over time. The decrease in 100LL sales further reflects the decrease in piston aircraft activity throughout the US. As a result, general aviation airports are often one of the first businesses to be impacted by a shrinking marketplace. Finally, the EPA has been leading an effort for many years to reduce and ultimately eliminate the use of leaded fuels for health related reasons.

An alternative to 100LL is beginning to be available in the US. The use of Mogas and diesel fuels are becoming more popular among traditional general aviation users. Their costs are lower than 100LL and are more efficient than traditional aviation fuels. The primary challenge in their widespread use is the acceptance among pilots as being a safe, effective and easily accessible alternative to 100LL.

Trends

Two fuels type have been researched as potential alternatives to Avgas since the early 1980s when leaded fuel became EPA's next target to reduce lead exposure: Mogas and Diesel. A study by the Aviation Fuel Club released in July 2012 indicates that between 80% and 83% of the current fleet of piston engine aircraft could safely operate on Mogas. The FAA has gradually approved the use of cheaper Mogas through Supplemental Type Certificates (STCs) in an increasing number of reciprocating engines to replace Avgas.

In 1998, a new diesel engine flew in a converted Avgas piston airplane. Today, close to 4,000 singles and twins diesel engines are flying. Will diesel engines become a trend in aviation? "Too early to judge" says many pilots and FBOs. The **Table 5-2** below compares the benefits and costs associated with these types of fuels.

Table 5-2: Fuel Type Comparisons

Fuel Type	Characteristics	Benefits	Costs
Avgas (100LL)	High lead content	Operates safely and reliably in older piston engine aircraft	$6.20/gal avg. Will be phased out eventually
Mogas/Autogas	Lead free fuel that FAA has approved numerous STCs.	Widely available, 80% of current piston fleet can use it.	$4.75/gal avg. But not available at many airports. Requires new storage tank. Aircraft engines do not tolerate Ethanol.
Jet A/Diesel	Lead free and two manufacturers have sold almost 4000 new piston engine, diesel aircraft.	Widely available, conversion packages for Avgas engines are available. Can use existing Jet A tank.	$5.50/gal avg.

Alternative Fuel Dispensing Considerations

New fuel storage tanks and pumps are expensive; around $400,000 for a 20,000 gallon tank. However the Aviation Fuel Club, for example, offers help to airports and FBOs find low-cost options, such as a small military surplus fuel trailers. U-Fuel has also developed a line of smaller, self-service Sport Fuel stations ideal for general aviation airports wishing to add Mogas. Self-service fuel facilities are becoming common at general aviation airports across the country. The pilots can fuel their general aviation aircraft 24 hours a day, seven days a week and the fuel cost to pilots was reduced because of the airport's labor cost savings. The ease of installing a self-fueling facility encourages many GA airports to invest in this system.

It may be too early for airports in Pennsylvania to invest in Mogas and diesel fuel tanks and pumps. However, airports will need to weigh the pros and cons of providing alternative fuels to their customers.

C. What Are Other States Doing?

There are several airports in other states offering Mogas to their customers. Mogas is found at five airports in Alaska, seven airports in Alabama, six airports in California, sixteen airports in Iowa and thirteen airports in Illinois. Some other states such as Arkansas, Arizona, Colorado, Connecticut, Delaware, Georgia, Idaho, Indiana, Kansas, Louisiana, Maryland, Michigan, Minnesota, Ohio, Oregon and Texas offer Mogas as well but only two or three airports in each of them carry this fuel. In Pennsylvania, only Mifflintown, Reigle Field, Punxsutawney Municipal and Skyhaven carry Mogas on site.

However, while the actual installation process is relatively simple, complying with the many codes and regulations can be daunting. Because of the environmental and fire-safety concerns that fueling generates, self-service facilities must comply with codes regarding aircraft fuel servicing, aircraft fueling ramp drainage, loading/ unloading containment, and a host of other site-specific codes. Airport managers must consider the relevant fire-safety, environmental, and security requirements before they decide to go ahead with plans to install a facility.

Ultimately, it is recommended that airports continue to monitor industry trends and determine what fuel options they should provide to best meet the needs of their customers.

III. Protecting Airspace and Runway Approaches

The safety and access benefits of obtaining a preferred approach at an airport are obvious to users and airport sponsors alike. Since 2002, many PA airports have benefited from the FAA's NEXGEN initiative and advancement of Global Position Satellite (GPS) based navigation and approach procedure development. This new technology has certainly reduced costs to install and maintain ground based equipment across the National Airspace System (NAS). However, there is a growing concern that the necessary land and infrastructure related costs needed at the airport to maximize the benefit of the new approach are not considered until the approach development is underway.

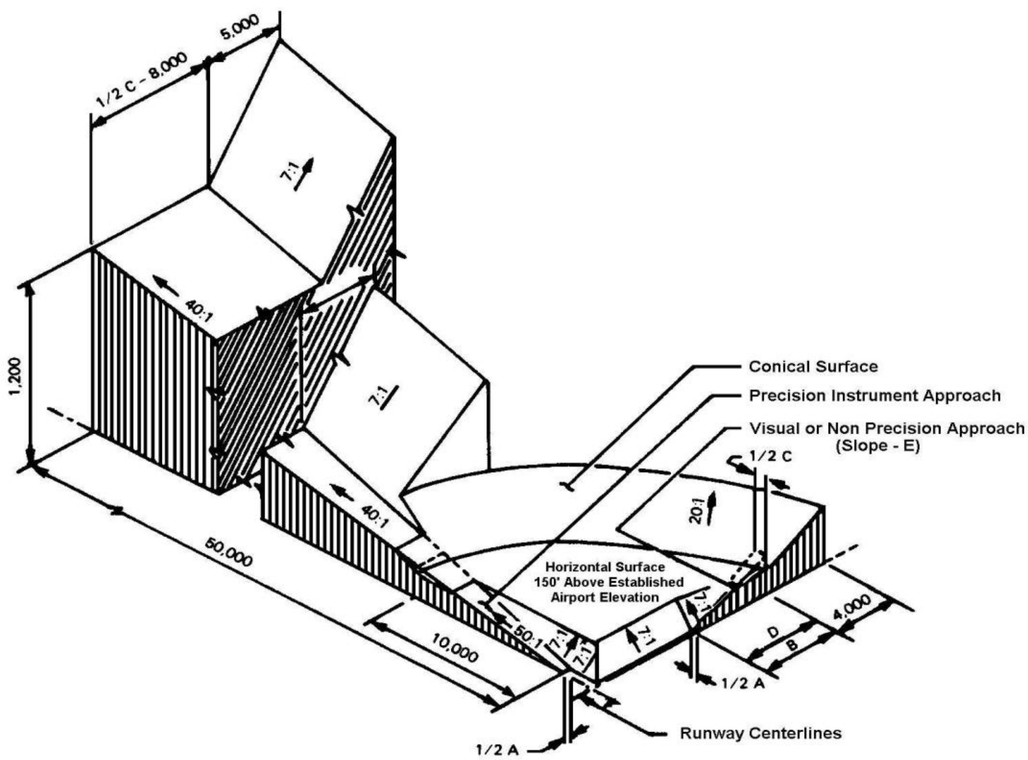
As background, Title 14 of the Code of Federal Regulations Part 77 establishes standards for determining obstructions in the navigable airspace. The prime objectives of the FAA are to promote air safety and the efficient use of the navigable airspace. To accomplish this mission, aeronautical procedures, rules and standards have been established by FAA.

Obstructions to air navigation have been a recurrent problem at many airports around the country. Obstructions can vary from vegetation, structures, mobile objects, and towers. **Figure 5-4** depicts the imaginary surfaces of Part 77. Title 14 of the CFR Part 77 establishes five different imaginary surfaces, designed according to the properties of a runway, in which any object can be an airspace obstruction. These five surfaces are the conical surface, transitional surface, primary surface, horizontal surface and approach surface. The acreage associated with a Part 77 visual, non-precision and precision approach area increase as the approach type complexity increases, as summarized below:

- Visual approach 20:1 - 86 acres
- Non-precision approach 34:1 - 460 acres (>3/4 mile) and 576 acres (=3/4 mile)
- Precision approach 50:1 – 2,008 acres (excluding 40:1 segment 10,200’ from runway end)

This illustrates the vast real estate/area requirements associated with the various runway approach categories as they increase in precision.

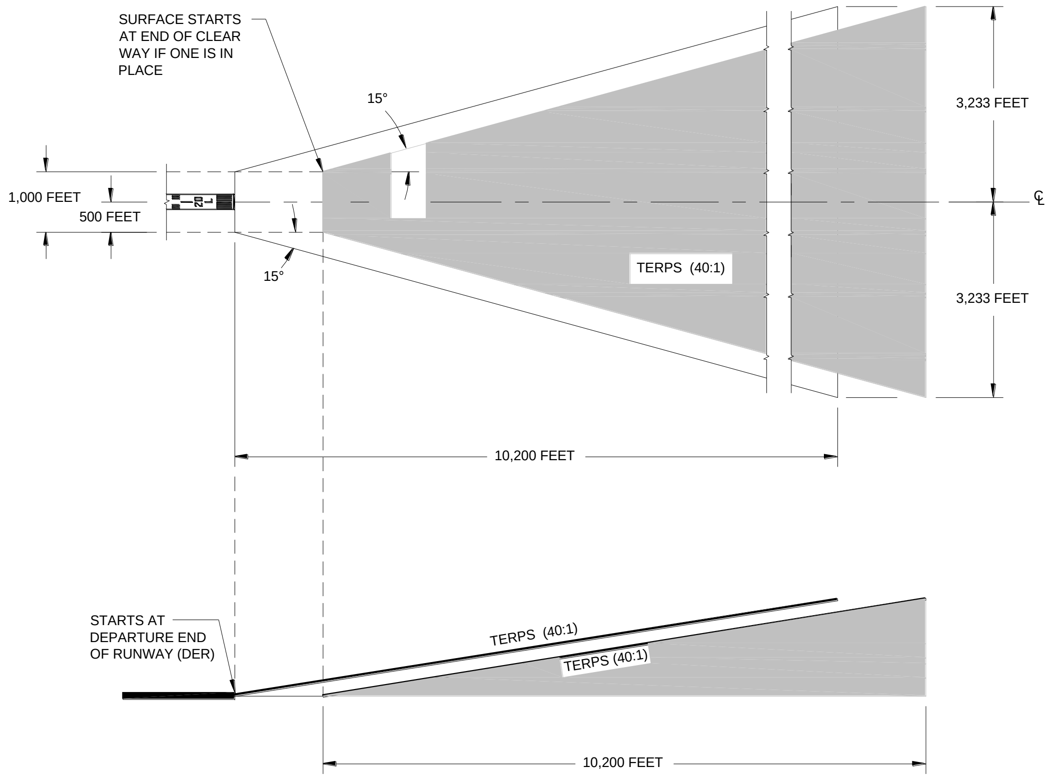
Figure 5-4: Part 77 Imaginary Surfaces



If a runway has an instrument departure procedure then a Terminal Area Procedure (TERPS) departure surface is required. The departure surface has a 40:1 slope and is wider than visual and non-precision Part 77 approach surfaces. Thus even though Part 77 surfaces are clear, the minimums for instrument departures may be high due to obstructions outside Part 77 but penetrating the 40:1 TERPS surface.

Figure 5-5 illustrates the dimensions of this instrument departure surface. The area associated with this 40:1 surface is 883 acres.

Figure 5-5: TERPS Departure Surface 40:1



A. Runway Approaches

When the FAA develops an approach for a particular runway at an airport, it builds in safety margins to allow for pilots deviations, instrument errors, and terrain or obstacle conditions. Criteria for instrument approaches are spelled out in the FAA Handbook 8260.3B United States Standards for Terminal instrument Procedures (TERPS).

A runway approach is classified as either visual or instrument. Visual approaches do not require the presence of visual aids to perform an aircraft landing. In contrast, instrument approaches provide both vertical and/or horizontal guidance to aid pilots during landing. Instrument approaches are further classified as precision and non-precision approaches. Non-precision approaches provide horizontal only guidance to the pilot while precision approaches provide both horizontal and vertical guidance. All instrument approaches have visibility minimums which consist of Decision Height (DH), Runway Visual Range (RVR), and have a corresponding glide slope. The criteria for determining visibility minimums are largely associated with the area surrounding the airport and the location of any obstructions.

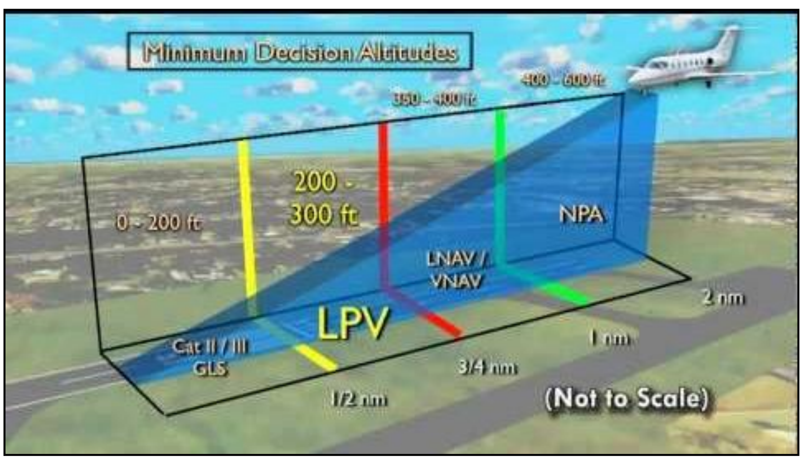
It should be noted that the Threshold Siting Surface, Departure Surface and in some cases the Obstacle Clearance Surface needs to be evaluated as these also affect the obstacle clearing requirements to get a particular type of approach.

B. Localizer Performance with Vertical Guidance (LPV)

A Localizer Performance with Vertical Guidance (LPV) approach is the most advanced instrument GPS approach type currently available without specialized aircrew training requirements. LPV approaches use the Wide Area Augmentation System (WAAS) to provide enhanced vertical guidance. The landing minimums are similar to those in an Instrument Landing System (ILS) with a decision height of 200 feet and visibility of 1/2 mile. Without WAAS capabilities, pilots flying in poor visibility conditions might otherwise have to fly to an alternate airport, if no ILS is available.

An LPV approach is similar to the precision of an ILS. LPVs utilize WAAS capabilities for precise horizontal and vertical guidance, classifying it as a near precision approach. Only ILS is more precise today, according to the FAA, at the end of the year 2012, there were 3,030 LPV approaches published. **Figure 5-6** shows where LPVs fall within the different Minimum Decision Altitudes types.

Figure 5-6: Minimum Decision Altitudes



The advent of WAAS enabled LPV approaches has resulted in many benefits to pilots and airports. Pilots now have the ability to operate from airports previously un-useable given surrounding terrain, airspace obstructions and/or poor visibility. WAAS enabled LPV approaches provide the most precise satellite-based navigational tool available today. In general, GPS accuracy has improved DH from approximately 330' above ground level (AGL) to approximately 200' AGL with WAAS. The incremental improvement in DH enables pilots to have a better view of the runway environment and determine the presence of potential obstructions on descent. For airports, WAAS enabled LPV approaches have created a new market for airports seeking corporate/business jet activity. This results in newfound fuel sales, maintenance opportunities and potential cargo operations. Finally, airports have WAAS enabled LPV approaches provide a higher sense of certainty for pilots operating in unfamiliar territory.

The biggest benefit from implementing LPV approaches is that with properly equipped aircraft, operators will save time and money by using WAAS. Since LPV approaches utilize satellite technology, no expensive ground equipment is necessary, thus no regular maintenance needed further reducing costs for FAA and/or airport.

C. Implications for Pennsylvania

By the end of 2012, there were 54 ILS and 66 LPV approaches published for airports in Pennsylvania. The trend of the FAA publishing LPV approaches continues throughout the Commonwealth. However, upgrading a runway with a satellite-based approach may require additional airspace to be cleared and if the upgrade is from a non-precision to a precision approach, it widens the primary surface and results in many new obstructions. In addition, land area and airspace corridors increase significantly when upgrading from a non-precision to a precision approach. Most of these areas are beyond the typical airport property boundary and thus require additional cooperation with the surrounding communities. This could mean trees and other obstacles, typically not controlled by the airport, need to be removed, lowered or lit with obstruction lights. Without these mitigation measures, the benefits of the improved approaches cannot be fully realized.

The following summarizes the benefits and costs associated with LPVs and other vertically guided approaches to both PA airports and the BOA.

Benefits:

- The implementation of LPV approaches with WAAS capabilities results in a potential increase in revenue for smaller airports by increasing aircraft usage. Smaller airports having this type of approach are no longer limited by only runway length as the determining factor in attracting business/corporate aircraft activity.
- Corporate and General Aviation Airports prefer LPV type approaches because they cost much less than ILS systems. Additionally, there is no LPV equipment maintenance or replacements necessary; therefore, less expensive for both individual airports and PA Airport System.

Costs:

- For airports to take full advantage of WAAS-based vertically guided approaches airports, with the support of BOA, must meet FAA's criteria identified in Advisory Circular 150/5300-13A Airport Design, which includes such facilities requirements as minimum runway lengths, parallel taxiways, runway lights, etc.
- Airports will also need to keep their runway approaches clear, particularly the specific TERPS surfaces associated with these WAAS approaches to achieve the full approach minimums desired by pilots.

IV. Trends and Impacts of Community Opposition\Acceptance of Airport Development

Pennsylvania like other states continues to see the complexity and cost of airport development increase proportionally with the increase and proximity of community residential development. More often than not this type of land use creates significant maintenance and development challenges for both the airport and statewide airport system. Communities that do not consider the airport in their land development plans, set the stage for local opposition to the airport and development projects.

Pennsylvania's general aviation airports are located in rural, suburban and urban locations all of which can be challenging from a development perspective even if the airport has existed there for decades. While the majority of airport improvement takes place on airport property, airport project delivery can be impacted when surrounding communities believe any development is bad and are willing to encourage delays or denial of local permits.

Airport infrastructure expansion projects face the greatest level of public scrutiny. In most cases, residents are skeptical and focus on the possible negative impact of the airport expansion plans. Residents are less likely to accept at face value the benefits that airports bring to their communities and are more likely to focus on the negative impacts of airport operations. To counter the negativity of airport expansion projects, Airports are including the communities in their Airport Master Plan projects to keep the community apprised of proposed airport development

A. Land Use and Development Regulations in PA

The PA Municipalities Planning Code (MPC) establishes the framework for land use planning and regulation in Pennsylvania and lists the following permitted types of land use ordinances: 1) Official Map, 2) Subdivision and Land Development, 3) Zoning, 4) Planned Residential Development Provisions (PRD) and Traditional Neighborhood Development Provisions (TND) as part of the zoning ordinance.

The Commonwealth has 2,565 local governments, all with local land use decision making power. Although zoning is the second most common type of land use ordinance, they are hardly universal:

- 1,650 municipalities, or 60%, have zoning regulations.
- 90% of PA's population resides in zoned communities.
- Eleven of 67 counties, or 16%, have adopted some type of county level zoning.
- Municipalities that are not zoned comprise 50% of the state's total land area, but only 10% of the total state population.
- Nearly 96 percent of the municipalities lacking zoning are classified as "rural",
- Only 2.3% of Pennsylvania's land area that is classified as "rural" has zoning protection.

Additional land use legislation related to airport zoning, known as Act 164, the Airport Zoning Act, was passed in 1984. In order to prevent the creation or establishment of airport hazards, Act 164 states that "*every municipality having an airport hazard area* within its territorial limits *shall adopt, administer and enforce, under the police power and in the manner and upon the conditions prescribed in this subchapter and in applicable zoning law unless clearly inconsistent with this subchapter".*

Despite the fact that Act 164 requires that local governments adopt airport zoning, there are many municipalities with airports that still do not have airport zoning. Within PA, there are currently:

- Over 130 public-use airports
- About 768 municipalities are required to enact Airport Hazard Zoning
- Only about 44% of those municipalities required to enact Airport Hazard Zoning have complied

While compliance is still on the low end, notable gains in Airport Hazard Zoning have been realized with the number of compliant municipalities doubling since the 2002 SASP. In fact most of these gains can be attributed to the successful implementation of the Bureau's 2010 Airport Hazard Zoning Outreach Project that included a streamlined model ordinance and educational material, as well as technical and funding assistance. It is, however, important to note that since Act 164 focuses primarily on airspace protection, it is likely that land use issues will continue to challenge airports not actively engaged in the local community planning and economic development process.

B. Changes Since the 2002 SASP

In addition to the continued encroachment of residential development near airports, advances in air navigation technology and expanding storm water management requirements have added increased land use complexities for airports.

Since 2002 many PA airports have benefited from the increased precision and availability of NEXTGEN technology. These satellite based approaches have certainly reduced costs to install and maintain ground based equipment. However, the “land use” related costs for an airport to implement a new precision satellite based approach are often underestimated. These costs are predominately related to the increased “area” impacted by approach and design standard clearance requirements. The GPS approach called LPV (Localizer Performance with Vertical Guidance) provides near precision guidance for pilots without the need for expensive ground based equipment, such as a localizer and glideslope which are associated with an Instrument Landing System (ILS). However, upgrading a runway with a satellite-based LPV approach may require additional airspace to be cleared. These land areas and airspace corridors increase significantly when upgrading from a non-precision to a precision approach. In addition, much of these areas are beyond the typical airport property boundary and thus requires additional coordination and cooperation with the surrounding communities. Nearby areas that were not affected by the airport are now in the LPV approach area. This could mean trees and other obstacles, typically not controlled by the airport, need to be removed, lowered or lit with obstruction lights. Without these mitigation measures, the benefits of the improved approaches cannot be fully realized. And without strong local community outreach programs by the airport, these new issues could be daunting and may create tension with the airports neighbors.

Recently adopted stormwater management regulations by the Pennsylvania Department of Environmental Protection (DEP) have impacted airport projects by creating delays and increased costs for airports around the Commonwealth.

In the past, stormwater control was provided only on a site-specific basis without evaluating the impacts of future improvements. Revised DEP Erosion and Sedimentation Control and Stormwater Management regulations (25 PA Code Chapter 102) were enacted in November 2010 to comply with US Environmental Protection Agency requirements. In November 2012, DEP’s Bureau of Point and Non-Point Source Management developed Standard Operating Procedures (SOPs) for the National Pollutant Discharge Elimination System (NPDES) and Water Quality Management (WQM) permits it administers through the Clean Water Program in regional DEP offices. The SOPs were developed to facilitate implementation of DEP’s Permit Review Process (PRP) and Permit Decision Guarantee (PDG) policy. As a requirement for the NPDES permit, each permit holder must now implement and enforce a stormwater management program that reduces the discharge of pollutants to the maximum extent practicable.

This is significant as many airports do not have storm water management programs in place but are now required to obtain the NPDES permit. In addition, more of an airport's limited land area must be used to accommodate stormwater mitigation projects. If standing water results it could be deemed to be an attractant to wildlife and in conflict with FAA design requirements/policies. Guidance found in FAA Advisory Circular 150/5200-33B '*Wildlife Hazards Attractants On or Near Airports*' should be employed to minimize potential risks.

This creates a challenge in design as the airport pursues compliance with both state and federal requirements. Thus, any change, however small, can result in more costly and land intensive stormwater management techniques, delaying or prohibiting development until the proper plans can be developed. The increased cost to address stormwater related issues could range from 10% to 25% based on the complexity of the stormwater management system requirements.

C. Benefits and Costs of Aviation to Local Communities

Airports provide a vital link to regional, national, and international markets to many businesses in Pennsylvania. A portion of the revenues generated by local businesses can be attributed to their access to the markets they serve and airports play a vital role in that access. The 2011 Airport Economic Impact study documents the significant economic contribution aviation has in supporting and encouraging economic development across the Commonwealth.

Statewide, regional and local economic activities, employment, and payroll can be attributed, directly and indirectly, to the operation of a local airport. Yet these benefits are often minimized by those living near airports that do not see what's in it for them.

Open and on-going communication with the community designed to help airport neighbors understand the importance and benefits of "their airport" should be a primary objective of every airport. Whether it's a new airport being developed in a new location or expansion to an existing airport to meet demand, public opposition can follow if airports are not actively communicating with its neighbors and local officials. In some locations, there is a history of mistrust between the airport and the community that only exacerbates these tensions. Clearly, this type of situation is difficult to overcome but with consistent efforts an airport can mend relationships and create a cooperative coexistence.

While the transportation benefits of an airport should be obvious, the services that a community experiences by the continued development and maintenance of an airport are not always apparent to the average resident. These benefits are reflected in the value of time saved and cost avoided by users of the air transportation system, whether its freight and passenger transportation for businesses and individuals, tourist access with their related spending, hospital or military transport, and emergency evacuation.

Intangible benefits of an airport are a sense of community pride, the possibility of attracting other businesses, and the support of related aviation activities. These benefits cannot be readily expressed in dollars, but they are valued benefits to many in a community. Without the airport, the benefits would not exist or would not be easily recognized.

Thus when it comes to airport improvement projects, regional economic development and business interests are often supportive of airport development, and local residents, whom may be more directly impacted, can be opposed. Since this stems mostly from people not understanding aviation, airports have a significant on-going responsibility to continually raise awareness in their communities.

D. Trends in Public Relations and Community Engagement

Public Relations (PR) is the art and science of establishing relationships between an organization and its stakeholders. Airport public relations plays a key role in helping airports create strong relationships, convey the benefits of aviation to the community, promote air service and airport businesses, and instill public confidence in the airport's ability to handle crisis. Public relations are one-way communications, meaning messages are released to the media or other outlets, but the public is not expected or encouraged to respond. Community engagement or public involvement on the other hand fosters two-way communications, and assumes both the airport and stakeholders/general public have input on airport improvement projects that may or may not affect the community. It consists of the process, procedures, and systems to communicate timely, accurate, and accessible information. Public Involvement Plans which include tools and techniques that engage audiences are being increasingly utilized, as the public has become more sophisticated and interested in transparency and involvement. The International Association of Public Participation defines the following levels of participation and typical techniques that address them, as depicted in **Figure 5-7.** In addition to the techniques listed below, social media is being used increasingly because it can be very effective, reaches a large audience and yet is inexpensive.

A best practice recommended by the Aviation Council of Pennsylvania is the use of ongoing advisory committees to assist with public engagement and support. In their September 2012 Newsletter, they highlighted the use of Airport Advisory Boards, which usually are comprised of a cross section of stakeholders, be it individual businesses or

Figure 5-7: Spectrum of Public Participation

IAP2 Spectrum of Public Participation

iap2
International Association for Public Participation

Increasing Level of Public Impact →

	Inform	Consult	Involve	Collaborate	Empower
Public participation goal	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
Promise to the public	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.
Example techniques	▪ Fact sheets ▪ Web sites ▪ Open houses	▪ Public comment ▪ Focus groups ▪ Surveys ▪ Public meetings	▪ Workshops ▪ Deliberative polling	▪ Citizen advisory committees ▪ Consensus-building ▪ Participatory decision-making	▪ Citizen juries ▪ Ballots ▪ Delegated decision

business organizations, environmental groups, community associations, etc. At monthly or quarterly meetings board members are educated about the challenges of effectively and efficiently running an airport, which can make them more effective spokespeople for the airport to the community.

E. Summary

The key to public acceptance of airport projects is operating in an open, cooperative and transparent manner. It's also important to explain that that everyone may not agree, but providing a forum for the public to become informed, to meet and talk with the airport and its supporters, including the politicians, can lead to a more civil discourse about the airport itself, its benefits to the community it serves, and its specific projects. The airport is a community asset and making sure the community understands and accepts this is part of public engagement activities. Good public relations, community involvement and engagement activities are important to the success of every airport development project.

Establishing and maintaining good relations as a business practice at airports will provide the basis for support and cooperation needed when the controversial project does arise.

CREATING AN AIRPORT ADVISORY BOARD

Today more than ever, public-use airports have to work even harder to keep the ship headed in the right direction. Staying connected to your costumers is absolutely essential if you intend to keep your business model on solid ground. One of the ways to help keep your airport engaged with your customers is by establishing an **airport advisory board** or **committee**.

Airport managers and sponsors need to recognize that every person that steps foot on their airport is a customer. If an airport has scheduled passenger service, every enplaned passenger is your customer. If you operate a general aviation airport, every person that steps onto your property is your customer.

The creation of this type of work group should be looked at as an extension of the airport with the establishment of deeper roots into the community. Advisory boards can help create important connectors between the airport and the local business and citizenry.

Advisory boards are not intended to replace the governing body of the airport such as airport authority members.

Who should be considered for a sea: at that table?

In most cases, it is best to have the CEO or top leader of an organization be invited to participate. There may be times when a person is requested to fill a seat due to the specialty of their career path, ie., senior vice president of marketing or finance.

Here is a list of possible categories to consider when forming an advisory board:

- Economic development agency
- Chamber of commerce
- Media TV, radio, newspaper and web-based
- Local elected officials and/or a representative
- State elected officials and/or a representative
- Tourism agency
- Local Entrepreneurs
- Medical industry
- Finance/banking/legal

The creation of an advisory board is like adding another set of helpers for both the good and not so good times. These are people who live, work and play in the community. They have a vested interest in wanting to see the local airport remain viable, vibrant and forward looking.

Advisory boards will normally meet four to six times each year. There may be occasions when more time investment may be required based on the airport and related needs. Airport operators of all sizes should highly consider this addition to their business model.