Chapter 3
Projections of Aviation Demand

This chapter contains aviation activity forecasts for the University Park Airport (Airport) over a 20-year planning horizon. Aviation demand forecasts are an important step in the master planning process. Ultimately, they form the basis for future demand-driven improvements at the Airport, provide data from which to estimate future off-airport impacts, such as noise and traffic, and are incorporated by reference into other studies and policy decisions. This chapter, which presents aviation activity forecasts through 2030, is organized as follows:

The Federal Aviation Administration (FAA) projects future aviation activity through its Terminal Area Forecasts (TAF) which were used to compare projections prepared for this master plan. Forecasts that are developed for airport master plans and/or federal grants must be approved by the FAA. It is the FAA's policy, listed in Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, that FAA approval of forecasts should be consistent with the TAF. Master plan forecasts for operations, based aircraft and enplanements are considered to be consistent with the TAF if they meet the following criteria:

- Forecasts differ by less than ten percent in the five-year forecast and 15 percent in the ten- or 20-year period

If the forecast is not consistent with the TAF, differences must be resolved prior to using the forecast in FAA decision-making. This may involve revisions to the airport sponsor's submitted forecasts, adjustments to the TAF, or both. FAA decision-making includes key environmental issues (e.g., purpose and need, air

quality, noise, land use), noise compatibility planning (14 CFR Part 150), approval of development on an airport layout plan and initial financial decisions.

This chapter examines data that pertains to aviation activities and describes the projections of aviation demand. It should be noted that projections of aviation demand are based on data through the year 2012, as this was the most recent calendar year for which a full 12 months of historical data was available at the time these forecasts were developed in May 2013.

3.1 Forecasting Approach

A number of forecasting techniques that range from subjective judgment to sophisticated mathematical modeling may be used to project aviation activity. These forecasts incorporate local and national industry trends in assessing current and future demand. Socio-economic factors such as local population, retail sales, and employment have also been analyzed for the effect they may have had on historical and may have on future levels of activity. The comparison of the relationships among these various indicators provided the initial step in the development of realistic forecasts for future aviation demand.

The following sections provide an assessment of historical trends of aviation activity data at the local and national level. Aviation activity statistics on such items as passenger enplanements, aircraft operations and based aircraft are collected, reviewed and analyzed. Since a large number of variables affect a facility plan, it is important that each one be considered in the context of its use in the plan.

In statistical analysis, correlation (often measured as a correlation coefficient) indicates the strength of a linear relationship between two independent variables. In this analysis, the Pearson product-moment correlation coefficient is calculated for some methodologies. The closer the correlation coefficient is to 1.0, the stronger the correlation between the variables. Methodologies used to develop forecasts described in this section include:

- Time-series methodologies
- Market share methodologies
- Socio-economic methodologies

3.1.a Time-Series Methodologies

Historical trend lines and linear extrapolation are widely used methods of forecasting. These techniques utilize time-series types of data and are most useful for a pattern of demand that demonstrates a historical relationship with time. Trend line analyses used in this chapter are linearly extrapolated using the least squares method to known historical data. Growth rate analyses used in this chapter examined the historical compounded annual growth rates (CAGR) and extrapolated future data values by assuming a similar CAGR for the future.

3.1.b Market Share Methodologies

Market share, ratio, or top-down methodologies compare local levels of activity with a larger entity. Such methodologies imply that the proportion of activity that can be assigned to the local level is a regular and predictable quantity. This method has been used extensively in the aviation industry to develop forecasts at the local level. Historical data is most commonly used to determine the share of total national traffic activity that will be captured by a particular region or airport. The FAA develops national forecasts annually in its FAA Aerospace Forecasts document, the latest edition of which is the FAA Aerospace Forecasts Fiscal Year (FY) 2013-2033.

3.1.c Socio-economic Methodologies

Though trend line extrapolation and market share analyses may provide mathematical and formulaic justification for demand projections, there are many factors beyond historical levels of activity that may identify trends in aviation and its impact on local aviation demand. Socio-economic or correlation analyses examine the direct relationship between two or more sets of historical data. Local market conditions examined in this chapter include population, total employment and total retail sales for Centre County and its surrounding counties of Blair, Cambria, Clearfield, Clinton, Huntingdon, Mifflin and Union. Historical and forecasted socio-economic statistics for this service area were obtained from the economic forecasting firm Woods & Poole Economics, Inc. Projections of population for Centre County were also obtained from the Centre Regional Planning Agency and it is these population projections for Centre County population that are utilized in this analysis. Based upon the observed and projected correlation between historical aviation activity and the socio-economic data sets, future aviation activity projections were developed. **Table 3-1** presents forecasts of socio-economic indicators that are utilized in various locations of this chapter.

Table 3-1: Projected Socio-Economic Indicators

Year	Regional Population (Thousands)	Regional Employment (Thousands of jobs)	Regional Total Retail Sales (mil, 2005$)
Historical			
2000	672,165	366,113	7,937.64
2001	672,152	366,730	7,915.59
2002	673,850	368,606	7,924.97
2003	674,519	368,938	8,038.32
2004	674,975	372,741	8,267.87
2005	675,320	377,206	8,447.15
2006	679,805	382,061	8,610.37
2007	680,445	383,977	8,591.87
2008	681,998	383,267	8,181.62
2009	682,768	375,844	7,515.43
2010	682,992	371,093	7,793.78
2011	683,543	370,999	8,157.95
2012	684,371	375,139	8,242.96
Projected			
2017	695,476	398,733	8,695.08
2022	704,968	423,797	9,200.45
2027	715,174	450,077	9,750.43
2032	725,151	477,799	10,354.12
CAGR (2012-2032)	*0.29%*	*1.22%*	*1.15%*

Note: Region includes Centre County and its surrounding counties of Blair, Cambria, Clearfield, Clinton, Huntingdon, Mifflin, and Union.
Source: Woods & Poole Economic Inc., except for projections of Centre County Population from the Centre Regional Planning Agency

3.2 Enplaned Passengers

Enplanements are defined as the activity of passengers boarding commercial service aircraft that depart an airport and include both revenue and non-revenue passengers on scheduled commercial service aircraft or unscheduled charter aircraft. Passenger enplanement data is provided to Airport management and the FAA by commercial passenger service carriers, who maintain counts on the number of people that are transported to and from an airport. This section examines the passenger enplanement data and describes future passenger projections.

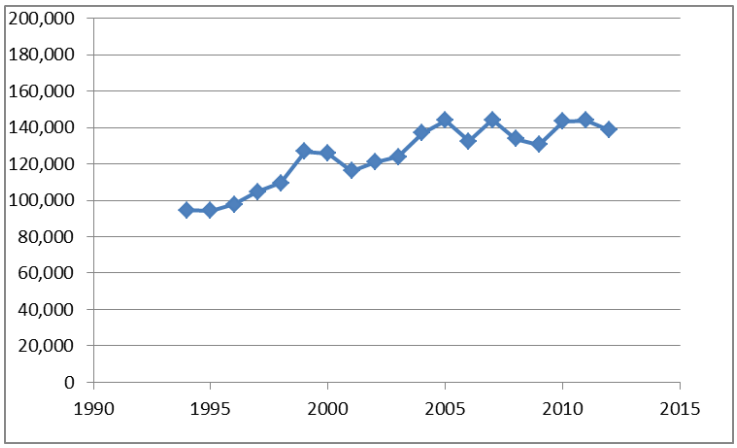
3.2.a Enplanement History

At the time of this analysis in May of 2013, FAA enplanement totals for 2012 were not currently available. Therefore, the 2012 enplanement total was estimated based upon the number scheduled passenger enplanements reported for 2012 by the carriers to the Centre County Airport Authority (134,452), combined with the average number of charter enplanements reported to the FAA for 2008 through 2011 (4,036), for an estimated 2012 total of 138,488 enplanements. Between 1994 and 2012, passenger enplanements at the Airport have fluctuated between a low of 94,343 in 1995 and a high of 144,160 in 2007. From 1994

through 2012, enplanements have increased from 94,427 to an estimated 138,488, at a CAGR of 2.15 percent. **Table 3-2** presents the historical enplanements at the Airport since 1994.

Table 3-2: Historical Enplanements

Year	UNV Enplanements	
1994	94,427	
1995	94,343	
1996	97,801	
1997	104,748	
1998	109,516	
1999	126,945	
2000	125,659	
2001	116,113	
2002	120,938	
2003	123,871	
2004	137,066	
2005	143,800	
2006	132,543	
2007	144,160	
2008	133,777	
2009	130,527	
2010	143,531	
2011	144,054	
2012	138,488	*ESTIMATED*
CAGR (1994-2012)	*2.15%*	



Notes: CAGR = Compounded Annual Growth Rate
2012 Estimate based upon 2012 schedule airlines from CCAA plus 2008 to 2011 average charter enplanements as reported by FAA ACAIS

Sources: Historical Enplanements – FAA ACAIS

3.2.b Federal Aviation Administration Forecast

The FAA records passenger enplanements for all commercial service airports and releases an updated version of the TAF every year. It should be noted that annual TAF data is based on the federal fiscal year rather than the calendar year, so historical figures differ slightly from the Airport's records. The FAA's historical records and projections of passenger enplanements are shown in **Table 3-3**.

Table 3-3: Enplanement Forecast – Terminal Area Forecast

Year	FAA TAF Enplanements	
Historical:		
2000	124,357	
2001	122,287	
2002	116,031	
2003	119,972	
2004	135,256	
2005	145,826	
2006	133,227	
2007	139,340	
2008	136,038	
2009	128,546	
2010	140,887	
2011	143,002	
2012	142,146	*EST*
Projected:		
2017	151,048	
2022	160,522	
2027	170,602	
2032	181,328	
CAGR (2012-2032)	*1.36%*	

Source: FAA Terminal Area Forecast

As illustrated, the FAA projects a 1.36 percent compound annual growth rate in enplanements for the Airport through 2032.

3.2.c Enplanement Forecast

Five methodologies were evaluated to develop projections for passenger enplanements. These methodologies are described in the following sections and include trend line and growth rate methodologies. The results of these two forecasting methodologies are presented in **Table 3-4**. There is a correlation coefficient of 0.72 between the year and passenger enplanements between 2000 and 2012.

Trend Line Methodology – The trend line methodology is based on the assumption that future trends will continue to mimic those of the selected time period and that factors that affect those trends will continue to influence demand levels in a similar fashion. The establishment of a linear trend line using historical data through the least squares method typically serves as a baseline projection to which other methodologies are compared.

Airport records for passenger enplanements from 2000 to 2012 were reviewed as a part of this methodology. Applying the least squares method, the trend line methodology projects passenger enplanements will increase to 152,814 in 2017 and continue to increase linearly through 2032 to 179,254.

Growth Rate Methodology – The growth rate methodology examines the percent change in activity between two points in time, and assumes that future activity will change at this rate throughout the forecasting period. Between 2000 and 2012, there was a 0.81 percent CAGR in passenger activity. Applying this CAGR, passenger enplanements are forecasted to grow to 144,213 in 2017; 150,174 in 2022; 156,381 in 2027; and 162,846 in 2032.

Table 3-4: Enplanement Forecasts – Trend Line & Growth Rate Methodologies

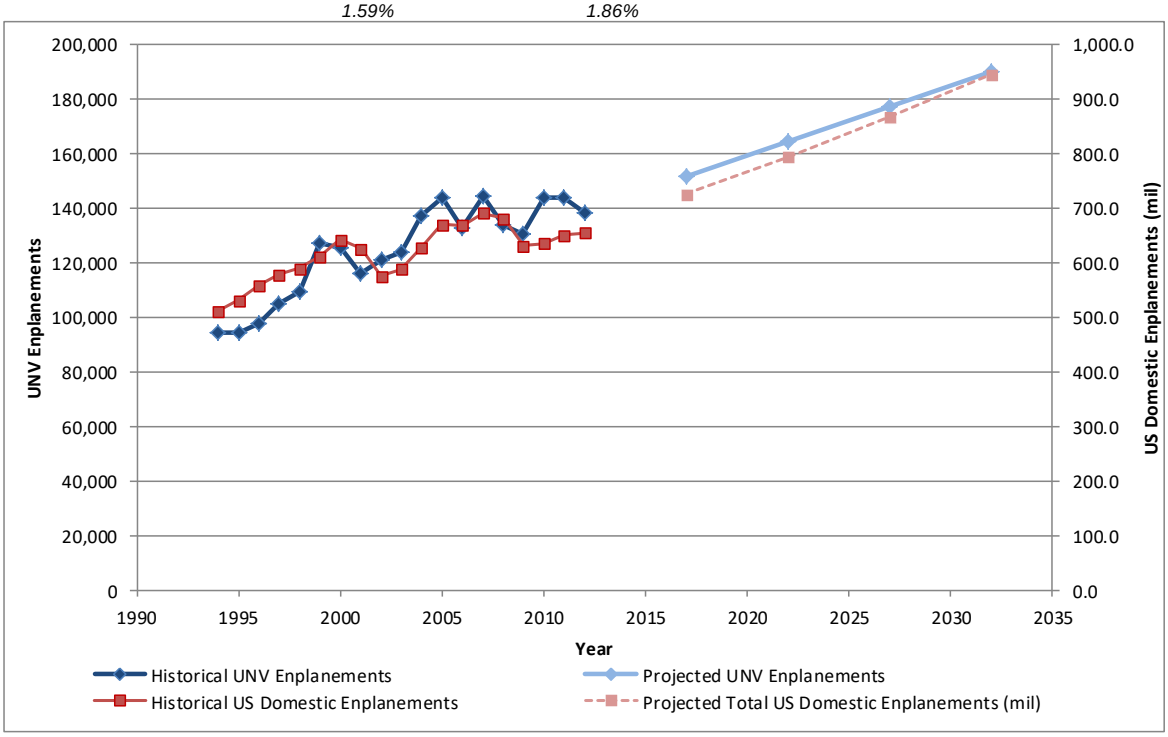
		Trend Line	Growth Rate	
Year		**Enplanements**	**Enplanements**	**Percent Change**
Historical:				
2000		125,659	125,659	
2001		116,113	116,113	-7.60%
2002		120,938	120,938	4.16%
2003		123,871	123,871	2.43%
2004		137,066	137,066	10.65%
2005		143,800	143,800	4.91%
2006		132,543	132,543	-7.83%
2007		144,160	144,160	8.76%
2008		133,777	133,777	-7.20%
2009		130,527	130,527	-2.43%
2010		143,531	143,531	9.96%
2011		144,054	144,054	0.36%
2012	*EST*	138,488	138,488	-3.86%
			CAGR (2000-2012)	*0.81%*
Projected:				
2017		152,814	144,213	*0.81%*
2022		161,627	150,174	*0.81%*
2027		170,441	156,381	*0.81%*
2032		179,254	162,846	*0.81%*
CAGR (2012-2032)		*1.30%*	*0.81%*	

Sources: Historical Enplanements - FAA ACAIS
Projections - Mead & Hunt

Market Share Methodology – A market share methodology compares activity levels at an airport to a larger geographical region as a whole over a given length of time. For the purposes of this master plan, a market share methodology forecast has been developed that compares activity at the Airport with total U.S. domestic enplanements. Domestic U.S. and the Airport's enplanement data dating back to 1994 were examined. The results of these projection methodologies are presented in **Table 3-5**. There is a strong correlation coefficient of 0.89 between U.S. Domestic Enplanements and UNV enplanements.

Table 3-5: Enplanement Forecast – Market Share Methodology

		Market Share Methodology		
Year		UNV Enplanements	Total US Domestic Enplanements (mil)	UNV Market Share
Historical:				
1994		94,427	511.3	0.0185%
1995		94,343	531.1	0.0178%
1996		97,801	558.1	0.0175%
1997		104,748	578.3	0.0181%
1998		109,516	589.3	0.0186%
1999		126,945	610.9	0.0208%
2000		125,659	641.2	0.0196%
2001		116,113	625.8	0.0186%
2002		120,938	575.1	0.0210%
2003		123,871	587.8	0.0211%
2004		137,066	628.5	0.0218%
2005		143,800	669.5	0.0215%
2006		132,543	668.4	0.0198%
2007		144,160	690.1	0.0209%
2008		133,777	680.7	0.0197%
2009		130,527	630.8	0.0207%
2010		143,531	635.2	0.0226%
2011		144,054	650.1	0.0222%
2012	*ESTIMATED*	138,488	653.7	0.0212%
	CAGR (1994-2012)	*2.15%*	*1.37%*	
			Average (1994-2012)	*0.0201%*
Projected:				
2017		151,480	724.8	0.0209%
2022		164,266	793.6	0.0207%
2027		176,879	867.1	0.0204%
2032		189,948	945.3	0.0201%
		1.59%	*1.86%*	



Notes: CAGR = Compounded Annual Growth Rate
Sources: Historical Enplanements - Airport Records
Total US Domestic Enplanements - FAA Aerospace Forecasts FY 2013-2033
Projections - Mead & Hunt

This market share methodology utilizes the projections of total U.S. domestic enplanements described in the FAA Aerospace Forecasts FY 2013-2033. The FAA develops their commercial aviation forecasts from econometric models that explain and incorporate emerging trends for the different segments of the industry along with the world and U.S. economies. The FAA has developed its forecasts for the U.S. domestic market with a model based upon real disposable personal income, believing that aviation demand is a derived demand – that is, aviation demand depends upon the level of business and leisure activity in the economy. The market share methodology assumes that the Airport's 2012 market share of U.S. domestic enplanements of 0.0212 percent will trend towards its 1994 to 2012 average market share of 0.0201 percent through the year 2032. The market share methodology projects 151,480 passenger enplanements in 2017; 164,266 in 2022; 176,879 in 2027; and 189,948 in 2032. This represents a CAGR of 1.59 percent.

Socio-economic Methodology – Socio-economic, or correlation, methodologies examine the direct relationship between two or more sets of historical data. To conduct forecasts using this method, local conditions were examined including population and total employment for Centre County and its surrounding counties of Blair, Cambria, Clearfield, Clinton, Huntingdon, Mifflin and Union. Historical and forecasted socio-economic statistics for this service area were obtained from the economic forecasting firm Woods & Poole Economics, Inc. Projections of population for Centre County were also obtained from the Centre Regional Planning Agency and it is these population projections for Centre County population that are utilized in this analysis. Based upon the observed and projected correlation between historical aviation activity and the socio-economic data sets, future aviation activity projections were developed. The results of these methodologies are presented in **Table 3-6**.

Socio-economic Methodology – Population Variable – Local population can be a strong indicator for the demand of commercial aviation, particularly at small hub and non-hub airports; however, at the Airport, the correlation coefficient between regional population and UNV enplanements is only 0.65. The socio-economic population variable methodology compares historical population figures to passenger enplanements. Between 2000 and 2012, the population of the region increased from 672,165 to 684,371. In 2012, the number of annual enplanements per capita was 0.202. This figure was applied to population projections to forecast 140,735 passenger enplanements in 2017; 142,656 in 2022; 144,721 in 2027; and 146,740 in 2032.

Socio-economic Methodology – Employment Variable – Because local economic conditions can impact levels of passenger activity, another socio-economic factor that was examined was total employment. Between 2000 and 2012, total employment in the Airport's region increased from 366,113 to 375,139, a CAGR of 0.20 percent. There is a correlation coefficient of 0.53 between regional employment and UNV enplanements. It is projected that for the region total employment through 2032 will increase to 477,799, a CAGR of 1.22 percent. The number enplanements per regional job was 0.369 in 2012. Applying this figure to the total employment projections by Woods & Poole Economics, Inc., forecasts illustrate that 147,198 passengers will be enplaned in 2017; 156,451 in 2022; 166,152 in 2027; and 176,386 in 2032.

Table 3-6: Enplanement Forecasts – Socio-economic Methodologies

	Socio-Economic Methodology - Population Variable			Socio-Economic Methodology - Retail Sales Variable		
Year	Enplanements	Regional Population	Enplanements Per Capita	Enplanements	Regional Employment	Enplanements per Job
Historical:						
2000	125,659	672,165	0.187	125,659	366,113	0.343
2001	116,113	672,152	0.173	116,113	366,730	0.317
2002	120,938	673,850	0.179	120,938	368,606	0.328
2003	123,871	674,519	0.184	123,871	368,938	0.336
2004	137,066	674,975	0.203	137,066	372,741	0.368
2005	143,800	675,320	0.213	143,800	377,206	0.381
2006	132,543	679,805	0.195	132,543	382,061	0.347
2007	144,160	680,445	0.212	144,160	383,977	0.375
2008	133,777	681,998	0.196	133,777	383,267	0.349
2009	130,527	682,768	0.191	130,527	375,844	0.347
2010	143,531	682,992	0.210	143,531	371,093	0.387
2011	144,054	683,543	0.211	144,054	370,999	0.388
2012 *EST*	138,488	684,371	0.202	138,488	375,139	0.369
	CAGR (2000-2012)	*0.15%*		*CAGR (2000-2012)*	*0.20%*	
		Average (2000-2012)	*0.197*		*Average (2000-2012)*	*0.357*
Projected:						
2017	140,735	695,476	0.202	147,198	398,733	0.369
2022	142,656	704,968	0.202	156,451	423,797	0.369
2027	144,721	715,174	0.202	166,152	450,077	0.369
2032	146,740	725,151	0.202	176,386	477,799	0.369
CAGR (2012-2032)	*0.29%*	*0.29%*		*1.22%*	*1.22%*	

Sources: Historical Enplanements - FAA ACAIS
Historical Population & Employment - Woods & Poole
Projected Population - Centre County Centre Regional Planning Agency, All other Counties Woods & Poole
Projected Employment - Woods & Poole
Projections - Mead & Hunt

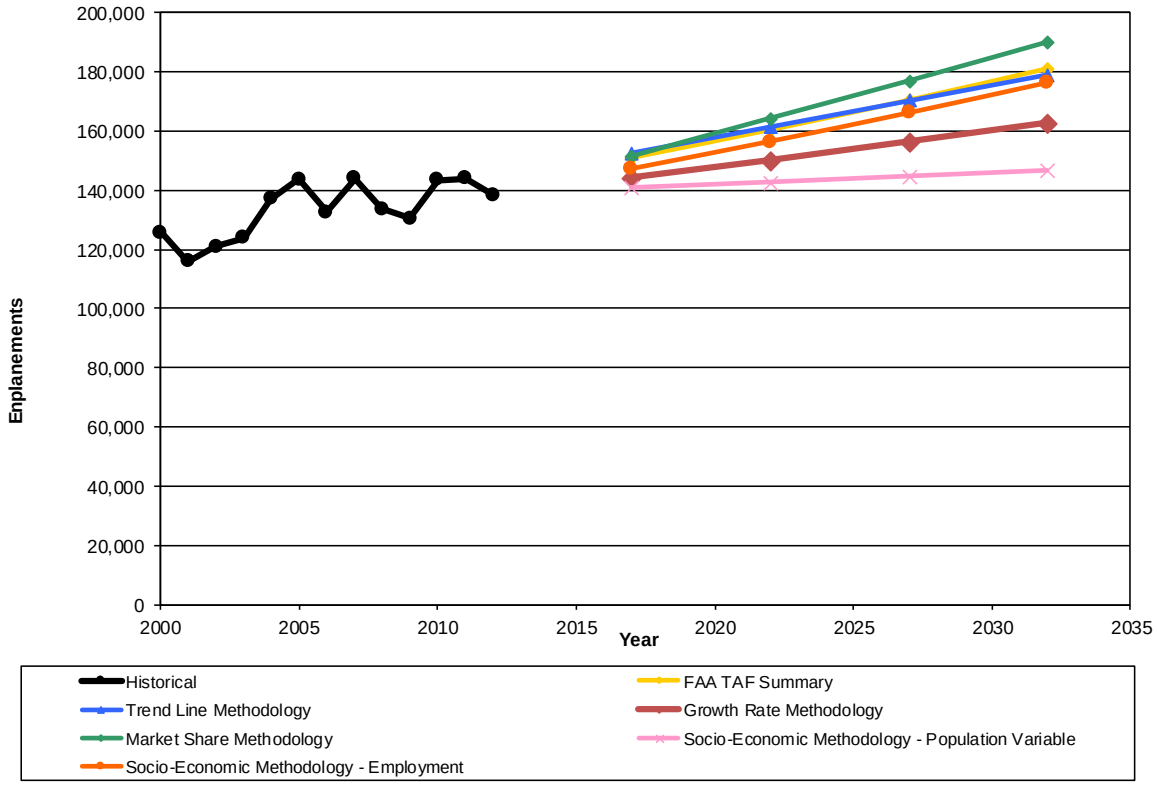
Enplanement Forecasts Comparison and Summary – A comparison of projected enplanements using the methodologies described in this section is presented in **Table 3-7**. All of the methodologies, with the exception of the FAA's TAF, project that there will be an increase in passenger demand over the next 20 years.

The FAA's projection of U.S. domestic enplanements is a based upon econometric models that explain and incorporate emerging trends for the different segments of the industry along with the world and U.S. economies. Given that there has historically been a strong correlation between U.S. domestic enplanements and UNV enplanements, it is this market share projection that serves as the preferred methodology for enplanement projections for this master plan. This methodology also has the highest correlation coefficient by a substantial amount over the other methodologies examined. Given also that the airport is in advanced negotiations with more than one carrier regarding potential air service additions, it is reasonable to assume continued growth in passenger enplanements, approximately in step with U.S. domestic passengers.

The market share methodology has been selected as the preferred enplanement projection.

Table 3-7: Enplanement Forecasts Summary

Year	Historical	FAA TAF Summary	Trend Line Methodology	Growth Rate Methodology	Preferred Market Share Methodology	Socio-Economic Methodology - Population Variable	Socio-Economic Methodology - Employment
Historical:							
2000	125,659						
2001	116,113						
2002	120,938						
2003	123,871						
2004	137,066						
2005	143,800						
2006	132,543						
2007	144,160						
2008	133,777						
2009	130,527						
2010	143,531						
2011	144,054						
2012	138,488	*Est*					
CAGR (2000-2012)	*0.81%*						
Correlation Coefficient		*NA*	*0.72*	*0.72*	*0.89*	*0.65*	*0.53*
Projected:							
2017		151,048	152,814	144,213	151,480	140,735	147,198
2022		160,522	161,627	150,174	164,266	142,656	156,451
2027		170,602	170,441	156,381	176,879	144,721	166,152
2032		181,328	179,254	162,846	189,948	146,740	176,386
CAGR (2012-2032)		*1.36%*	*1.30%*	*0.81%*	*1.59%*	*0.29%*	*1.22%*



Sources: Historical Enplanements - Airport Records
Projections - Mead & Hunt, Inc., except FAA TAF Summary which are from the FAA Terminal Area Forecast

3.3 Based Aircraft

The FAA defines a based aircraft at an airport as an aircraft that is "operational & air worthy" and which is typically based at the airport for a majority of the year. The current FAA 5010 Airport Master Record notes an inspection date of January 9, 2013, and notes the following based aircraft at the Airport: 48 single-engine aircraft, 7 multi-engine, 5 jet, and 1 helicopter, for a total of 59.

There are several factors that affect the number of based aircraft at an airport. Recently, increasing costs to own and operate aircraft has been a primary factor that has contributed to a slight decline in the overall U.S. general aviation (GA) fleet since 2007. The Airport, however, has experienced an increase in the number of based aircraft following a low in 2006. Several methodologies were evaluated to develop based aircraft projections. The FAA TAF and time series methodologies that include trend line analysis and growth rate analysis are presented in **Table 3-8**.

Table 3-8: Based Aircraft Forecasts – Terminal Area Forecast, Trend Line, & Growth Rate Methodologies

	FAA TAF Summary	Trend Line	Growth Rate	
Year	Based Aircraft	Based Aircraft	Based Aircraft	Growth Rate
Historical:				
2000	61	61	61	
2001	57	57	57	-6.56%
2002	57	57	57	0.00%
2003	57	57	57	0.00%
2004	54	54	54	-5.26%
2005	54	54	54	0.00%
2006	44	44	44	-18.52%
2007	49	49	49	11.36%
2008	53	53	53	8.16%
2009	53	53	53	0.00%
2010	62	62	62	16.98%
2011	66	66	66	6.45%
2012	59	59	59	-10.61%
			CAGR (2000-2012)	*-0.28%*
Projected:				
2017	79	58	58	*-0.28%*
2022	84	59	57	*-0.28%*
2027	89	60	57	*-0.28%*
2032	94	61	56	*-0.28%*
	2.36%	*0.14%*	*-0.28%*	

Sources: Historical Based Aircraft -2000-2011 FAA Terminal Area Forecast; 2012 FAA 5010 Form
Projected Based Aircraft - Mead & Hunt, Inc., except FAA TAF Summary which are from the FAA TAF

The market share methodology compares local based aircraft at the Airport to the total number of general aviation aircraft in the U.S. as reported by the FAA. As illustrated in **Table 3-9**, the Airport's market share has increased since 2006, and in 2012 the number of based aircraft represented 0.02674 percent of total active general aviation aircraft in the U.S. Applying a projected CAGR of 0.50 percent as forecasted for the

growth of based aircraft in the U.S., the number of aircraft at the Airport is forecasted to grow from 59 in 2012 to 65 in 2032.

Table 3-9: Based Aircraft Forecast – Market Share Methodology

	Market Share Methodology		
Year	**Based Aircraft**	**Total U.S. Active Aircraft**	**Market Share**
Historical:			
2000	61	217,533	0.02804%
2001	57	211,446	0.02696%
2002	57	211,244	0.02698%
2003	57	209,606	0.02719%
2004	54	219,319	0.02462%
2005	54	224,257	0.02408%
2006	44	221,942	0.01982%
2007	49	231,606	0.02116%
2008	53	228,664	0.02318%
2009	53	223,876	0.02367%
2010	62	223,370	0.02776%
2011	63	220,770	0.02854%
2012	59	220,670	0.02674%
		Average (2000-2012)	*0.02529%*
Projected:			
2017	60	223,315	0.02674%
2022	61	226,970	0.02674%
2027	62	233,355	0.02674%
2032	65	243,670	0.02674%
0.00%	*0.50%*	*0.50%*	

Sources: Historical Based Aircraft -2000-2011 FAA Terminal Area Forecast; 2012 FAA 5010 Form
Total U.S. Active Aircraft (GA & Air Taxi) - FAA Aerospace Forecasts FY2013-2033
Projected Based Aircraft - Mead & Hunt, Inc.

Socio-economic (or correlation) forecasting methodologies examine the direct relationship between two or more sets of historical data. Data examined in developing based aircraft forecasts using this methodology included both population and total employment. Total employment was used as an indicator of economic activity occurring within the community with the assumption being that changes in economic activity will impact the number of based aircraft. Population and total employment for Centre County and its surrounding counties of Blair, Cambria, Clearfield, Clinton, Huntingdon, Mifflin and Union were examined. Historical and forecasted socio-economic statistics for this service area were obtained from the economic forecasting firm Woods & Poole Economics, Inc. Projections of population for Centre County were also obtained from the Centre Regional Planning Agency and it is these population projections for Centre County population that are utilized in this analysis. Based upon the observed and projected correlation between historical aviation activity and socio-economic data, based aircraft forecasts were developed. The forecasts that were prepared utilizing these methodologies are presented in **Table 3-10**. As illustrated in the table, based aircraft at the Airport are projected to increase from 59 aircraft in 2012 to 63 aircraft in 2032 using the population variable socio-economic methodology. Utilizing the same methodology, but using the number of based per job in the region, based aircraft at the Airport are projected to increase from 59 aircraft in 2012 to 75 aircraft in 2032.

Table 3-10: Based Aircraft Forecasts – Socio-economic Methodologies

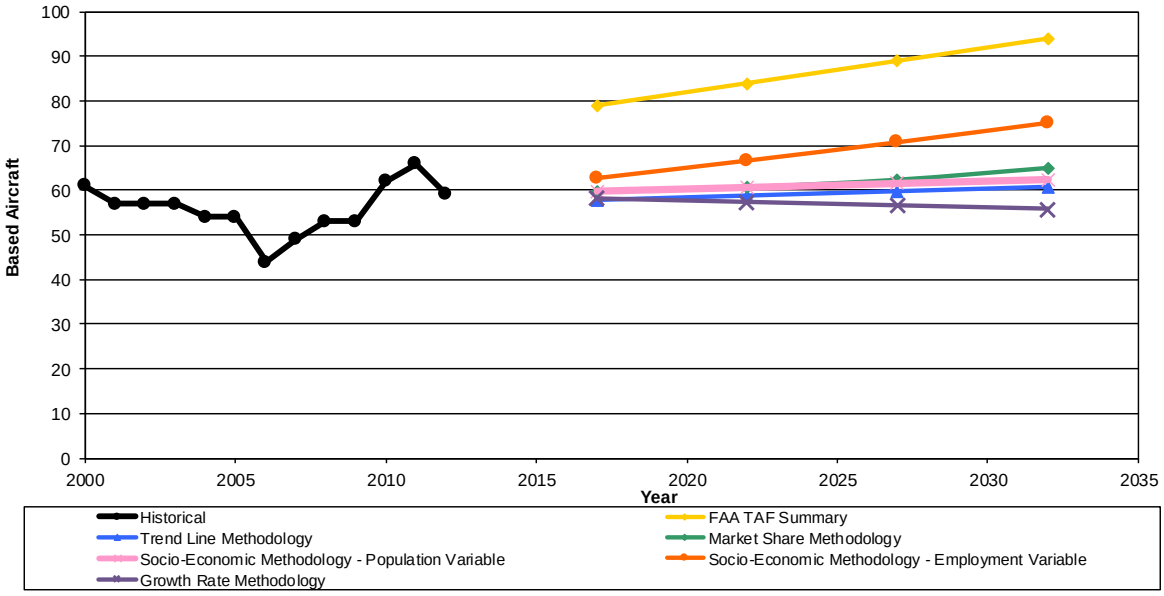
	Socio-Economic Methodology - Population Variable			Socio-Economic Methodology - Total Employment Variable		
Year	Based Aircraft	Regional Population	Based Aircraft Per Capita	Based Aircraft	Regional Employment	Based Aircraft Per Job
Historical:						
2000	61	672,165	0.00009	61	366,113	0.00017
2001	57	672,152	0.00008	57	366,730	0.00016
2002	57	673,850	0.00008	57	368,606	0.00015
2003	57	674,519	0.00008	57	368,938	0.00015
2004	54	674,975	0.00008	54	372,741	0.00014
2005	54	675,320	0.00008	54	377,206	0.00014
2006	44	679,805	0.00006	44	382,061	0.00012
2007	49	680,445	0.00007	49	383,977	0.00013
2008	53	681,998	0.00008	53	383,267	0.00014
2009	53	682,768	0.00008	53	375,844	0.00014
2010	62	682,992	0.00009	62	371,093	0.00017
2011	63	683,543	0.00009	63	370,999	0.00017
2012	59	684,371	0.00009	59	375,139	0.00016
Projected:						
2017	60	695,476	0.00009	63	398,733	0.00016
2022	61	704,968	0.00009	67	423,797	0.00016
2027	62	715,174	0.00009	71	450,077	0.00016
2032	63	725,151	0.00009	75	477,799	0.00016
	0.29%	*0.29%*		*1.22%*	*1.22%*	

Sources: Historical Based Aircraft -2000-2011 FAA Terminal Area Forecast; 2012 FAA 5010 Form
Historical Population & Employment - Woods & Poole
Projected Population - Centre County Centre Regional Planning Agency, All other Counties Woods & Poole
Projected Employment - Woods & Poole
Projections - Mead & Hunt

A comparison of projected based aircraft at the Airport using the methodologies described in this section is presented in **Table 3-11**. The methodologies range from slightly declining at -0.28 percent compound annual rate to the TAF's projection with a compound annual growth rate of 2.36 percent. For the purposes of this master plan study, the socio-economic methodology based upon the correlation between based aircraft and employment lies near the middle of the various methodologies and serves as the preferred projection of based aircraft for the next 20 years. This methodology projects based aircraft to increase from 59 in 2010 to 75 in 2032, a CAGR of 1.22 percent.

Table 3-11: Based Aircraft Forecasts Summary

Year	Historical	FAA TAF Summary	Trend Line Methodology	Growth Rate Methodology	Market Share Methodology	Socio-Economic Methodology - Population Variable	Socio-Economic Methodology - Employment Variable
Historical:							
2000	61						
2001	57						
2002	57						
2003	57						
2004	54						
2005	54						
2006	44						
2007	49						
2008	53						
2009	53						
2010	62						
2011	66						
2012	59						
CAGR (2000-2012)	*-0.28%*						
Projected:							
2017		79	58	58	60	60	63
2022		84	59	57	61	61	67
2027		89	60	57	62	62	71
2032		94	61	56	65	63	75
CAGR (2012-2032)		*2.36%*	*0.14%*	*-0.28%*	*0.50%*	*0.29%*	*1.22%*



Sources: Historical Based Aircraft -2000-2011 FAA Terminal Area Forecast; 2012 FAA 5010 Form
Projections - Mead & Hunt, Inc., except FAA TAF Summary which are from the FAA Terminal Area Forecast

3.4 Based Aircraft Fleet Mix

Historical based aircraft by type and projected fleet mix at the Airport is presented in **Table 3-12**. In 2012, 78 percent of the local fleet was comprised of single-engine aircraft; 12 percent, multi-engine aircraft; 8 percent, jet aircraft; and 2 percent, helicopters. The FAA Aerospace Forecast FY 2013-2033 projects that turboprop and jet aircraft will see a higher growth rate than other types of aircraft through 2030. This trend

is also anticipated to occur locally as the number of multi-engine and jet aircraft based at the Airport are expected to increase at a higher growth rate than single-engine aircraft types.

Table 3-12: Based Aircraft Fleet Mix Forecast

	Single Engine		Multi-Engine		Jet		Helicopter		Other		
Year	#	%	#	%	#	%	#	%	#	%	Total
Historical:											
2000	40	66%	17	28%	3	5%	1	2%	0	0%	61
2001	35	61%	18	32%	3	5%	1	2%	0	0%	57
2002	35	61%	18	32%	3	5%	1	2%	0	0%	57
2003	35	61%	18	32%	3	5%	1	2%	0	0%	57
2004	40	74%	12	22%	1	2%	1	2%	0	0%	54
2005	40	74%	12	22%	1	2%	1	2%	0	0%	54
2006	35	80%	7	16%	1	2%	1	2%	0	0%	44
2007	39	80%	7	14%	2	4%	1	2%	0	0%	49
2008	42	79%	8	15%	2	4%	1	2%	0	0%	53
2009	42	79%	8	15%	2	4%	1	2%	0	0%	53
2010	48	77%	8	13%	5	8%	1	2%	0	0%	62
2011	49	78%	8	13%	5	8%	1	2%	0	0%	63
2012	46	78%	7	12%	5	8%	1	2%	0	0%	59
Projected:											
2017	47	75%	8	12%	7	11%	1	2%	0	0%	63
2022	50	75%	8	12%	7	11%	1	2%	0	0%	67
2027	52	74%	9	13%	8	11%	1	2%	0	0%	71
2032	56	74%	10	13%	8	11%	2	2%	0	0%	75
CAGR (2012-2032)	*0.95%*		*1.68%*		*2.55%*		*2.06%*		*0.00%*		*1.22%*

Notes: Numbers may not add due to rounding
Sources: Historical Based Aircraft -2000-2011 FAA Terminal Area Forecast; 2012 FAA 5010 Form Projections - Mead & Hunt, Inc.

3.5 Total Operations

As the Airport's airport traffic control tower (ATCT) opened in September 2011, 2012 is the only full historical year of data available. Any databases of operations prior to the opening of the ATCT are based upon estimates only. As data from the FAA Air Traffic Activity Data System (ATADS) contains the FAA's official air traffic operations data, it is generally the source of operational data used in this master plan. However, data in this system are from operations recorded by the ATCT during its operational hours, which in the case of the Airport is from 6:00 am to 10:00 pm. There are operations which occur outside of these hours that are not included in the FAA ATADS database. For instance, the Airport has three scheduled airline operations outside of these hours: a 5:45 a.m. departure, an 11:18 p.m. arrival, and an 11:45 p.m. arrival. There are also an unknown number of general aviation and/or military operations occurring outside of the ATCT hours as well. **Table 3-13** summarizes the total number of estimated operations occurring at the airport. This includes the 3 daily commercial operations and an estimated additional 5 percent of general aviation activity. It is these operational totals that will be used in this master plan, to account for all operations occurring at the airport.

Table 3-13: Total Operations

Year	Commercial			General Aviation	Military	Total
	Air Carrier	Commuter / Air Taxi	Total			
Historical ATCT						
2012	64	13,134	13,198	24,508	863	38,569
Estimated operations outside of ATCT hours:						
ATCT hours are 0600 to 2200						
2012	0	1,095 [1]	1,095	1,225 [2]	0	2,320
Total Estimated Airport Operations						
2012	64	14,229	14,293	25,733	863	40,889

[1] Airline schedules include 3 operations outside of ATCT hours (5:45 a.m. departure, 11:18 p.m. arrival, and 11:45 p.m. arrival) which is approximately 1,095 operations.

[2] Estimated at 5% of annual GA operations

Sources: Historical ATCT records – FAA Air Traffic Activity Data System (ATADS)
Historical scheduled commercial operations: airline schedules obtained from Diio Mi
Projections – Mead & Hunt, Inc.

3.6 Commercial Aircraft Operations

Commercial aircraft operations are either scheduled or unscheduled flights typically operated by a certificated air carrier, or are conducted by a charter or air taxi operator. This section summarizes the forecasts that were prepared for commercial aircraft operations.

3.6.a Scheduled Commercial Passenger Operations Forecasts

National trends in aviation demand have been volatile in recent years. The terrorist attacks that occurred on September 11, 2001, had a significant impact on collective national travel behavior, and the economic recession that began in 2008 also impacted travel behavior and the commercial airlines' economics. As a result, fewer passengers were enplaned at many airports throughout the U.S. With recent increases in aircraft operating costs, airlines have been forced to maximize fleet efficiency to remain profitable.

In many markets, air carriers are reducing or retiring older turboprops and less fuel efficient small regional jet aircraft (typically 50 seats and smaller), and if the market can profitably sustain it, replacing them with larger regional jets (typically 70 to 90 seats) and narrow-body jets that have more seats and lower operational costs per passenger. In many markets, the use of larger aircraft is reducing the frequency of particular routes. Due to increasing fuel and operational costs, air carriers must maintain higher passenger load factors to remain profitable. **Table 3-14** presents the historical and projected seats per departure and load factor at the Airport and for the U.S. regional and mainline carrier fleets.

Table 3-14: Scheduled Commercial Average Seats/Departure and Load Factor

	Average Seats/Dep			Load Factor % (Domestic)		
Year	UNV	US Regional Carrier Fleet	US Mainline Carrier Fleet	UNV	US Regional Carrier Fleet	US Mainline Carrier Fleet
Historical:						
2007	40.5	49.9	150.6	65.7%	75.5%	80.4%
2008	40.8	52.9	150.3	68.3%	73.7%	80.2%
2009	42.2	55.2	151.2	67.8%	74.3%	81.4%
2010	41.8	56.1	151.9	72.5%	76.2%	82.7%
2011	41.9	56.4	152.3	72.1%	76.2%	83.6%
2012E	41.3	56.1	152.7	68.7%	77.6%	84.1%
CAGR (2007-2012)	*1.07%*	*3.98%*	*0.29%*	*3.30%*	*0.31%*	*0.94%*
Projected:						
2017	48.2	58.2	153.9	74.0%	76.8%	85.5%
2022	56.0	60.4	155.0	75.0%	77.0%	86.0%
2027	66.4	62.6	156.5	76.0%	77.2%	86.3%
2032	68.6	64.9	158.0	78.0%	77.3%	86.5%
CAGR (2012-2032)	*2.28%*	*0.66%*	*0.18%*	*0.34%*	*0.07%*	*0.20%*

Sources: UNV Hist Average Seat Data - Airline Schedules, Diio Mio
Hist Load Factor Calculated from Historial Passengers, Historcial Departures, and Historical Avg Seats/Dep
Hist and Projected US Carrier Fleet Avg/Seats & Load Factor - FAA Aerospace Forecasts FY2013-2033
Projections - Mead & Hunt, Inc.

At the Airport, the average number of seats per departure and aircraft load factor is projected to increase, similar to the FAA's projected increases in these metrics within the U.S. regional and mainline carrier fleets. At the Airport, the average number of seats per departure is anticipated to increase from 56.1 in 2012, to 58.2 in 2017, 60.4 in 2022, 62.6 in 2027, and 64.9 in 2032. Passenger load factor is also anticipated to increase throughout the projection period, from 68.7 percent in 2012 to 78.0 percent through the forecast period.

In calculating future scheduled commercial operations, the average number of seats per departure at the Airport is multiplied by the passenger load factor. Projected passenger enplanements are then divided by this figure to obtain scheduled commercial passenger departures and departures are multiplied by two to calculate projected scheduled commercial operations (operations being arrivals and departures) as shown in **Table 3-15**. Through the next 20 years, even though passenger enplanements are projected to increase, increases in aircraft size and load factor are anticipated to result in a decrease in the number of scheduled commercial operations. Scheduled passenger operations are projected to total 8,268 in 2017; 7,630 in 2022; 6,850 in 2027; and 6,949 in 2032, resulting in a decreasing CAGR of -1.54 percent.

Table 3-15: Scheduled Commercial Operations Forecasts

Year	Scheduled Passenger Enpl	Scheduled Passenger Dep	Average Seats/Dep	Load Factor	Scheduled Passenger Ops
Historical:					
2007	141,338	5,312	40.5	65.7%	10,624
2008	129,774	4,660	40.8	68.3%	9,320
2009	126,880	4,431	42.2	67.8%	8,862
2010	139,689	4,612	41.8	72.5%	9,224
2011	139,402	4,613	41.9	72.1%	9,226
2012	134,452	4,736	41.3	68.7%	9,472
Projected:					
2017	147,444	4,134	48.2	74.0%	8,268
2022	160,230	3,815	56.0	75.0%	7,630
2027	172,843	3,425	66.4	76.0%	6,850
2032	185,912	3,474	68.6	78.0%	6,949
CAGR (2012-2032)	*1.63%*	*-1.54%*			*-1.54%*

Sources: Hist Enplanements - Airport Records
Hist Scheduled Air Carrier Dep's and Avg Seat Data - Airline Schedules, Diio Mi
Projections - Mead & Hunt, Inc.

3.6.b Air Carrier Fleet Mix

The FAA Aerospace Forecast FY 2013-2033 notes the following regarding the U.S. commercial aircraft fleet:

> *"After 2013, the mainline air carrier passenger fleet increases an average of 58 aircraft a year over the remaining years of the forecast period, totaling 4,907 aircraft in 2033. The narrow-body fleet (including E-190's at JetBlue and U.S. Airways) is projected to grow by 28 aircraft annually over the period 2012-2033; the wide-body fleet grows by 26 aircraft a year as the Boeing 787 and Airbus A350s enter the fleet.*
>
> *The regional carrier passenger fleet is forecast to decrease by 63 aircraft in 2013 as increases in larger regional jets are more than offset by reductions in 50 seat and smaller regional jets and turboprops. After 2013, the regional carrier fleet is expected to increase by an average of 5 aircraft (0.2 percent) a year over the remaining years of the forecast period, totaling 2,436 aircraft in 2033. The number of regional jets (90 seats or fewer) at regional carriers is projected to grow from 1,645 in 2012 to 2,082 in 2033, an average annual increase of 1.1 percent. All of the growth in regional jets over the forecast period occurs in the larger 70 to 90-seat aircraft……. Turboprop/piston aircraft are expected to account for just 14.5 percent of the regional carrier passenger fleet in2033, down from a 31.5 percent share in 2012."*

The number of commercial passenger aircraft in the U.S. is forecast to grow from 6,185 in 2012 to 7,343 in 2033. The U.S. mainline carrier fleet is projected to shrink initially through 2015 as carriers remove older, less fuel efficient narrow-body aircraft and then increase through 2033. The narrow-body fleet is anticipated to grow by approximately 3 aircraft annually, particularly as carriers take deliveries of Embraer 190s, and

the coming single-aisle replacements from Airbus and Boeing (A320-NEO, B737-MAX). The wide-body fleet is anticipated to grow by 15 aircraft a year, particularly as the Boeing 787 and Airbus A350s enter the fleet.

The regional carrier passenger fleet is forecast to increase by nearly 2 aircraft per year as increases in larger regional jets offset reductions in 50-seat and smaller regional jets. All growth in regional jets over the forecast period is projected to occur in the larger 70 and 90-seat aircraft. The turboprop/piston fleet is expected to shrink from 758 units in 2012 to 354 in 2033, reflecting a decline in the make-up of the regional carrier passenger fleet from 31.5 percent turboprop/piston in 2012 to only 14.5 percent in 2033.

Bombardier Commercial Aircraft prepares market forecasts regarding the world commercial aircraft market. The Bombardier Commercial Market Forecast 2012-2031 projects a significant decline in the less than 60-seat fleet and strong growth in the 60- to 99-seat fleet along with the strong growth in the 100- to 149-seat aircraft fleets (see **Table 3-16**).

Table 3-16: Bombardier Fleet Growth Forecast (20- to 149-seat Aircraft Market)

World Fleet	2011 Fleet	Deliveries	Retirements	2031 Fleet
20- to 59-seat	3,600	300	2,700	1,200
60- to 99-seat	2,500	5,600	1,300	6,800
100- to 149-seat	5,100	6,900	3,000	9,000
Total	11,200	12,800	7,000	17,000

Sources: Bombardier Commerical Aircraft Market Forecast 2012-2031

As previously mentioned, in many U.S. markets, air carriers are reducing or retiring older and less fuel-efficient aircraft, particularly 50-seat and smaller regional jets, and replacing them with larger regional (70 to 90 seats) and narrow-bodied jets that have more seats and lower operational costs per passenger. This trend is anticipated to present itself at the Airport as the turboprop and small regional jets are retired from air carrier fleets and replaced with larger regional jets. The Airport market also has the strong potential for low-cost carrier service. These types of low-cost carriers typically operate narrow-body aircraft with a few times weekly service to leisure destinations.

Table 3-17 presents the historical and projected fleet of scheduled commercial airline operators at the Airport. Commercial aircraft equipped with less than 40 and 40 to 60 seats make up all the current scheduled operations fleet mix. As these aircraft are retired by the carriers, they are being replaced with larger regional jets; therefore, it is projected that less than 40-seat aircraft will be removed from the market within the 20-year forecast period, and operations by aircraft with 40- to 60-seats will be reduced in favor of 70- to 90-seat regional jets. Additionally service by low-cost carriers, utilizing narrow-body aircraft, a few times per week to leisure destinations is anticipated to be initiated through the projection period.

Table 3-17: Scheduled Commercial Operations Fleet Mix Forecast

Seat Range	Typical Aircraft	Historical Departures 2010	2011	2012	Projected 2017	2022	2027	2032
Less than 40	Saab340, 328Jet, ERJ135	2,128	2,077	2,697	1,558	763	0	0
	Beech1900, EMB120, DHC-8	*46.1%*	*45.0%*	*56.9%*	*37.7%*	*20.0%*	*0.0%*	*0.0%*
40-60	CRJ200, ERJ140, ERJ145,	2,479	2,536	2,039	2,191	1,953	1,466	1,251
	DHC-8-300	*53.8%*	*55.0%*	*43.1%*	*53.0%*	*51.2%*	*42.8%*	*36.0%*
61-99	AvroRJ, CRJ700, CRJ900,	5	0	0	289	992	1,850	2,085
	EMB170, EMB175	*0.1%*	*0.0%*	*0.0%*	*7.0%*	*26.0%*	*54.0%*	*60.0%*
100-130	B717, DC9, EMB190,	0	0	0	0	0	0	0
	EMB195, A319	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
131-150	A320, MD81/82/83/87/88,	0	0	0	95	107	110	139
	B737-4, B737-5	*0.0%*	*0.0%*	*0.0%*	*2.3%*	*2.8%*	*3.2%*	*4.0%*
151 or more	MD90, B737-8, B737-9, B757	0	0	0	0	0	0	0
		0.0%	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Total Scheduled Passenger Aircraft Departures		4,612	4,613	4,736	4,134	3,815	3,425	3,474
Average Seats Per Departure		41.8	41.9	41.3	48.2	56.0	66.4	68.6
Total Scheduled Seats		192,776	193,415	195,796	199,249	213,639	227,425	238,349

Note: Numbers may not add due to rounding
Sources: Historical Scheduled Departures and Average Seat Data - Airline Schedules, Diio Mi
Projections - Mead & Hunt, Inc.

3.6.c Unscheduled Commercial Passenger Operations Forecasts

Unscheduled commercial flights are typically categorized as charters or air taxis. The Airport has a significant amount of charter activity due to the presence of The Pennsylvania State University (Penn State) and the number of athletic charters that use the airport. Of particular interest in this fleet is the number of operations by air carrier type aircraft, which, for air traffic purposes, the FAA defines as an aircraft with a seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire. **Table 3-18** summarizes the number of air carrier operations by aircraft type reported in 2011 and 2012 by the FAA's Traffic Flow Management System Counts (TFMSC).

Table 3-18: Unscheduled Air Carrier Operations

Aircraft	Approx Seats	IFR Operations 2011	IFR Operations 2012	Avg/year
B752 - Boeing 757-200	200	6	4	5
B738 - Boeing 737-800	160	66	48	57
MD83 - Boeing (Douglas) MD 83	155	2	0	1
A320 - Airbus A320 All Series	150	8	2	5
B734 - Boeing 737-400	145	4	4	4
A319 - Airbus A319	130	0	2	1
B733 - Boeing 737-300	130	0	2	1
B737 - Boeing 737-700	130	4	8	6
DC93 - Boeing (Douglas) DC 9-30	130	10	14	12
B732 - Boeing 737-200/VC96	113	12	0	6
DC91 - Boeing (Douglas) DC 9-10	80	10	12	11
E170 - Embraer 170	70	0	2	1
Total Air Carrier		**122**	**98**	**110**

Sources: 2011 & 2012 IFR Departures - Traffic Flow Management System Counts (TFMSC) and Aviation System Performance Metrics (ASPM)

Table 3-19 summarizes the number of scheduled commercial operations in comparison to the number of operations conducted by commercial air carrier aircraft over 60 seats and air taxi aircraft 60 seats and under reported by the Airport's ATCT. The difference between the two totals is the number of unscheduled commercial operations.

Table 3-19: Air Carrier and Air Taxi Operations Forecasts

Year	Total: Air Carrier	Total: Commuter/ Air Taxi	Total: Total Commercial	Scheduled Operations: Scheduled Commercial Departures	Scheduled Operations: Scheduled Commercial Operations	Scheduled Operations: *Percent Scheduled*	Unscheduled / Others[1]: Ops	Unscheduled / Others[1]: *Percent Unscheduled*
Historical:	***Historical Operations***							
2012	64	14,229	14,293	4,736	9,472	*66.3%*	4,821	*33.7%*
	FAA Projected Growth Rate in Total Active General Aviation and Air Taxi Fleet [3]						*0.5%*	
Projected:								
2017	494 [2]	12,716	13,210	4,134	8,268	*62.6%*	4,943	*37.4%*
2022	1,209 [2]	11,489	12,698	3,815	7,630	*60.1%*	5,068	*39.9%*
2027	2,069 [2]	9,977	12,046	3,425	6,850	*56.9%*	5,196	*43.1%*
2032	2,334 [2]	9,942	12,276	3,474	6,949	*56.6%*	5,327	*43.4%*
CAGR (2012-2032)	*19.70%*	*-1.78%*	*-0.76%*	*-1.54%*	*-1.54%*		*0.50%*	

[1] Others is the difference between the tower reported Commercial Ops and the Scheduled Ops reported by Diio Mi. Other represents the Charter/Air Taxi/Fractional ownership aircraft.

[2] Aircraft type charter operations recorded in the FAA TFMSC IFR flight plan database were 122 in 2011 and 98 in 2012, for an average of 110 per year; this average per year has been added to the scheduled airline aircraft operations for the projected years.

[3] FAA Aerospace Forecasts 2013-2033

Sources: Historical operations – FAA Air Traffic Activity Data System (ATADS) and Mead & Hunt, Inc.
Historical scheduled commercial operations: airline schedules obtained from Diio Mi
Projections – Mead & Hunt, Inc.

The overall proportion of unscheduled operations at the Airport was 33.7 percent in 2012. According to the FAA Aerospace Forecast FY 2013-2033, the projected annual growth rate of the national general aviation and air taxi fleet is expected to be 0.5 percent. It is assumed that unscheduled operations at the Airport will reflect this national trend; therefore, applying this projected CAGR to the level of operations conducted in 2012, an increase to 5,327 unscheduled operations annually can be anticipated by 2032.

3.7 General Aviation Operations

GA operations are those aircraft operations that are not categorized as commercial or military. As the ATCT opened in September 2011, 2012 is the only full historical year of data available. Any databases of operations prior to the opening of the ATCT are based upon estimates only, as data from the FAA ATADS contains the FAA's official air traffic operations data. Overall, GA operations across the nation over the past ten years have significantly decreased, with the greatest loss of activity experienced in recreational flying due to higher fuel and operating costs.

As historical data for GA operations at the Airport are not available prior to the ATCT opening, several projection methodologies that utilize historical trend lines are not applicable. **Table 3-20** presents the GA operations forecasts that were prepared using the Operations per Based Aircraft Methodology, the Market Share Methodology, and summary of the FAA TAF forecast.

Table 3-20: General Aviation Operations Forecasts

		FAA TAF Summary	Operations Per Based Aircraft Methodology			Market Share Methodology		
Year	Historical	Total GA Ops	Based Acft	Ops per Based Acft	Total GA Ops	Total GA Ops	Total U.S. GA Ops	Market Share
Historical:								
2012	25,733	46,714	59	436	25,733	25,733	26,580,130	0.0968%
Projected:								
2017		31,446	63	436	27,352	25,695	26,540,848	0.0968%
2022		33,966	67	436	29,071	26,270	27,134,396	0.0968%
2027		36,707	71	436	30,874	26,873	27,756,756	0.0968%
2032		39,691	75	436	32,776	27,505	28,409,977	0.0968%
CAGR (2012-2032)		*-0.81%*	*1.22%*		*1.22%*	*0.33%*	*0.33%*	

Sources: Historical Operations - Air Traffic Activity Data System (ATADS) and Mead & Hunt
Total U.S. GA Operations - FAA Aerospace Forecasts FY 2013-2033
Projections - Mead & Hunt, Inc., except FAA TAF Summary which are from the FAA Terminal Area Forecast

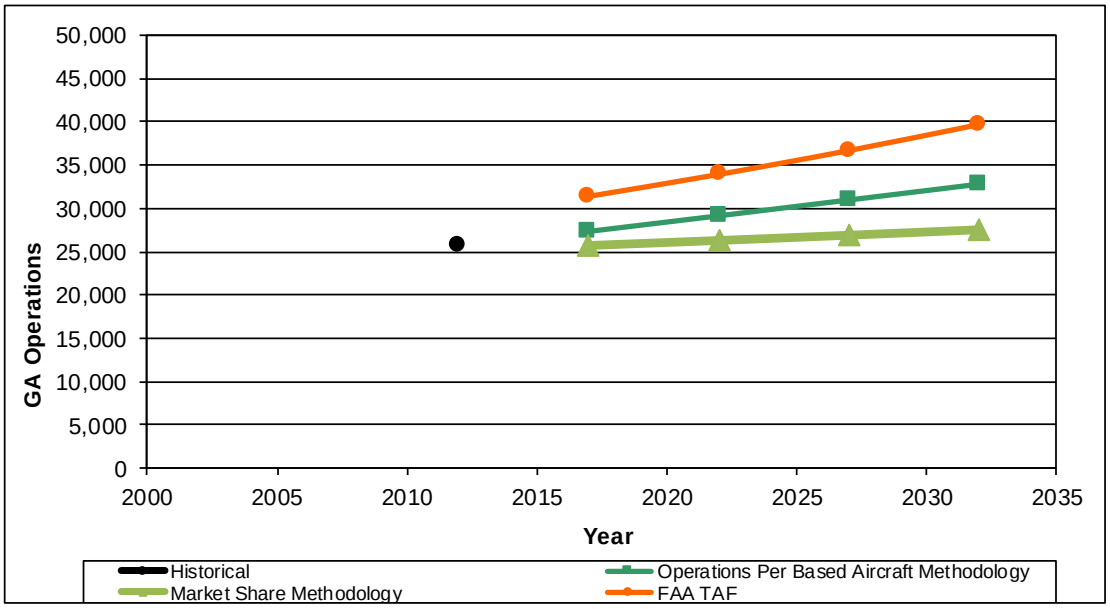
The Operations per Based Aircraft Methodology examines the number of GA operations that occurred in 2012 per based aircraft. In 2012, the number of GA operations per based aircraft was 436. Using the projected number of based aircraft for the Airport and assuming this level of operations per based aircraft remains constant throughout the forecasting period, GA operations will increase from 25,733 in 2012 to 32,776 in 2032.

The market share methodology compares local activity with a larger entity. In 2012, the Airport's 25,733 GA operations represented 0.0968 percent of the total U.S. GA operations. Using the FAA's forecasts of total U.S. GA operations, and assuming the 2012 market share of 0.0968 percent remains constant throughout the forecasting period, the market share methodology projects GA operations will increase from 25,733 in 2012 to 27,505 in 2032.

GA activity can be affected by many variables including the costs to own and operate an aircraft, available hangar space for lease, and the status of local, state, national and world economies. A comparison of projected GA operations using the methodologies described in this section is presented in **Table 3-21**. It is anticipated that the Airport's number of based aircraft will increase proportionally with the number of based aircraft for the Airport, and the Operations per Based Aircraft Methodology is the preferred projection, representing a CAGR of 1.22 percent.

Table 3-21: General Aviation Operations Forecasts Summary

Year	Historical	*Preferred* Operations Per Based Aircraft Methodology	Market Share Methodology	FAA TAF
Historical:				
2012	25,733			
Projected:				
2017		27,352	25,695	31,446
2022		29,071	26,270	33,966
2027		30,874	26,873	36,707
2032		32,776	27,505	39,691
CAGR (2012-2032)		*1.22%*	*0.33%*	*2.19%*



Notes: ATCT Opened in Sept of 2011; 2012 is only available historical year
CAGR = Compounded annual growth rate.
Sources: Historical Operations - Air Traffic Activity Data System (ATADS)
Projections - Mead & Hunt, Inc., except FAA Terminal Area Forecast Summary

As a part of the projections developed for GA operations, a breakdown of the operations that can be anticipated by local and itinerant aircraft movements was also prepared. As defined by the FAA ATADS, local operations are those operations performed by aircraft that remain in the local traffic pattern, execute simulated instrument approaches or low passes at an airport, and the operations to or from an airport and a designated practice area within a 20−mile radius of the tower. Itinerant operations are operations performed by an aircraft, either instrument flight rule (IFR), special visual flight rule (SVFR), or VFR that lands at an airport arriving from outside the airport area or departs an airport and leaves the airport area.

In 2012, itinerant GA operations represented 60 percent of the total GA operations, while local operations represented 40 percent. It is anticipated that the split in local/itinerant operations experienced in 2012 will remain constant throughout the forecasting period. A summary of the projected local and itinerant general aviation operations is presented in **Table 3-22**.

Table 3-22: Local/Itinerant General Aviation Operations Forecast

Year	Total GA Operations	Itinerant GA Operations	Itinerant GA Percent	Local GA Operations	Local GA Percent
Historical:					
2012	25,733	15,420	60%	10,313	40%
Projected:					
2017	27,352	16,390	60%	10,962	40%
2022	29,071	17,421	60%	11,651	40%
2027	30,874	18,501	60%	12,373	40%
2032	32,776	19,640	60%	13,135	40%
CAGR (2012-2032)	*1.22%*	*1.22%*		*1.22%*	

Notes: CAGR = Compounded Annual Growth Rate.
Sources: Historical Operations - Air Traffic Activity Data System (ATADS) and Mead & Hunt
Projections - Mead & Hunt, Inc.

3.8 Military Operations

In 2012 the number of annual military operations conducted at the Airport was 863. Military operations are driven more by national security policy decisions than by economic factors; therefore, it is logical to project military operations will remain consistent with the number conducted in 2012. **Table 3-23** presents the military operations projections.

Table 3-23: Military Operations Forecast

Year	Itinerant Operations	Itinerant %	Local Operations	Local %	Total
Historical:					
2012	484	56%	379	44%	863
Projected:					
2017	484	56%	379	44%	863
2022	484	56%	379	44%	863
2027	484	56%	379	44%	863
2032	484	56%	379	44%	863
				CAGR 2012-2032	*0.00%*

Sources: Historical Military Operations - FAA Air Traffic Activity Data System (ATADS)
Projections - Mead & Hunt, Inc.

Table 3-24 presents the fleet mix break down by physical aircraft class and representative equipment types (in declining prevalence) for the projected years. The current military fleet mix was obtained from the FAA's Traffic Flow Management System Counts (TFMSC), which utilizes IFR flight plan data and radar track records to estimate operational counts. As noted above, military operations are driven more by national

security policy decisions than by economic factors; therefore, it is assumed that the projected military operational fleet mix will remain consistent with it 2012 composition.

Table 3-24: Military Operations Fleet Mix

		Current Military Fleet Mix		
Physical Class	**Equipment Type**	**2012 IFR Departures**	**Percent of Military Activity**	**Projected Annual Operations (2013-2032)**
Jet	CL41 - Canadair CL-41 Tutor	5	6.3%	54
Jet	F18 - Boeing FA-18 Hornet	3	3.8%	32
Jet	B737 - Boeing 737-700	2	2.5%	22
Jet	C560 - Cessna Citation V/Ultra/Encore	2	2.5%	22
Jet	GLF5 - Gulfstream V/G500	2	2.5%	22
Jet	F15 - Boeing F-15 Eagle	1	1.3%	11
Jet	F5 - Northrop F-5 Freedom Fighter	1	1.3%	11
Jet	LJ35 - Bombardier Learjet 35/36	1	1.3%	11
	Subtotal Jets	17	21.3%	183
Turbine	BE20 - Beech 200 Super King	14	17.5%	151
Turbine	C208 - Cessna 208 Caravan	4	5.0%	43
Turbine	C130 - Lockheed 130 Hercules	3	3.8%	32
Turbine	PC12 - Pilatus PC-12	3	3.8%	32
Turbine	C30J - C-130J Hercules ; Lockheed	2	2.5%	22
Turbine	SH33 - Shorts 330	2	2.5%	22
Turbine	TEX2 - Raytheon Texan 2	2	2.5%	22
Turbine	B350 - Beech Super King Air 350	1	1.3%	11
Turbine	C2A - C-2 Greyhound	1	1.3%	11
Turbine	BE9L - Beech King Air 90	1	1.3%	11
Turbine	D328 - Dornier 328 Series	1	1.3%	11
	Subtotal Turbines	34	42.5%	367
Piston	C182 - Cessna Skylane 182	9	11.3%	97
Piston	C172 - Cessna Skyhawk 172/Cutlass	4	5.0%	43
Piston	FA62 - unknown	3	3.8%	32
Piston	P68 - Partenavia P-68 Victor	1	1.3%	11
Piston	T6 - North American T-6 Texan	1	1.3%	11
	Subtotal Pistons	18	22.5%	194
Copter	H60 - Sikorsky SH-60 Seahawk	10	12.5%	108
Copter	UH60 - Blackhawk Helicopter	1	1.3%	11
	Subtotal Copters	11	13.8%	119
	Grand Total	80	100.0%	863

Sources: 2012 IFR Military Departures - FAA Traffic Flow Management System Counts (TFMSC)
Projections - Mead & Hunt, Inc.

3.9 Instrument Operations

Instrument operations are those conducted by properly equipped aircraft that can utilize radio and global positioning system (GPS) signals emitted by navigational equipment for a pilot to conduct a landing with limited visual cues. Most instrument operations are conducted by commercial aircraft, GA aircraft filing instrument flight plans, and essentially all aircraft operations conducted in IFR weather. In 2012, 43 percent of all aircraft operations conducted at the Airport were instrument operations (**Table 3-25**). Assuming this percentage remains constant throughout the forecasting period, instrument operations are projected to increase from 17,492 in 2012 to 19,641 in 2032.

Table 3-25: Instrument Operations Forecast

Year	Total Operations	Instrument Operations		Visual Operations	
		Operations	Percent	Operations	Percent
Historical:					
2012	40,889	17,492	43%	23,398	57%
Projected:					
2017	41,425	17,721	43%	23,704	57%
2022	42,632	18,237	43%	24,395	57%
2027	43,783	18,729	43%	25,053	57%
2032	45,914	19,641	43%	26,273	57%
CAGR (2012-2030)	*0.58%*	*0.58%*		*0.58%*	

Notes: CAGR = Compounded Annual Growth Rate.
Sources: Historical Operations - FAA Air Traffic Activity Data System (ATADS) and Mead & Hunt Projections - Mead & Hunt, Inc.

3.10 Cargo Activity

Air cargo at the Airport consists of activity by Wiggins Aviation operating for FedEx and AirNet Systems, a small package express carrier. Wiggins operates a fleet of primarily C-208 Cessna Caravans, with some occasional Beechcraft BE-99s and Embraer EMD-110s. AirNet primarily operates a twin-engine Beechcraft Baron 58, with some occasional Lear 35s. There is also some air cargo carried by the scheduled carriers; however, this activity is fairly negligible.

The Airport provided data regarding the amount of inbound cargo for 2011 and 2012. As shown in **Table 3-26**, the Airport's market share compared to total U.S. revenue ton miles in 2012 was 0.01199 percent. The air cargo projection assumes that the Airport's current market share of the domestic air cargo market will remain steady through the forecasting period. Analyzing U.S. air cargo projections obtained from the FAA Aerospace Forecast FY 2013-2033, a CAGR of 0.70 percent is projected through 2032. Applying this CAGR, total air cargo enplaned at the Airport is projected to increase from 1,445,060 pounds in 2012 to 1,662,695 pounds in 2032.

Table 3-26: Air Cargo Projections

Year	Total UNV Inbound Cargo	Total U.S. Air Cargo (mil-rev ton mi)	UNV Market Share
Historical:			
2011	1,514,771	12,046.9	0.01257%
2012	1,445,060	12,053.4	0.01199%
Projected:			
2017	1,535,123	12,804.6	0.01199%
2022	1,575,865	13,144.4	0.01199%
2027	1,620,523	13,516.9	0.01199%
2032	1,662,695	13,868.7	0.01199%
CAGR (2012-2032)	*0.70%*	*0.70%*	

Notes: CAGR = Compounded annual growth rate.
Sources: Historical Airport Cargo Data - Airport Management
Total U.S. Air Cargo (Revenue Ton Miles) - FAA Aerospace Forecasts FY2013-2033

3.11 Peak Operations

Airfield infrastructure planning is often based on peak periods of aircraft activity. In an effort to measure how well existing facilities can accommodate high levels of demand, this section presents the monthly, daily and hourly peak activity levels for aircraft operations that can be anticipated at the Airport for the next 20 years.

To forecast peak month operations, the average percent of operations accounted for in the peak month is multiplied by the projected number of annual operations, and then divided by the number of days in the peak month. Assuming this percentage remains constant throughout the forecasting period, the peak number of operations in a month is anticipated to increase from 3,965 in 2012 to 4,720 in 2032.

The number of aircraft operations in the peak hour for each day was estimated at 14.0 percent based upon a typical industry average. Assuming this percentage remains constant throughout the forecasting period, the number of peak hour operations in the peak month is anticipated to increase from 18 in 2012 to 21 in 2032 (**Table 3-27**).

Table 3-27: Peak Month, Average Day, and Peak Hour Operations Projections

		Monthly Operations 2012		
Historical:	Jan	2,711		
	Feb	2,848		
	Mar	3,255		
	Apr	3,335		
	May	3,273		
	Jun	3,591		
	Jul	3,350		
	Aug	3,965		
	Sep	3,599		
	Oct	3,336		
	Nov	3,007		
	Dec	2,299		
	Total	38,569	*Estimted PMAD Peak Hour Ops* [1]	14.0%
	Peak Month	3,965	*Estimted PMAD Peak Hour Ops* [2]	18
	Peak Month	August		
	Percent of Annual	10.28%		
	PMAD Operations	128		
	PMAD PH Ops [1]	14.0%		

Projected:	**Annual Ops**	**Peak Mnth %**	**PM Ops**	**PMAD Ops**	**Peak Hr[1] %**	**PH Ops**
2017	41,425	10.28%	4,259	137	14.00%	19
2022	42,632	10.28%	4,383	141	14.00%	20
2027	43,783	10.28%	4,501	145	14.00%	20
2032	45,914	10.28%	4,720	152	14.00%	21
CAGR (2012-2032)	*0.88%*		*0.88%*	*0.88%*		*0.88%*

Notes: CAGR – Compounded Annual Growth Rate
Historical operations only include operations during ATCT hours
PM = Peak Month; PMAD – Peak Month Average Day
[1] Estimated based upon typical industry averages
Sources: Historical monthly operations – FAA Air Traffic Activity Data System (ATADS)
Projections: Mead & Hunt, Inc.

3.12 Design Aircraft

It is important to determine the most demanding aircraft operating at an airport, or "design aircraft," as these aircraft have a direct influence on airfield geometric design standards and safety criteria. The design aircraft is a composite aircraft representing a collection of aircraft classified by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). The AAC, ADG, and approach visibility minimums are combined to form the Runway Design Code (RDC). The RDC provides the information needed to determine certain standards that apply. The first component depicted by a letter is the AAC and relates to aircraft approach speed (operational characteristics). The second component depicted by a Roman numeral is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics). The TDG signifies the standards to which taxiways are to be built based upon

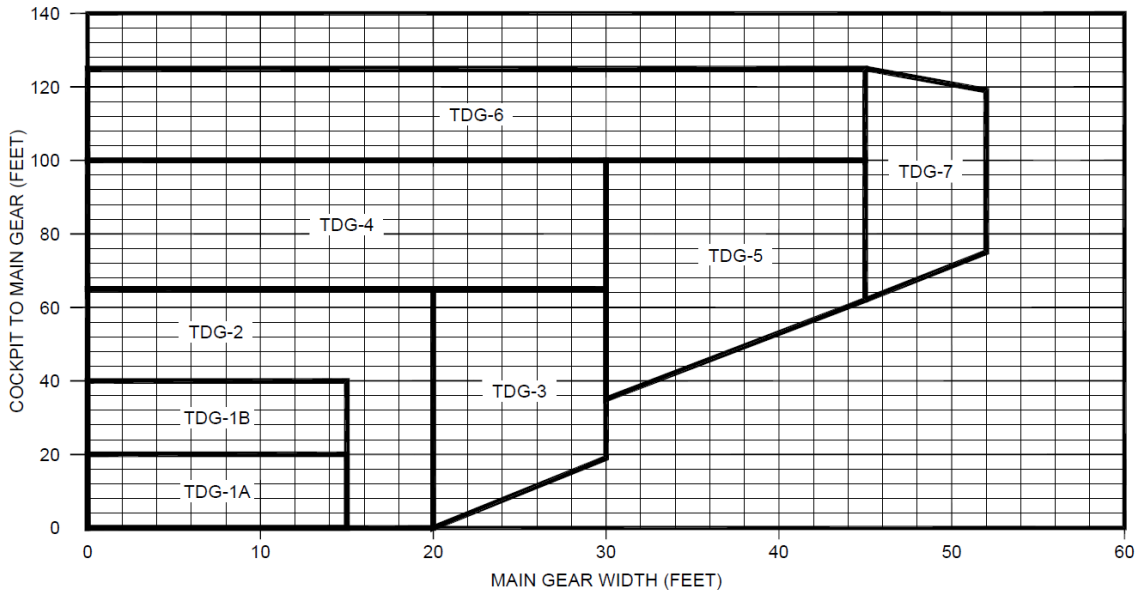
undercarriage dimensions. FAA standard definitions for aircraft approach categories and design groups are noted in **Table 3-28**.

Table 3-28: Aircraft Approach Category and Design Group Definitions

Aircraft Approach Category (AAC)	Approach Speed (knots)
A	Less than 91 knots
B	91 or greater, but less than 121
C	121 or greater, but less than 141
D	141 or greater, but less than 166
E	166 or greater

Airplane Design Group (ADG)	Wingspan (feet)	Tail Height (feet)
I	<49	<20
II	49 - <79	20 - <30
III	79 - <118	30 - <45
IV	118 - <171	45 - <60
V	171 - <214	60 - <66
VI	214 - <262	66 - <80

Taxiway Design Groups (TDG)



Source: FAA Advisory Circular 150/5300-13A, *Airport Design*

The most demanding aircraft that currently use the Airport are large commercial jet and business jet aircraft. Large commercial jet aircraft operating at the Airport include the Boeing 757, Boeing 737, Airbus A320, Bombardier CRJ-200, DHC-8 100/300 and Saab340. Large business jet aircraft regularly operating at the Airport include all Cessna Citation models, the Bombardier Challenger 600/601/604, the Bombardier Global Express, the Hawker 800, numerous Gulfstream models, numerous Dassault Falcon models, and numerous Learjet models. **Table 3-29** summarizes the number of IFR jet operations and commercial turboprop operations recorded in 2010, 2011, and 2012, also noting the AAC and ADG for each type.

Table 3-29: Historical Instrument Flight Rules Operations by Aircraft Type (page 1)

Aircraft Type	Approach Category AAC	Airplane Design Goup ADG	Historical IFR Operations 2010	2011	2012	Avg/ Year
All Jets						
EA50 - Eclipse 500	B	I	208	242	178	209
C525 - Cessna CitationJet/CJ1	B	I	110	140	122	124
C550 - Cessna Citation II/Bravo	B	I	102	130	52	95
E50P - Embraer Phenom 100	B	I	4	12	12	9
PRM1 - Raytheon Premier 1/390 Premier 1	B	I	14	24	10	16
FA10 - Dassault Falcon/Mystère 10	B	I	22	12	6	13
C501 - Cessna I/SP	B	I	0	14	2	5
C510 - Cessna Citation Mustang	B	I	30	4	2	12
C500 - Cessna 500/Citation I	B	I	2	0	0	1
MU30 - Mitsubishi MU300/ Diamond I	B	I	0	2	0	1
SBR1 - North American Rockwell Sabre 40/60	B	I	0	4	0	1
C560 - Cessna Citation V/Ultra/Encore	B	II	124	120	150	131
FA50 - Dassault Falcon/Mystère 50	B	II	40	88	70	66
C680 - Cessna Citation Sovereign	B	II	94	54	58	69
C25A - Cessna Citation CJ2	B	II	56	44	54	51
C650 - Cessna III/VI/VII	B	II	16	26	50	31
E55P - Embraer Phenom 300	B	II	2	6	22	10
FA20 - Dassault Falcon/Mystère 20	B	II	8	8	16	11
C25B - Cessna Citation CJ3	B	II	26	48	12	29
F900 - Dassault Falcon 900	B	II	40	68	12	40
ASTR - IAI Astra 1125	B	II	4	12	8	8
C25C - Cessna Citation CJ3	B	II	0	0	8	3
C551 - Cessna Citation II/SP	B	II	0	12	0	4
BE40 - Raytheon/Beech Beechjet 400/T-1	C	I	96	82	76	85
WW24 - IAI 1124 Westwind	C	I	10	16	28	18
LJ55 - Bombardier Learjet 55	C	I	10	18	24	17
LJ25 - Bombardier Learjet 25	C	I	4	0	2	2
H25A - BAe HS 125-1/2/3/400/600	C	I	6	0	0	2
LJ24 - Bombardier Learjet 24	C	I	6	0	0	2
CRJ2 - Bombardier CRJ-200	C	II	3,864	4,240	3,728	3,944
C56X - Cessna Excel/XLS	C	II	218	232	186	212
H25B - BAe HS 125/700-800/Hawker 800	C	II	228	206	152	195
E145 - Embraer ERJ-145	C	II	160	76	78	105
J328 - Fairchild Dornier 328 Jet	C	II	62	60	66	63
CL30 - Bombardier (Canadair) Challenger 300	C	II	18	22	62	34
CL60 - Bombardier Challenger 600/601/604	C	II	50	46	52	49
C750 - Cessna Citation X	C	II	32	86	46	55
F2TH - Dassault Falcon 2000	C	II	38	36	32	35
CRJ1 - Bombardier CRJ-100	C	II	10	150	30	63
GALX - IAI 1126 Galaxy/Gulfstream G200	C	II	10	28	12	17
GLF3 - Gulfstream III/G300	C	II	6	8	4	6
E135 - Embraer ERJ 135/140/Legacy	C	II	6	4	2	4
H25C - BAe/Raytheon HS 125-1000/Hawker 1000	C	II	4	0	2	2
E45X - Embraer ERJ 145 EX	C	II	78	0	0	26
HA4T - Hawker 4000	C	II	6	2	0	3

Table 3-29: Historical Instrument Flight Rules Operations by Aircraft Type (page 2)

Aircraft Type	Approach Category AAC	Airplane Design Goup ADG	Historical IFR Operations 2010	2011	2012	Avg/ Year
DC93 - Boeing (Douglas) DC 9-30	C	III	4	10	14	9
DC91 - Boeing (Douglas) DC 9-10	C	III	6	10	12	9
B737 - Boeing 737-700	C	III	4	4	8	5
B734 - Boeing 737-400	C	III	6	4	4	5
A319 - Airbus A319	C	III	0	0	2	1
A320 - Airbus A320 All Series	C	III	6	8	2	5
B733 - Boeing 737-300	C	III	0	0	2	1
E170 - Embraer 170	C	III	0	0	2	1
B722 - Boeing 727-200	C	III	4	0	0	1
B732 - Boeing 737-200/VC96	C	III	2	12	0	5
GLEX - Bombardier BD-700 Global Express	C	III	0	2	0	1
MD83 - Boeing (Douglas) MD 83	C	III	0	2	0	1
B752 - Boeing 757-200	C	IV	2	6	4	4
C17 - Boeing Globemaster 3	C	IV	4	6	0	3
LJ45 - Bombardier Learjet 45	D	I	20	40	46	35
LJ35 - Bombardier Learjet 35/36	D	I	18	18	30	22
LJ40 - Learjet 40; Gates Learjet	D	I	12	12	20	15
LJ60 - Bombardier Learjet 60	D	I	16	18	16	17
LJ31 - Bombardier Learjet 31/A/B	D	I	16	8	12	12
F18 - Boeing FA-18 Hornet	D	I	0	8	6	5
F15 - Boeing F-15 Eagle	D	I	0	0	2	1
F5 - Northrop F-5 Freedom Fighter	D	I	0	0	2	1
F16 - Lockheed F-16 Fighting Falcon	D	I	0	4	0	1
GLF4 - Gulfstream IV/G400	D	II	64	110	78	84
G150 - Gulfstream G150	D	II	4	2	6	4
GLF2 - Gulfstream II/G200	D	II	4	0	0	1
B738 - Boeing 737-800	D	III	42	66	48	52
GLF5 - Gulfstream V/G500	D	III	26	28	36	30
-1 - unknown			26	0	0	9
Scheduled Carrier Turboprops						
SF34 - Saab SF 340	B	II	2,912	2,852	1,664	2,476
DH8A - Bombardier DHC8-100	A	III	1,362	1,160	2,394	1,639
DH8C - Dash 8/DHC8-300	A	III	732	480	220	477
Grand Total			11,116	11,252	10,056	10,808

Note: Operations based upon twice the number of departures
Source: FAA Traffic Flow Management System Counts (TFMSC), Aviation System Performance Metrics (ASPM)
Mead & Hunt, Inc

Table 3-30 summarizes the number of historical and projected operations by AAC and ADG for IFR jet operations and scheduled carrier turboprop operations. Nonscheduled turboprops and piston aircraft are not included in these totals. Projections for operations by commercial aircraft types were based on airline fleet mix projections presented previously in this chapter while projections for GA aircraft types assumed operations by each type of aircraft would increase at the same rate as the projected number of total GA operations.

Table 3-30: Historical and Projected Instrument Flight Rules Operations by Approach Category and Design Group

Approach Category	Historical IFR Operations				Projected IFR Operations			
	2010	2011	2012	Avg/yr	2017	2022	2027	2032
A	2094	1640	2614	2116	810	397	0	0
B	3,814	3,922	2,508	3,415	1,513	1,312	1,125	1,196
C	4,960	5,376	4,632	4,989	6,260	7,282	8,102	8,279
D	222	314	302	279	297	315	335	356
Total	11,090	11,252	10,056	10,799	8,880	9,306	9,562	9,830
Design Group								
I	706	808	648	721	766	813	864	918
II	8,184	8,646	6,660	7,830	6,395	5,750	4,622	4,297
III	2,194	1,786	2,744	2,241	1,711	2,734	4,067	4,605
IV	6	12	4	7	8	8	9	9
Total	11,090	11,252	10,056	10,799	8,880	9,306	9,562	9,830

Note: Table only includes IFR Jet Operations and Scheduled Carrier Turboprop operations
Source: FAA Traffic Flow Management System Counts (TFMSC), Mead & Hunt, Inc

The TDG of the aircraft currently operating at and projected to operate at the Airport was also examined. The majority of the aircraft operating at the Airport are TDG's 1, 2, and 3; however, there are some TDG-4 aircraft currently operating at the airport. In particular, the TDG-4 aircraft currently operating at the airport include the MD80 and the Boeing 757 as well as an occasional operation by a TDG-6 aircraft such as the Boeing 767. Operations by TDG-4 aircraft have averaged 8 per year from 2010 through 2012. It is projected that the number of operations by TDG-4 aircraft will increase substantially in the future as the MD80 is a prevalent aircraft type in the low-cost carrier fleet and service by low-cost carriers is anticipated in the near future. The number of operations by TDG-4 is anticipated to include scheduled commercial service, with operations increasing from approximately 200 in 2017 up to nearly 300 by 2032.

FAA AC 150/5300-13A, *Airport Design*, states the following regarding selection of a design aircraft:

> *"The design aircraft enables airport planners and engineers to design the airport in such a way as to satisfy the operational requirements of such aircraft and meet national standards for separation and geometric design (safety issues). The "design" aircraft may be a single aircraft or a composite of several different aircraft composed of the most demanding characteristics of each."*

This FAA guidance document also states the following regarding selection of a design aircraft for federally funded projects:

> *"The FAA administers a grant program (Order 5100.38) which provides financial assistance for developing public-use airports. Persons interested in the program can obtain information from the FAA Airports Regional Office or Airports District Office (ADO) that serves their geographic area.*

> *Consult these offices for assistance with selection of the design aircraft for federally funded projects, which depends on demand factors that are beyond the scope of this AC."*

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS) defines "substantial use" as 500 or more annual itinerant operations, or scheduled commercial service, by the design or critical aircraft to be eligible for federal funding participation. However, FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, also notes that:

> *"Under unusual circumstances, adjustments may be made to the 500 total annual itinerant operations threshold after considering the circumstances of a particular airport. Two examples are airports with demonstrated seasonal traffic variations, or airports situated in isolated or remote areas that have special needs."*

According to the most recent Airport Layout Plan (ALP), the RDC for Runway 6/24 is C-III. However, there are aircraft with more demanding approach categories and design groups currently using the Airport on a regular basis, albeit at less than the 500 operations substantial use threshold. There has also been interest on the part of Penn State and potentially other universities for regular athletic charter operations by aircraft such as the Boeing 757, which is an RDC C-IV aircraft. Penn State recently put out a Request for Proposal (RFP) for seasonal athletic charter service for the football team by Boeing 757 type aircraft. However, the charter operators solicited have indicated that they cannot fulfill this operational need due to the current airfield limitations, particularly because of taxiway widths.

Operations by TDG-4 aircraft have averaged 8 per year from 2010 through 2012; however, operations by TDG-4 aircraft are anticipated to increase substantially in the near future, as the MD80 is a prevalent aircraft in the low-cost carrier fleet. Therefore, since scheduled commercial service operations by TDG-4 aircraft are anticipated in the near future, the taxiway system should be designed to TDG-4 standards. This anticipated scheduled commercial service need meets the FAA's substantial use threshold as defined in the NPIAS.

The current and future design aircraft are summarized in **Table 3-31**. The current design aircraft is a C-III and TDG-3 aircraft, and the future design aircraft is recommended as a D-IV and TDG-4 aircraft to accommodate the scheduled commercial service and seasonal operational needs of the Airport's users identified above.

Table 3-31: Current and Future Design Aircraft

Design Category	Current Design Aircraft	Future Design Aircraft
Runway Design Code (RDC)	C-III	D-IV
Aircraft Approach Category (AAC)	C	D
Approach Speed (knots)	121 or greater, but less than 141	141 or greater, but less than 166
Design Aircraft	CRJ-200 (140 knots)	Gulfstream G400 (145 knots)
Airplane Design Group (ADG)	III	IV
Wingspan (feet)	79 - <118	118 - <171
Design Aircraft	Dash 8 (90 feet)	B757-300 (125 feet)
Taxiway Design Group (TDG)	TDG-3	TDG-4
Design Aircraft	B737-900	MD80

Source: Airport Layout Plan
Mead & Hunt, Inc.

Based on the design aircraft identified above, C-III is the current RDC for Runway 6/24. It is recommended and prudent to plan for future D-IV standards, given that Approach Category D operations are increasing through the planning period, and there is a demonstrated regular seasonal need for Design Group IV aircraft operations both now and in the future. Scheduled commercial service by low-cost carriers in the future is anticipated to result in a need for TDG-4 aircraft. It is important to note that many aircraft operating at the Airport fit into smaller RDC categories. Because the Airport is utilized regularly by all sizes and types of aircraft, the facility requirements and alternatives analyses will consider the needs of all user groups and not just the design aircraft identified above.

3.13 Forecast Summary and Terminal Area Forecast Comparison

Passenger and aircraft activity at the Airport has fluctuated in recent history. This is not uncommon in comparison to many U.S. airports as economic uncertainty and increased travel costs have impacted travel behavior. Despite increases in fuel cost, airline bankruptcies, system-wide route restructuring and aircraft fleet overhauls, the forecasts developed for this Master Plan suggest passenger enplanements, based aircraft and total aircraft operations will grow at the Airport over the next 20 years. A summary of these projections is presented in **Table 3-32**. A summary of these forecasts is also presented in specific FAA required tabular formats in **Table 3-33** and **Table 3-34**.

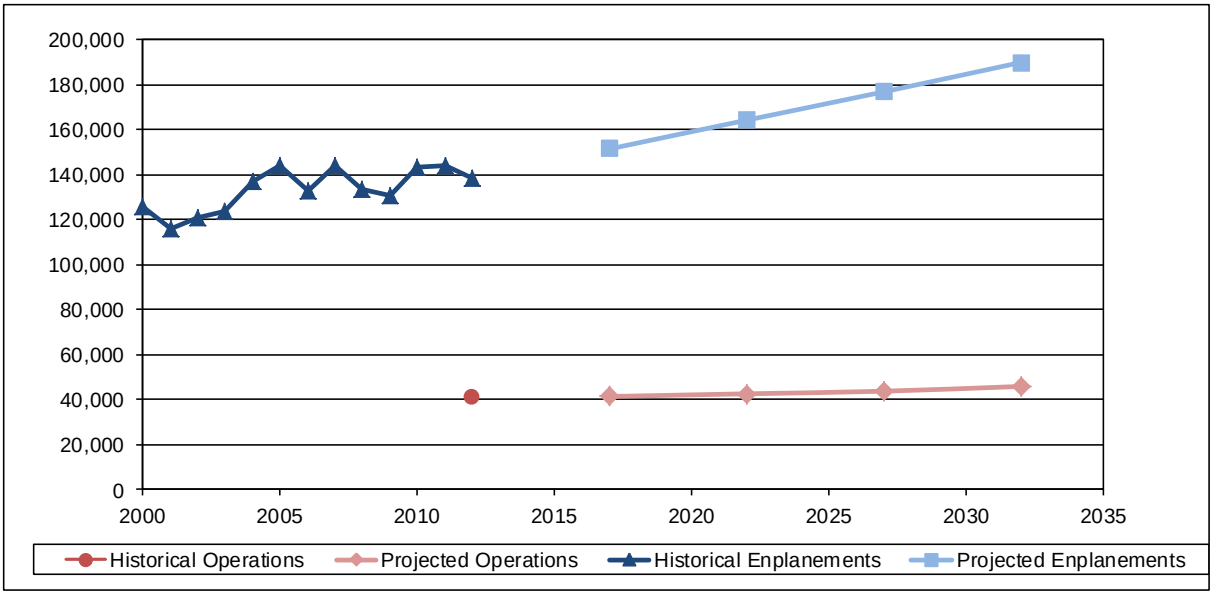
As was noted earlier, forecasts that differ from the FAA TAF projections by more than 15 percent are considered inconsistent with the TAF and require FAA HQ review. As shown in **Table 3-34** the enplanement projections prepared as part of the master plan are within 5 percent of the current FAA TAF projection.

The 20-year commercial operations projection is 20.8 percent below the FAA TAF projection. As part of this master plan, it projected that retirements of 50-seat regional jets and turboprop aircraft will result in increasing numbers of larger 70- to 90-seat regional jets operating at the Airport; it is also projected that low cost carrier narrow body service with 130 to 150 seats will be initiated within the planning period. These air carrier fleet changes towards larger aircraft is anticipated to result in fewer numbers of commercial operations despite the projected growth in passengers.

The 20-year projection of total operations is 18.0 percent below the FAA TAF projection. For total operations, the ATCT has only been open since September 2011, and historical operations totals prior to the ATCT opening are based upon rough estimates of activity only, not actual tower counts. Now that the ATCT is open, more accurate operational levels are being recorded, and these totals are lower than the previous estimates, this may be the cause of the differences in these forecast levels.

Table 3-32: Projections Summary

Year	Enplanements	Operations				Total Inbound Air Cargo	Based Aircraft
		Commercial Air Carrier	General Aviation	Military	Total		
Historical							
2000	125,659						61
2001	116,113						57
2002	120,938						57
2003	123,871						57
2004	137,066						54
2005	143,800						54
2006	132,543						44
2007	144,160						49
2008	133,777						53
2009	130,527						53
2010	143,531						62
2011	144,054					1,514,771	63
2012	138,488	14,293	25,733	863	40,889	1,445,060	59
Projected							
2017	151,480	13,210	27,352	863	41,425	1,535,123	63
2022	164,266	12,698	29,071	863	42,632	1,575,865	67
2027	176,879	12,046	30,874	863	43,783	1,620,523	71
2032	189,948	12,276	32,776	863	45,914	1,662,695	75
CAGR (2012-2032)	*1.59%*	*-0.76%*	*1.22%*	*0.00%*	*0.58%*	*0.70%*	*1.22%*



Note: Total Freight in pounds
Source: Historical Enplanements - FAA ACAIS
Historical Operations - Air Traffic Activity Data System (ATADS) and Mead & Hunt
Historical Freight - Airport Records
Historical Based Aircraft -2000-2011 FAA Terminal Area Forecast; 2012 FAA 5010 Form
Projections - Mead & Hunt, Inc.

Table 3-33: Federal Aviation Administration Template – Forecast Levels and Growth Rates

A. Forecast Levels and Growth Rates

	Specify base year: 2012					Average CAGR			
	2012	**2017**	**2022**	**2027**	**2032**				
	Base Yr. Level	**Base Yr. + 5yr.**	**Base Yr. + 10yrs.**	**Base Yr. + 15yrs.**	**Base Yr. + 20yrs.**	**Base Yr. + 5yr.**	**Base Yr. + 10yrs.**	**Base Yr. + 15yrs.**	**Base Yr. + 20yrs.**
Passenger Enplanements									
TOTAL Air Carrier & Commuter	138,488	151,480	164,266	176,879	189,948	1.8%	1.7%	1.6%	1.6%
Operations									
Itinerant									
Air carrier	64	494	1,209	2,069	2,334	50.5%	34.2%	26.1%	19.7%
Commuter/air taxi	14,229	12,716	11,489	9,977	9,942	-2.2%	-2.1%	-2.3%	-1.8%
Total Commercial Operations	14,293	13,210	12,698	12,046	12,276	-1.6%	-1.2%	-1.1%	-0.8%
General aviation	15,420	16,390	17,421	18,501	19,640	1.2%	1.2%	1.2%	1.2%
Military	484	484	484	484	484	0.0%	0.0%	0.0%	0.0%
Local									
General aviation	10,313	10,962	11,651	12,373	13,135	1.2%	1.2%	1.2%	1.2%
Military	379	379	379	379	379	0.0%	0.0%	0.0%	0.0%
TOTAL OPERATIONS	40,889	41,425	42,632	43,783	45,914	0.3%	0.4%	0.5%	0.6%
Instrument Operations	17,492	17,721	18,237	18,729	19,641	0.3%	0.4%	0.5%	0.6%
Peak Hour Operations	18	19	20	20	21	1.4%	1.0%	0.8%	0.9%
Cargo/mail (deplaned)	1,445,060	1,535,123	1,575,865	1,620,523	1,662,695	1.2%	0.9%	0.8%	0.7%
Based Aircraft									
Single Engine (Nonjet)	46	47	50	52	56	0.4%	0.8%	0.9%	1.0%
Multi Engine (Nonjet)	7	8	8	9	10	1.5%	1.3%	1.8%	1.7%
Jet Engine	5	7	7	8	8	6.6%	3.9%	3.0%	2.5%
Helicopter	1	1	1	1	2	4.6%	2.9%	2.3%	2.1%
Other	0	0	0	0	0	NA	NA	NA	NA
TOTAL	59	63	67	71	75	1.2%	1.2%	1.2%	1.2%

B. Operational Factors

	Base Yr. Level	**Base Yr. + 5yr.**	**Base Yr. + 10yrs.**	**Base Yr. + 15yrs.**	**Base Yr. + 20yrs.**
Average aircraft size (seats)					
Air carrier & Commuter	41.9	48.2	56.0	66.4	68.6
Average enplaning load factor					
Air carrier & Commuter	72.1%	74.0%	75.0%	76.0%	78.0%
GA operations per based aircraft	436	436	436	436	436

CAGR = Compound Annual Growth Rate

Table 3-34: Federal Aviation Adminstration Template – Forecast Levels and Growth Rates

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
Base Yr. Level	2012	138,488	142,146	-2.6%
Base Yr. + 5yr.	2017	151,480	151,048	0.3%
Base Yr. + 10yrs.	2022	164,266	160,522	2.3%
Base Yr. + 15yrs.	2027	176,879	170,602	3.7%
Base Yr. + 20yrs.	2032	189,948	181,328	4.8%
Commercial Operations				
Base Yr. Level	2012	14,293	25,659	-44.3%
Base Yr. + 5yr.	2017	13,210	13,764	-4.0%
Base Yr. + 10yrs.	2022	12,698	14,320	-11.3%
Base Yr. + 15yrs.	2027	12,046	14,898	-19.1%
Base Yr. + 20yrs.	2032	12,276	15,500	-20.8%
Total Operations				
Base Yr. Level	2012	40,889	71,927	-43.2%
Base Yr. + 5yr.	2017	41,425	46,039	-10.0%
Base Yr. + 10yrs.	2022	42,632	49,115	-13.2%
Base Yr. + 15yrs.	2027	43,783	52,434	-16.5%
Base Yr. + 20yrs.	2032	45,914	56,020	-18.0%

NOTES: TAF data is on a U.S. Government fiscal year basis (October through September).
Airport Forecast is on a calendar year basis.

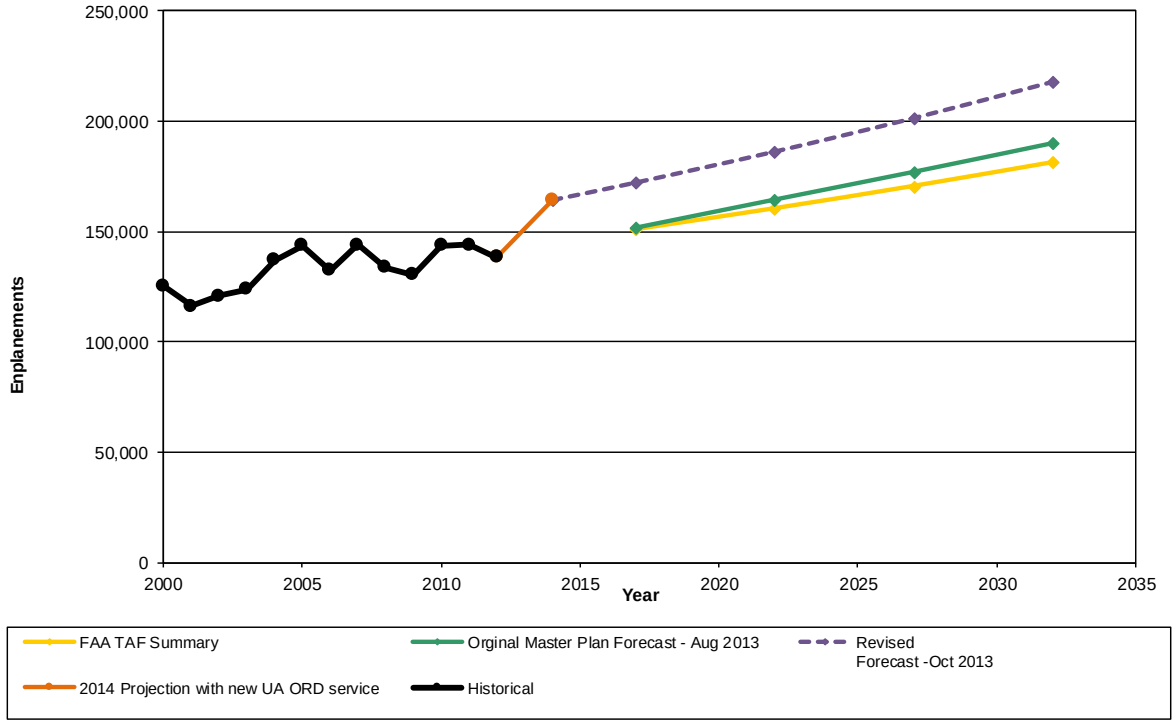
3.14 Revised Enplanement Forecast

The master plan forecasts presented in this chapter were originally prepared in July and August 2013. On September 9, 2013, United Airlines announced new service between State College and Chicago O'Hare beginning on January 7, 2014. This new route is anticipated to result in approximately 25,500 additional enplanements (100 seats/day x 365 days x 70 percent load factor). We have revised the master plan enplanement projections to account for the additional passengers anticipated as a result of this additional air service and seats in the market in the year 2014. The 1.59 percent CAGR used in the original master plan enplanement projections has been maintained; this rate is based upon a market share methodology of the FAA's projected growth rate in total U.S. domestic enplanements. However, the enplanement projection has been revised to include a new projected starting point in 2014 incorporating the additional passengers anticipated as a result of the new service.

Table 3-35 presents the revised enplanement forecast to be used in this master plan, in comparison to the original forecast and the FAA TAF. Enplanements in 2014 are projected to total 164,038 and increase to nearly 218,000 by 2032.

Table 3-35: Revised Enplanement Projection

Year	Historical	2014 Projection with new UA ORD service	FAA TAF Summary	Orginal Master Plan Forecast - Aug 2013 Enplanements Forecast	Orginal Master Plan Forecast - Aug 2013 Diff from FAA TAF	Revised Forecast -Oct 2013 Enplanements Forecast	Revised Forecast -Oct 2013 Diff from FAA TAF
Historical:							
2000	125,659						
2001	116,113						
2002	120,938						
2003	123,871						
2004	137,066						
2005	143,800						
2006	132,543						
2007	144,160						
2008	133,777						
2009	130,527						
2010	143,531						
2011	144,054						
2012	138,488						
CAGR (2000-2012)	*0.81%*						
Projected:							
2014		164,038				164,038	
2017			151,048	151,480	0.29%	172,000	13.87%
2022			160,522	164,266	2.33%	186,137	15.96%
2027			170,602	176,879	3.68%	201,437	18.07%
2032			181,328	189,948	4.75%	217,994	20.22%
	CAGR (2012-2032)		*1.36%*	*1.59%*			
					CAGR (2014-2032)	*1.59%*	



Note: CAGR = Compound Annual Growth Rate
Sources: Historical Enplanements - Airport Records
Near term projection assumes 2012 enplanements plus full year of 100 seats per day at 70% load factor (25,550 add'l enplanements)
Projections - Mead & Hunt, Inc., except FAA TAF Summary which are from the FAA Terminal Area Forecast
Prepared by: Mead & Hunt, October 4, 2013