

2. AVIATION ACTIVITY FORECASTS

2.1 Forecast Overview

An essential step to updating Virginia’s Air Transportation System Plan (VATSP) is the development of aviation demand forecasts. These projections are used to assess the airport system’s sufficiency in terms of annual operational capacity, establish future airport facility requirements and provide insight into where changes in the system may be appropriate over the forecast period.

It is important to set the context for projections developed as part of the VATSP Update. System plan forecasts are developed from the perspective of the overall system and are not individualized to take into account all of the unique factors that may influence activity levels at each airport. System plan projections attempt to remove double counting of activity that may occur if master plan forecasts for airports in the same or neighboring market areas are aggregated. In addition, the system plan and individual airport master plans occur at varying intervals and points in time. As a result, forecasts developed for Virginia airports as part of the VATSP Update may not agree with forecasts developed in individual airport master plans.

For this update to the VATSP, activity forecasts were developed for the 66 study airports, which consist of 57 public-use general aviation airports and nine commercial service airports. Using 2012 as the base year, the following components of aviation demand were forecast for a 25-year planning period:

- Based general aviation aircraft and fleet mix
- Annual general aviation operations
- Annual commercial passenger enplanements
- Annual commercial aircraft operations

The following sections describe historical trends in aviation activity at Virginia’s airports and present the forecasts of long-term aviation demand. It should be noted that airport sponsors participated in the development of forecasts presented in this chapter. Draft forecasts were distributed to all airport sponsors to provide them with an opportunity to review and comment on both the historical data and the forecasts. Information obtained through this review process was used to refine and finalize the aviation activity forecasts.

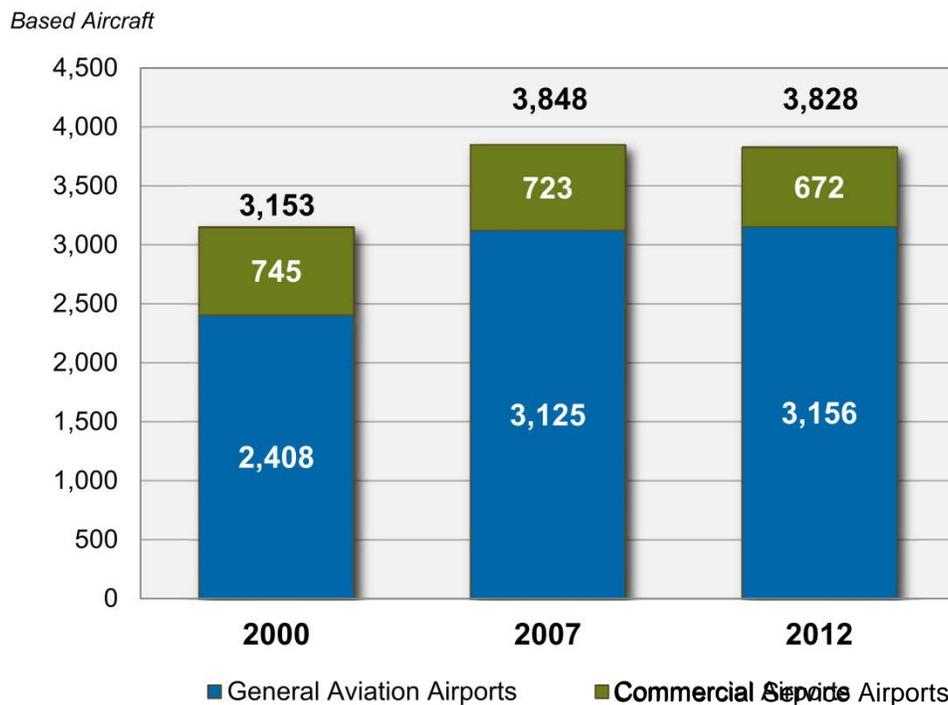
2.2 General Aviation Activity

General aviation is defined as all aviation other than commercial airline and military aviation. General aviation activity in the Commonwealth consists of a diverse range of activities including pilot training, recreational flying, law enforcement, medical/patient transport, aerial spraying and business aviation. Forecasts of general aviation activity include forecasts of based general aviation aircraft, general aviation fleet mix, and aircraft operations.

2.2.1 Based General Aviation Aircraft Forecast

To develop projections of based general aviation aircraft for study airports, historical growth in based aircraft in the Commonwealth was reviewed. Historical data maintained by the Virginia Department of Aviation was used to analyze the historical trends in the number of based general aviation aircraft in the Commonwealth. **Figure 2-1** shows Virginia’s historical growth in based general aviation aircraft between 2000 and 2012.

Figure 2 - 1: Historic Based Aircraft at Virginia Commercial Service and General Aviation Airports 2000 – 2012



Source: 2003 VATSP; DOAV Based Aircraft Surveys; FAA Aerospace Forecast FY12-FY32

Virginia’s total based general aviation aircraft increased from 3,153 in 2000 to 3,828 in 2012. As reflected in Figure 2-1, while the total number of based general aviation aircraft in Virginia increased between 2000 and 2012, the number of general aviation aircraft based at the commercial service airports actually decreased. For the most recent five year period, the total number of based aircraft in Virginia fell slightly from 3,848 in 2007 to 3,828 in 2012.

Table 2-1 provides information on the average annual rate of growth for Virginia’s based general aviation aircraft and compares this rate of growth to growth for total general aviation aircraft in the U.S. As shown, between 2000 and 2012, based general aviation aircraft in Virginia increased at an average annual rate of 1.6 percent. At the general aviation airports, total general aviation aircraft increased at a higher average annual rate of 2.3 percent. However, based general aviation aircraft at the commercial service airports actually fell by an average annual rate of -0.9 percent over the same period.

Table 2 - 1: Historic Average Annual Growth Rates for Based General Aviation Aircraft in Virginia

Airports	Average Annual Growth of Total Based Aircraft		
	2000-2007	2007-2012	2000-2012
Virginia Commercial Service Airports	-0.4%	-1.5%	-0.9%
Virginia General Aviation Airports	3.8%	0.2%	2.3%
All Virginia Airports	2.9%	-0.1%	1.6%
All U.S. Airports	0.9%	-0.8%	0.2%

Table 2-1 also shows that rate of growth for based general aviation aircraft in Virginia outpaced growth for general aviation aircraft in the U.S. Between 2000 and 2012, total general aviation aircraft in the U.S. increased at an average annual rate of 0.2 percent compared to 1.6 percent in Virginia. While Virginia's based general aviation aircraft grew over the long-term historical period, the more recent trend shows a decline. As presented in Table 2-1, between 2007 and 2012, based aircraft in Virginia decreased at an average annual rate of -0.1 percent, while general aviation aircraft in the U.S. decreased at an annual rate of -0.8 percent. While both the U.S. and Virginia experienced declines in based aircraft between 2007 and 2012, the rate of decrease was slower in Virginia than in the U.S.

Information shown in both Figure 2-1 and Table 2-1 was used to help set a context for the development of future levels of based general aviation aircraft in Virginia.

To develop forecasts of based general aviation aircraft, four different methodologies were tested. Ultimately, a single methodology was used to forecast based aircraft for all study airports. The four methodologies considered are discussed briefly below:

- **Linear Trend** – This methodology is based on the historical growth in based aircraft in terms of the number of aircraft added per year. This methodology is considered a bottom up approach. The actual growth in based general aviation aircraft at each airport for the long-term growth between 2000-2012 was averaged with the 2007-2012 short-term growth rate. Once this average rate of growth was established for individual airports, based aircraft at each airport were projected to grow at this average rate through 2037. For this methodology, some limits to both increases and decreases in based aircraft at specific study airports were set.
- **Average Annual Growth Rate Trend** – This methodology considered historic based aircraft growth in terms of actual average annual growth rates. This methodology is considered a bottom up approach. Similar to the linear trend methodology, long term (2000-2012) and short term (2007-2012) growth rates at each airport were averaged. Using this methodology, based aircraft at individual airports were forecast to grow at the average annual rate through 2037. For this methodology, some limits were also set to both increases and decreases in based aircraft at specific study airports.

- **Market Share**—The market share methodology is a top down forecasting approach. This methodology considers Virginia’s market share of total U.S. general aviation aircraft, as well as each study airport’s share of Virginia’s total based general aviation aircraft. In this methodology, the trend in Virginia’s share of total U.S. general aviation aircraft is projected forward. Changes in 2000 and 2007 market shares for individual study airports, as they related to total based aircraft in Virginia, were averaged and projected forward. Manual adjustments to the results were made as needed.
- **Group Growth Rate** – For this methodology, airports were grouped into five categories. Category assignments were based on each airport’s historical growth in based aircraft, forecast population growth for the airport’s market area, and forecast growth in income for the market area. Once assigned to a category, forecast growth rates for based aircraft were developed for each category. This methodology resulted in a based aircraft forecast for each individual airport, as well as for Virginia as a whole.

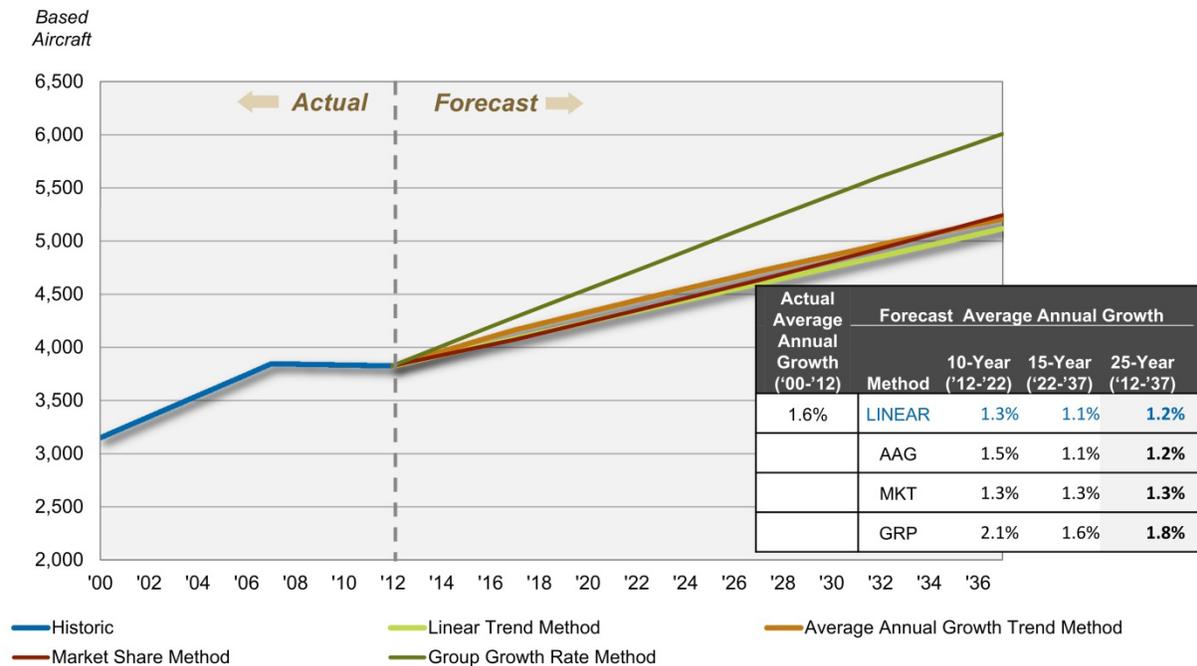
The objective in testing these various methodologies was to identify a forecast approach that provides the most viable results for all study airports. After reviewing the results of the various methodologies, the linear trend methodology was selected as the preferred methodology for forecasting based general aviation aircraft. This methodology was selected in part as a result of its conservative approach to projecting future based general aviation aircraft in Virginia.

Figure 2-2 compares the statewide results of the four methodologies. As shown in Figure 2-2, three of the four methodologies produced similar results for future based aircraft in Virginia. Only the group growth rate methodology produced a noticeably higher result. The preferred methodology (linear trend) resulted in an average annual growth rate of 1.2 percent.

After the linear trend methodology was selected to develop based aircraft forecasts for each of the Virginia airports, the individual airport forecasts were reviewed by airport sponsors, the DOAV and the FAA. Based on the review process adjustments were made in cases where historical trends were influenced by singular events and did not represent sustainable long-term growth rates. After the adjustments were made, the preferred methodology results in a total based aircraft forecast growth of 1.0 percent per year.

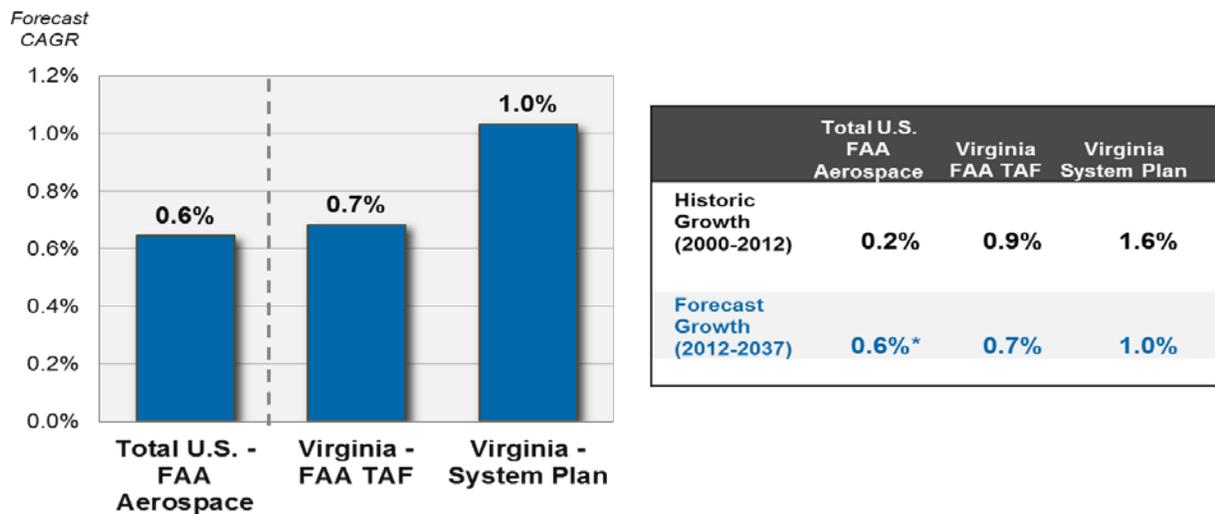
Figure 2-3 compares the VATSP forecast growth rate for based aircraft to the FAA’s projections of based aircraft for Virginia and the U.S.

Figure 2 - 2: Comparison of Results for Based Aircraft Forecast Methodologies



Source: ICF SH&E

Figure 2 - 3: Comparison of Forecast Average Annual Growth for Based Aircraft



Source: ICF SH&E; FAA Aerospace Forecast FY12-FY32; FAA TAF FY12-FY40

*Forecast is 2012-2032

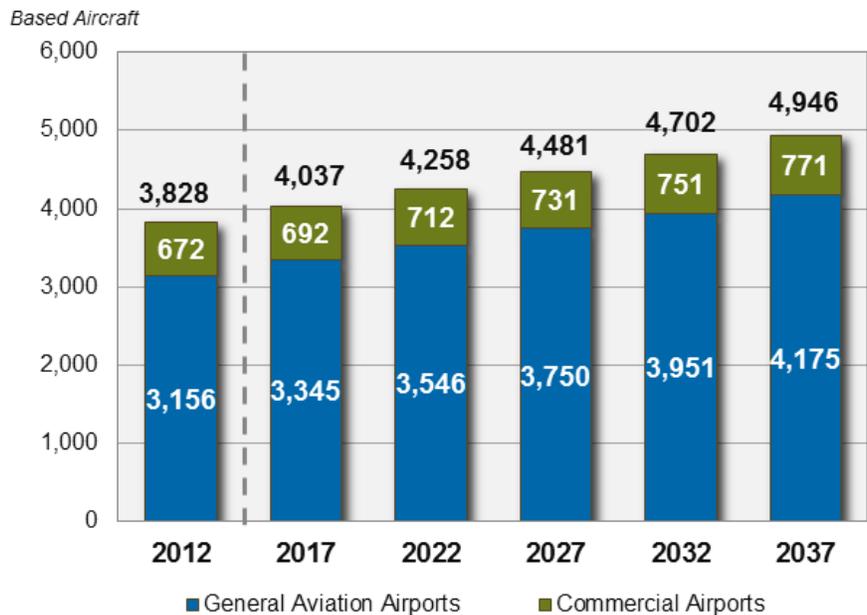
Figure 2-3 compares projected average annual rates of growth for based aircraft projections. As shown in this figure, the VATSP Update selected projection shows based aircraft in Virginia increasing at an average annual rate of 1.0 percent. FAA in its 2013 National Aerospace Forecasts projects total general aviation aircraft in the U.S. to increase at an average annual rate of just over 0.6 percent. Not all study airports in the VATSP are included in FAA's Terminal Area Forecast (TAF); for those that are, the FAA forecasts an average annual rate of growth slightly below 0.7 percent for general aviation aircraft based at these airports.

As shown in Figure 2-3, the average annual rate of growth for based general aviation aircraft in Virginia historically has outpaced the FAA's forecast growth for all general aviation aircraft in the U.S. and the FAA's rate of growth for Virginia airports included in FAA's TAF. This comparison of historical average annual rates of growth helps to support the somewhat higher rate of average annual growth that has been selected for use in the VATSP Update.

Figure 2-4 reflects Virginia's statewide projection of general aviation aircraft. As shown in this figure, statewide based aircraft are expected to increase from their current level of 3,828 to 4,946 by 2037. As noted, the implied average annual rate of growth in this projection is 1.0 percent. Figure 2-4 also shows the number of based general aviation aircraft that are expected at commercial and general aviation airports. For the selected based aircraft projection, **Table 2-2** compares the average annual rate of growth for general aviation aircraft expected to be based at both commercial and general aviation airports in Virginia. These growth rates are compared to the projected rate of growth for all based aircraft in Virginia and to the projected average annual rate of growth for all general aviation aircraft in the U.S., as obtained from the FAA's 2013 National Aerospace Forecast.

Using the preferred methodology, **Table 2-3** presents a projection of based general aviation aircraft for each of the study airports. This table also shows each airport's historical based aircraft for 2000, 2007 and 2012 which provides a context for each airport's individual projection of based general aviation aircraft.

Figure 2 - 4: Forecast of Based Aircraft at Virginia Commercial Service and General Aviation Airports



Source: ICF SH&E; FAA Aerospace Forecast FY12-FY32

Table 2 - 2: Comparison of Forecast Growth for Based Aircraft in Virginia and the U.S.

Airports	Forecast Average Annual Growth of Total Based Aircraft		
	2012-2022	2022-2037	2012-2037
Virginia Commercial Service Airports	0.6%	0.5%	0.6%
Virginia General Aviation Airports	1.2%	1.1%	1.1%
All Virginia Airports	1.1%	1.0%	1.0%
All U.S. Airports	0.4%	0.9%*	0.6%*

Source: ICF SH&E; FAA Aerospace Forecast FY12-FY32

*Total U.S.: Forecast is only through 2032 (column 3: '22-'32 / column 4: '12-'32)

Table 2 - 3: Preferred Based Aircraft Forecasts by Airport

Airport Name	VATSP Service Role	Actual			Forecast		
		2012	2017	2022	2027	2032	2037
Charlottesville-Albemarle	CM	68	68	68	68	68	68
Lynchburg Regional	CM	81	85	89	93	97	101
Newport News-Williamsburg International	CM	95	99	103	106	110	114
Norfolk International	CM	95	95	95	95	95	95
Richmond International	CM	65	65	65	65	65	65
Roanoke-Blacksburg Regional	CM	124	131	138	145	152	159
Ronald Reagan Washington National ¹	CM	0	0	0	0	0	0
Shenandoah Valley Regional	CM	84	87	90	93	96	99
Washington Dulles International	CM	60	62	64	66	68	70
Total Commercial Service Airports		672	692	712	731	751	771
Chesapeake Regional	RL	141	153	165	177	189	203
Hampton Roads Executive	RL	204	222	240	258	276	294
Hanover County Municipal	RL	115	124	133	142	151	160
Leesburg Executive	RL	232	232	232	232	232	232
Manassas Regional	RL	404	413	424	436	449	464
Richmond Executive-Chesterfield County	RL	121	134	147	160	173	185
Stafford Regional	RL	70	75	89	107	121	147
Warrenton-Fauquier	RL	165	182	199	216	233	252
Accomack County	GR	28	31	34	37	40	43
Blue Ridge Regional	GR	50	50	50	50	50	50
Culpeper Regional	GR	132	138	144	150	156	162
Danville Regional	GR	40	40	40	40	40	40
Dinwiddie County	GR	79	83	87	91	95	99
Emporia-Greenville Regional	GR	6	7	8	9	10	11
Farmville Municipal	GR	29	29	29	29	29	29

Table 2 - 3: Preferred Based Aircraft Forecasts by Airport (Continued)

Airport Name	VATSP Service Role	Actual			Forecast		
		2012	2017	2022	2027	2032	2037
Ingalls Field	GR	4	4	4	4	4	4
Lonesome Pine	GR	22	22	22	22	22	22
Mecklenburg-Brunswick Regional	GR	30	32	34	36	38	39
Middle Peninsula Regional	GR	37	45	53	61	69	77
Mountain Empire	GR	26	26	26	26	26	26
New River Valley	GR	44	47	50	53	56	60
Suffolk Executive	GR	77	77	77	77	77	77
Tappahannock-Essex County	GR	28	34	40	46	52	58
Tazewell County	GR	10	11	12	13	14	15
Virginia Highlands	GR	68	71	74	77	80	83
William M. Tuck	GR	18	18	18	18	18	18
Winchester Regional	GR	117	122	127	132	137	142
Blackstone AAF	GC	13	15	17	19	21	23
Brookneal-Campbell County	GC	0	2	4	4	4	4
Franklin Municipal	GC	25	27	29	31	33	36
Front Royal-Warren County	GC	65	69	73	77	81	86
Lee County	GC	9	9	9	9	9	9
Louisa County	GC	52	54	56	58	60	62
Luray Caverns	GC	22	23	24	25	26	29
Lake Country Regional	GC	6	7	8	9	10	11
New Kent County	GC	51	59	67	75	83	91
Orange County	GC	34	34	34	34	34	34
Shannon	GC	103	103	103	103	103	103
Tangier Island	GC	0	0	0	0	0	0
Twin County	GC	12	12	12	12	12	12
Virginia Tech-Montgomery Executive	GC	48	55	62	69	76	83

Table 2 - 3: Preferred Based Aircraft Forecasts by Airport (Continued)

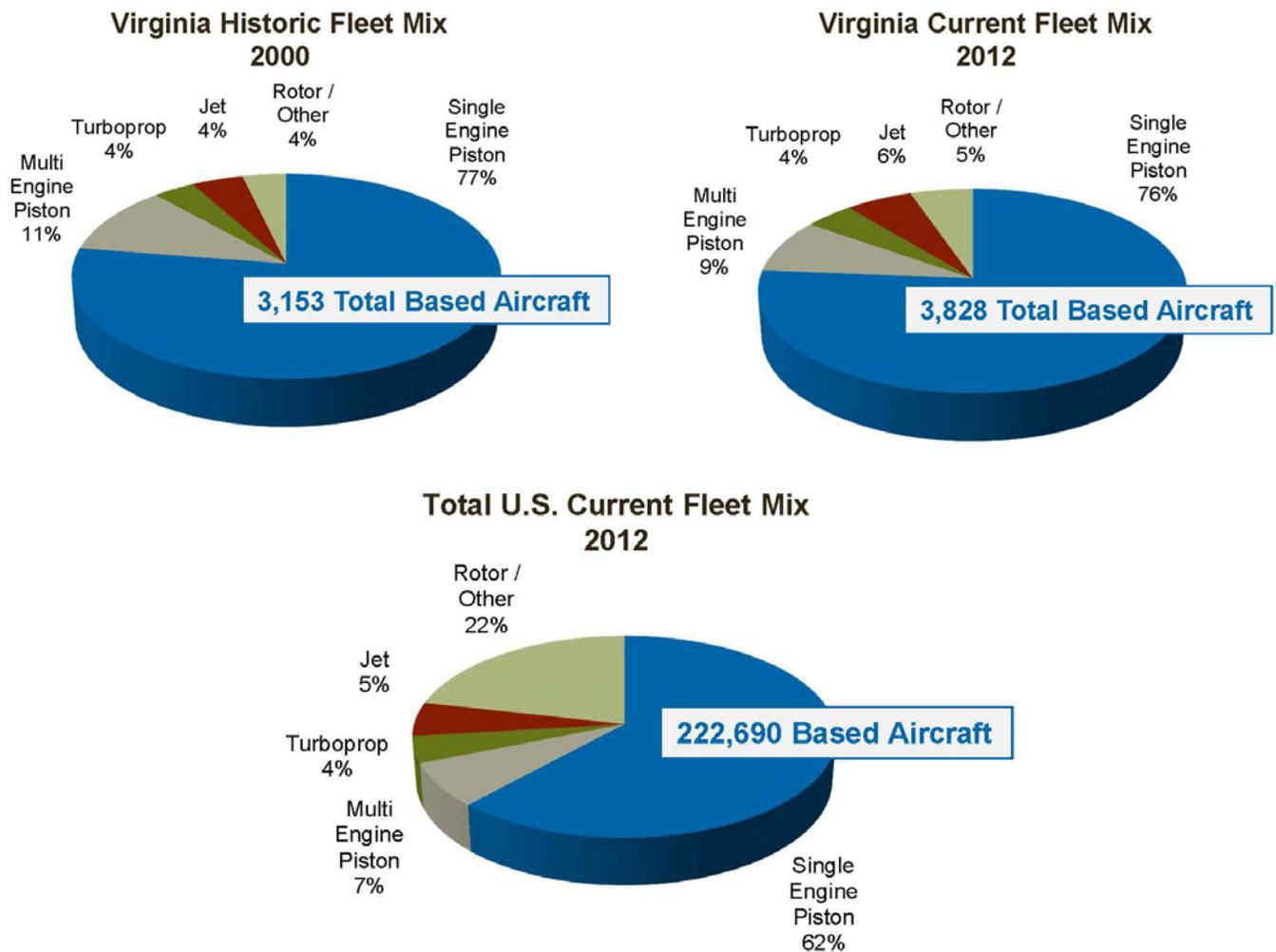
Airport Name	VATSP Service Role	Actual		Forecast			
		2012	2017	2022	2027	2032	2037
Wakefield Municipal	GC	26	26	26	26	26	26
Williamsburg-Jamestown	GC	73	77	81	85	89	93
Bridgewater Air Park	LO	81	106	131	156	181	206
Chase City Municipal	LO	4	4	4	4	4	4
Crewe Municipal	LO	10	10	10	10	10	10
Waynesboro-Eagle's Nest	LO	52	55	58	61	64	69
Falwell	LO	11	11	11	11	11	11
Gordonsville Municipal	LO	22	24	26	28	30	32
Grundy Municipal	LO	11	11	11	11	11	11
Hummel Field	LO	34	34	34	34	34	34
Lake Anna	LO	2	2	3	4	5	6
Lawrenceville-Brunswick	LO	3	3	3	3	3	3
Lunenburg County	LO	2	3	4	5	6	7
New London	LO	49	49	49	49	49	49
New Market	LO	27	27	27	27	27	27
Smith Mountain Lake	LO	12	12	12	12	12	12
Total GA Airports		3,156	3,345	3,546	3,750	3,951	4,175
Total VATSP Airports		3,828	4,037	4,258	4,481	4,702	4,946

/1 Washington National currently has zero based aircraft. No based aircraft is forecast over the study period based on the preferred historical trend methodology, as well as general aviation restrictions in place at the airport.

2.2.2 Fleet Mix Forecast for Based General Aviation Aircraft

In addition to projecting total based general aviation aircraft, the VATSP also includes forecasts of the number of based aircraft by aircraft category or the “fleet mix”. **Figure 2-5** summarizes the fleet mix for Virginia’s based general aviation aircraft in 2000 and 2012. As shown in Figure 2-5, the percentage of single and multi-engine piston aircraft in the Virginia fleet declined between 2000 and 2012. While the percentage of turboprop aircraft remained unchanged, and the percentage of jets and helicopter/other increased. Aircraft in the “other” category include experimental aircraft, gliders, ultra-light aircraft, and aircraft included in the sport aviation category.

Figure 2 - 5: Historical Virginia and Comparative U.S. General Aviation Fleet Mix

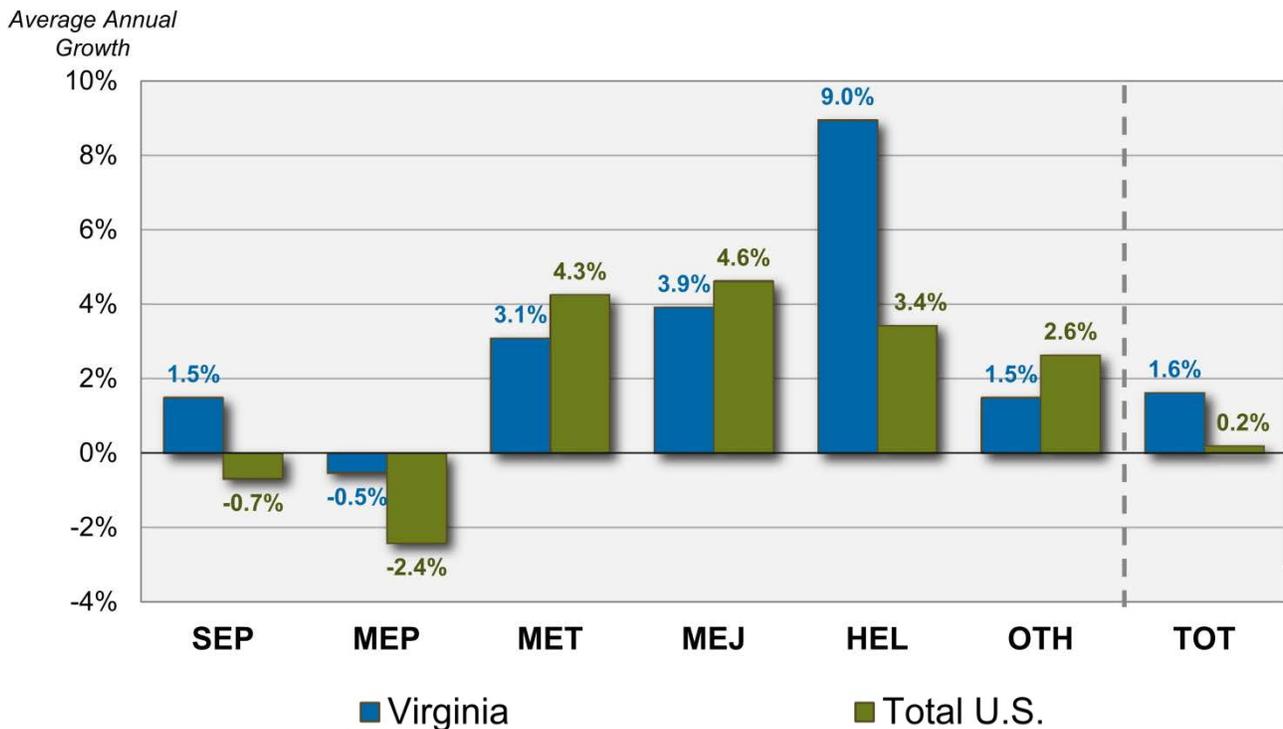


Source: DOAV Based Aircraft Surveys; FAA Aerospace Forecast FY12-FY32

Figure 2-5 also provides the fleet mix for all general aviation aircraft in the U.S. for 2012. There are notable differences between the general aviation fleet mix for Virginia and the U.S. Single engine piston aircraft account for a much higher percentage of the Virginia fleet than the national fleet. Conversely, helicopters account for a lower share of the Virginia fleet compared to the U.S. fleet.

Figure 2-6 compares changes in the general aviation fleet for Virginia and the U.S. between 2000 and 2012. The general trends by aircraft category have been similar between Virginia and the U.S. but the comparative rates of increase or decrease have differed. One of the most notable differences between changes in the Virginia and the U.S. general aviation fleets is in the single engine piston aircraft category (SEP). For the U.S. as a whole, the number of single engine pistons aircraft declined at an average annual rate of -0.7 percent, while in Virginia single engine pistons aircraft grew by 1.5 percent per year over the same period. In both the Virginia and U.S. fleets, jet (MEJ) and turboprop (MET) aircraft have grown at robust rates between 3.1 and 4.6 percent per year. The rate of growth for helicopters (HEL) in Virginia also outpaced helicopter growth in the U.S. fleet.

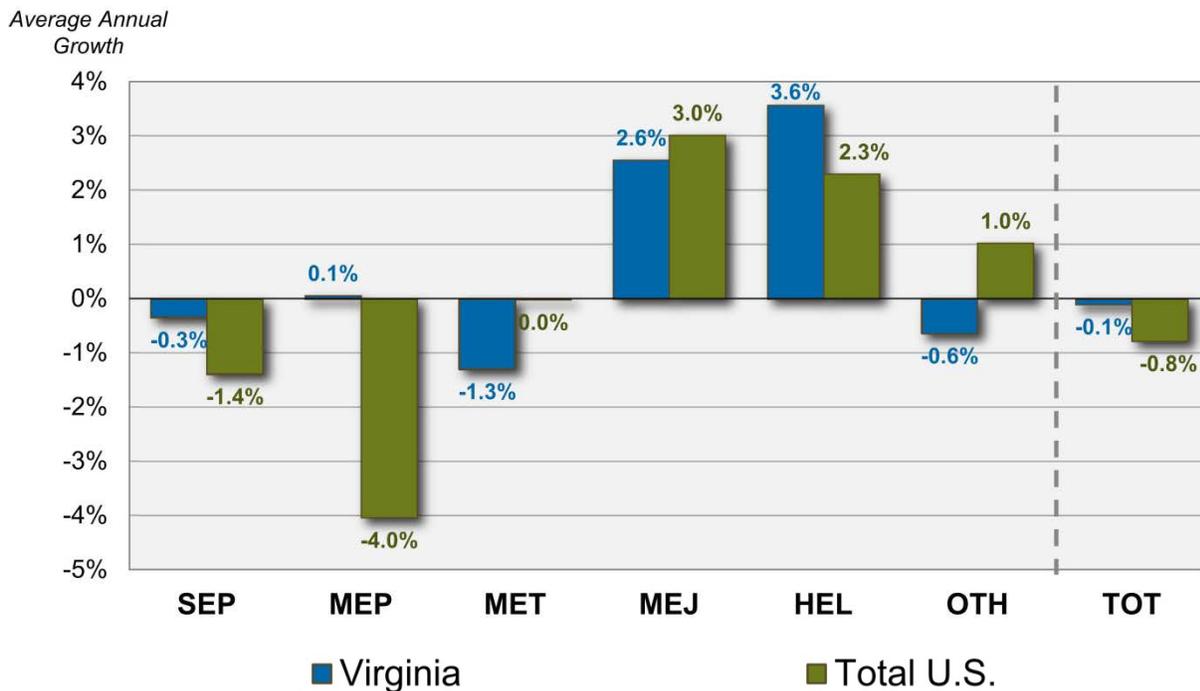
Figure 2 - 6: Change in General Aviation Fleet by Aircraft Category for Virginia and the U.S. (2000 to 2012)



Source: 2003 VATSP; DOAV Based Aircraft Surveys; FAA Aerospace Forecast FY12-FY32

Figure 2-7 compares changes in the general aviation fleet mixes for Virginia and the U.S. between 2007 and 2012. As Figure 2-7 shows, the single engine piston fleet in Virginia declined by -0.3 percent per year over the past five years, while the U.S. fleet continued to decline but at a faster pace of -1.4 percent. While turboprop aircraft declined by more than one percent per year in the U.S. overall, the Virginia fleet remained relatively flat. Jet aircraft increased in Virginia, but at a slower rate than nationally. The helicopter fleet grew more rapidly in Virginia than in the U.S. “Other” (OTH) general aviation aircraft, which includes experimental and sport aircraft, increased in the U.S. fleet, while aircraft in this category actually declined in Virginia.

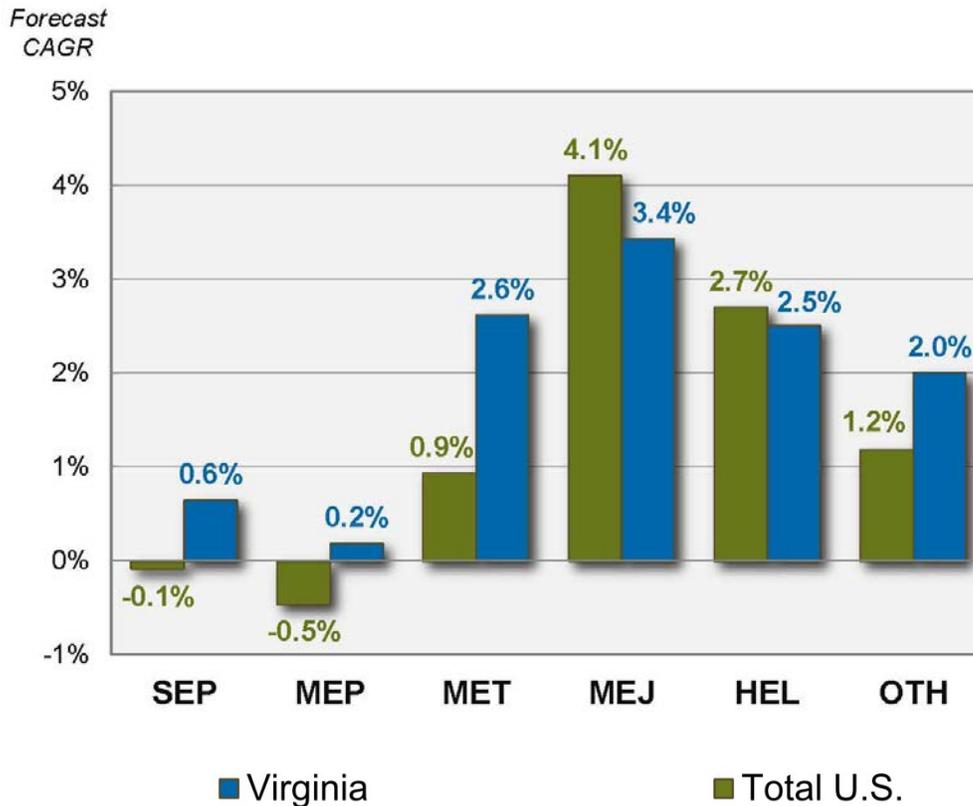
Figure 2 - 7: Change in General Aviation Fleet by Aircraft Category for Virginia and the U.S. (2007 to 2012)



Source: DOAV Based Aircraft Surveys; FAA Aerospace Forecast FY12-FY32

Figure 2-8 shows the FAA’s forecast growth rates for the U.S. general aviation fleet from 2012 to 2032. As shown, the FAA projects declines in both the single engine (SEP) and multi-engine (MEP) categories. Jet engine aircraft are projected to have the highest rate of growth between 2012 and 2032, according to the FAA. Information in Figure 2-8 was used to develop the general aviation fleet mix projections for each of the study airports. At the Virginia airports, individual aircraft categories were assumed to grow at rates similar to the FAA forecast rates for the national fleet.

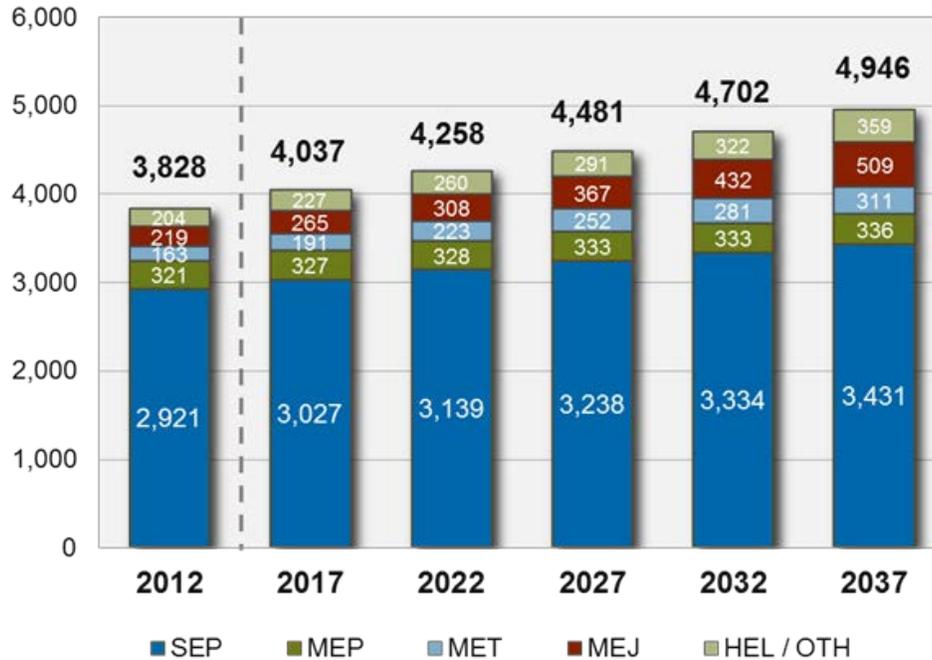
Figure 2 - 8: Forecast Growth Rates for the U.S. and Virginia General Aviation Fleets by Aircraft Category



Source: FAA Aerospace Forecast FY12-FY32

A general aviation fleet mix forecast for Virginia was developed using the preferred forecast of total based aircraft in the state, the base year fleet mix for Virginia airports and the FAA’s national forecast growth rates for general aviation aircraft categories. **Figure 2-9** summarizes the VATSP forecast of Virginia’s general aviation fleet between 2012 and 2037. **Table 2-4** summarizes the growth rate assumptions for each segment of the general aviation fleet. Mirroring the FAA’s projection for the U.S. fleet, jet and turboprop aircraft, along with helicopter and “other” general aviation aircraft are projected to grow the fastest between 2012 and 2037.

**Figure 2 - 9: Forecast Based General Aviation Aircraft Fleet Mix at Virginia Airports
2012 - 2037**



Source: ICF SH&E

**Table 2 - 4: Growth Rate Assumptions for Virginia's General Aviation Fleet by Aircraft
Category**

Aircraft Category	Forecast Average Annual Growth		
	2012-2022	2022-2037	2012-2037
Virginia			
SEP	0.7%	0.6%	0.6%
MEP	0.2%	0.2%	0.2%
MET	3.2%	2.2%	2.6%
MEJ	3.5%	3.4%	3.4%
HEL/OTH	2.4%	2.2%	2.3%
Total Virginia	1.1%	1.0%	1.0%
Total U.S.	0.4%	0.9%*	0.6%*

Source: ICF SH&E; FAA Aerospace Forecast FY12-FY32

*Total U.S. Forecast is only through 2032 (column 3: '22-'32 / column 4: '12-'32)

Table 2-5 summarizes the historical and forecast rates of growth for the general aviation fleets in Virginia and the U.S. Differences in the historical and the forecast rates of growth for various aircraft categories were previously discussed. Between 2012 and 2037, the VATSP Update anticipates that growth in the individual aircraft categories will move toward the U.S. averages.

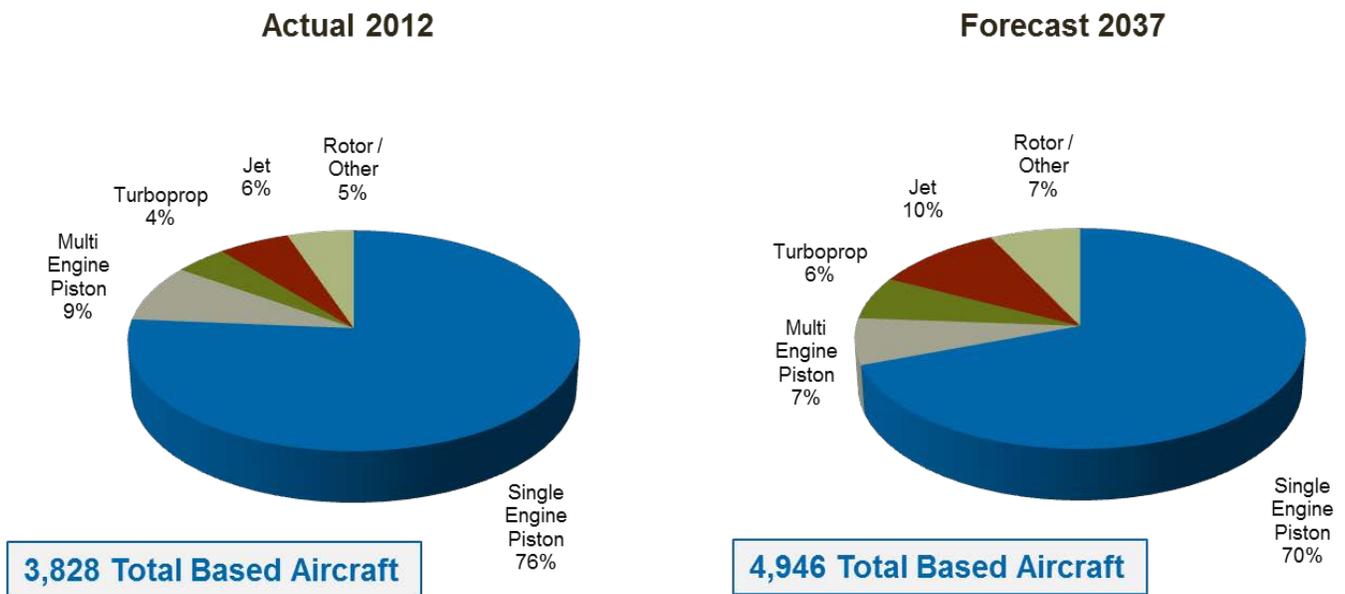
Table 2 - 5: Comparison of U.S. and Virginia General Aviation Fleet Growth by Aircraft Category

	Actual and Forecast Average Annual by Based Aircraft Category						
	SEP	MEP	MET	MEJ	HEL	OTH	TOT
Virginia							
Actual (2000-2012)	1.5%	-0.5%	3.1%	3.9%	9.0%	1.5%	1.6%
Forecast (2012-2037)	0.6%	0.2%	2.6%	3.4%	2.5%	2.0%	1.0%
Total U.S.							
Actual (2000-2012)	-0.7%	-2.4%	4.3%	4.6%	3.4%	2.6%	0.2%
Forecast (2012-2032)	-0.1%	-0.5%	0.9%	4.1%	2.7%	1.2%	0.6%

Source: ICF SH&E; FAA Aerospace Forecast FY12-FY32

Figure 2-10 shows how Virginia’s general aviation fleet mix is anticipated to change between 2012 and 2037. It shows the anticipated distribution of Virginia’s 4,946 based aircraft in 2037. Single engine piston aircraft will continue to be the dominant type in Virginia’s general aviation fleet. However, the piston share will decline over time from 76 percent in the base year to 70 percent in 2037. Similarly, the multi-engine piston share is forecast to drop from 9 percent to 7 percent. Jets and turboprops will account for a growing share of the general aviation fleet. The jet share is forecast to climb from 6 percent to 10 percent, while the turboprop share is projected to grow from 4 percent to 6 percent.

Figure 2 - 10: Actual and Forecast Based General Aviation Aircraft Fleet Mix at Virginia Airports



Source: DOAV Based Aircraft Surveys; ICF SH&E

Table 2-6 provides the projected general aviation fleet mix for each of the study airports. This table shows the base year 2012 and forecast year 2037 fleet mixes for each of the study airports and the long-term forecast growth rates.

Table 2 - 6: Actual and Forecast General Aviation Fleet Mix for Study Airports

Airport Name	VATSP Service Role	Actual 2012						Forecast 2037						Average Annual Growth (2012-2037)					
		SEP	MEP	MET	JET	HEL + OTH	TOT	SEP	MEP	MET	JET	HEL + OTH	TOT	SEP	MEP	MET	JET	HEL + OTH	TOT
Charlottesville-Albemarle	CM	49	2	2	11	4	68	37	1	2	23	5	68	-1.1%	-2.7%	0.0%	3.0%	0.9%	0.0%
Lynchburg Regional	CM	60	6	2	7	6	81	61	6	3	20	11	101	0.1%	0.0%	1.6%	4.3%	2.5%	0.9%
Newport News-Williamsburg International	CM	67	6	4	18	0	95	60	5	5	44	0	114	-0.4%	-0.7%	0.9%	3.6%	-	0.7%
Norfolk International	CM	1	49	14	13	18	95	1	32	13	26	23	95	0.0%	-1.7%	-0.3%	2.8%	1.0%	0.0%
Richmond International	CM	16	12	4	29	4	65	9	6	3	43	4	65	-2.3%	-2.7%	-1.1%	1.6%	0.0%	0.0%
Roanoke-Blacksburg Regional	CM	97	20	4	3	0	124	120	22	6	10	1	159	0.9%	0.4%	1.6%	4.9%	-	1.0%
Ronald Reagan Washington National	CM	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Shenandoah Valley Regional	CM	51	17	8	2	6	84	55	17	11	6	10	99	0.3%	0.0%	1.3%	4.5%	2.1%	0.7%
Washington Dulles International	CM	5	0	0	54	1	60	2	0	0	67	1	70	-3.6%	-	-	0.9%	0.0%	0.6%
Total Commercial Airports		346	112	38	137	39	672	345	89	43	239	55	771	0.0%	-0.9%	0.5%	2.3%	1.4%	0.6%
Chesapeake Regional	RL	126	12	0	2	1	141	177	15	0	8	3	203	1.4%	0.9%	-	5.7%	4.5%	1.5%
Hampton Roads Executive	RL	173	13	2	3	13	204	231	16	3	12	32	294	1.2%	0.8%	1.6%	5.7%	3.7%	1.5%
Hanover County Municipal	RL	108	4	1	1	1	115	146	5	2	4	3	160	1.2%	0.9%	2.8%	5.7%	4.5%	1.3%
Leesburg Executive	RL	198	7	14	9	4	232	180	6	16	23	7	232	-0.4%	-0.6%	0.5%	3.8%	2.3%	0.0%
Manassas Regional	RL	314	30	10	27	23	404	314	30	12	68	40	464	0.0%	0.0%	0.7%	3.8%	2.2%	0.6%
Richmond Executive-Chesterfield County	RL	85	14	2	14	6	121	105	16	3	48	13	185	0.8%	0.5%	1.6%	5.1%	3.1%	1.7%
Stafford Regional	RL	52	5	0	0	13	70	69	19	16	22	21	147	1.1%	5.5%	-	-	1.9%	3.0%
Warrenton-Fauquier	RL	143	17	2	1	2	165	216	23	4	4	5	252	1.7%	1.2%	2.8%	5.7%	3.7%	1.7%
Accomack County	GR	28	0	0	0	0	28	43	0	0	0	0	43	1.7%	-	-	-	-	1.7%
Blue Ridge Regional	GR	39	5	2	2	2	50	36	4	2	5	3	50	-0.3%	-0.9%	0.0%	3.7%	1.6%	0.0%
Culpeper Regional	GR	119	4	0	0	9	132	142	4	0	0	16	162	0.7%	0.0%	-	-	2.3%	0.8%
Danville Regional	GR	35	3	1	0	1	40	34	3	1	0	2	40	-0.1%	0.0%	0.0%	-	2.8%	0.0%
Dinwiddie County	GR	56	8	4	0	11	79	66	9	6	0	18	99	0.7%	0.5%	1.6%	-	2.0%	0.9%
Emporia-Greenville Regional	GR	5	1	0	0	0	6	9	2	0	0	0	11	2.4%	2.8%	-	-	-	2.5%

Table 2 - 6: Actual and Forecast General Aviation Fleet Mix for Study Airports (Continued)

Airport Name	VATSP Service Role	Actual 2012						Forecast 2037						Average Annual Growth (2012-2037)					
		SEP	MEP	MET	JET	HEL + OTH	TOT	SEP	MEP	MET	JET	HEL + OTH	TOT	SEP	MEP	MET	JET	HEL + OTH	TOT
Farmville Municipal	GR	25	1	1	1	1	29	22	1	1	3	2	29	-0.5%	0.0%	0.0%	4.5%	2.8%	0.0%
Ingalls Field	GR	3	0	0	0	1	4	3	0	0	0	1	4	0.0%	-	-	-	0.0%	0.0%
Lonesome Pine	GR	13	4	0	1	4	22	11	3	0	2	6	22	-0.7%	-1.1%	-	2.8%	1.6%	0.0%
Mecklenburg-Brunswick Regional	GR	29	0	1	0	0	30	37	0	2	0	0	39	1.0%	-	2.8%	-	-	1.1%
Middle Peninsula Regional	GR	31	3	0	0	3	37	62	5	0	0	10	77	2.8%	2.1%	-	-	4.9%	3.0%
Mountain Empire	GR	23	1	0	0	2	26	22	1	0	0	3	26	-0.2%	0.0%	-	-	1.6%	0.0%
New River Valley	GR	33	8	0	0	3	44	43	10	0	0	7	60	1.1%	0.9%	-	-	3.4%	1.2%
Suffolk Executive	GR	55	8	0	3	11	77	48	6	0	7	16	77	-0.5%	-1.1%	-	3.4%	1.5%	0.0%
Tappahannock-Essex County	GR	22	5	0	0	1	28	46	9	0	0	3	58	3.0%	2.4%	-	-	4.5%	3.0%
Tazewell County	GR	7	3	0	0	0	10	11	4	0	0	0	15	1.8%	1.2%	-	-	-	1.6%
Virginia Highlands	GR	44	3	5	9	7	68	40	3	6	23	11	83	-0.4%	0.0%	0.7%	3.8%	1.8%	0.8%
William M. Tuck	GR	16	2	0	0	0	18	16	2	0	0	0	18	0.0%	0.0%	-	-	-	0.0%
Winchester Regional	GR	99	11	2	4	1	117	113	11	3	13	2	142	0.5%	0.0%	1.6%	4.8%	2.8%	0.8%
Blackstone AAF	GC	7	0	0	0	6	13	11	0	0	0	12	23	1.8%	-	-	-	2.8%	2.3%
Brookneal-Campbell County	GC	0	0	0	0	0	0	0	0	0	4	0	4	-	-	-	-	-	-
Franklin Municipal	GC	24	1	0	0	0	25	35	1	0	0	0	36	1.5%	0.0%	-	-	-	1.5%
Front Royal-Warren County	GC	49	1	0	0	15	65	59	1	0	1	25	86	0.7%	0.0%	-	-	2.1%	1.1%
Lee County	GC	6	1	0	0	2	9	5	1	0	0	3	9	-0.7%	0.0%	-	-	1.6%	0.0%
Louisa County	GC	47	4	0	0	1	52	56	4	0	0	2	62	0.7%	0.0%	-	-	2.8%	0.7%
Luray Caverns	GC	16	5	0	1	0	22	20	6	0	3	0	29	0.9%	0.7%	-	4.5%	-	1.1%
Lake Country Regional	GC	6	0	0	0	0	6	11	0	0	0	0	11	2.5%	-	-	-	-	2.5%
New Kent County	GC	50	1	0	0	0	51	89	2	0	0	0	91	2.3%	2.8%	-	-	-	2.3%
Orange County	GC	30	2	2	0	0	34	29	2	3	0	0	34	-0.1%	0.0%	1.6%	-	-	0.0%
Shannon	GC	90	6	0	0	7	103	85	5	0	0	13	103	-0.2%	-0.7%	-	-	2.5%	0.0%
Tangier Island	GC	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Twin County	GC	11	0	1	0	0	12	11	0	1	0	0	12	0.0%	-	0.0%	-	-	0.0%

Table 2 - 6: Actual and Forecast General Aviation Fleet Mix for Study Airports (Continued)

Airport Name	VATSP Service Role	Actual 2012						Forecast 2037						Average Annual Growth (2012-2037)					
		SEP	MEP	MET	JET	HEL + OTH	TOT	SEP	MEP	MET	JET	HEL + OTH	TOT	SEP	MEP	MET	JET	HEL + OTH	TOT
Virginia Tech-Montgomery Executive	GC	43	1	0	2	2	48	68	1	0	9	5	83	1.9%	0.0%	-	6.2%	3.7%	2.2%
Wakefield Municipal	GC	25	0	0	0	1	26	25	0	0	0	1	26	0.0%	-	-	-	0.0%	0.0%
Williamsburg-Jamestown	GC	70	2	0	0	1	73	89	2	0	0	2	93	1.0%	0.0%	-	-	2.8%	1.0%
Bridgewater Air Park	LO	2	2	75	2	0	81	4	4	187	11	0	206	2.8%	2.8%	3.7%	7.1%	-	3.8%
Chase City Municipal	LO	4	0	0	0	0	4	4	0	0	0	0	4	0.0%	-	-	-	-	0.0%
Crewe Municipal	LO	9	1	0	0	0	10	9	1	0	0	0	10	0.0%	0.0%	-	-	-	0.0%
Waynesboro-Eagle's Nest	LO	43	2	0	0	7	52	55	2	0	0	12	69	1.0%	0.0%	-	-	2.2%	1.1%
Falwell	LO	11	0	0	0	0	11	11	0	0	0	0	11	0.0%	-	-	-	-	0.0%
Gordonsville Municipal	LO	20	1	0	0	1	22	28	1	0	0	3	32	1.4%	0.0%	-	-	4.5%	1.5%
Grundy Municipal	LO	9	2	0	0	0	11	9	2	0	0	0	11	0.0%	0.0%	-	-	-	0.0%
Hummel Field	LO	34	0	0	0	0	34	34	0	0	0	0	34	0.0%	-	-	-	-	0.0%
Lake Anna	LO	2	0	0	0	0	2	6	0	0	0	0	6	4.5%	-	-	-	-	4.5%
Lawrenceville-Brunswick	LO	3	0	0	0	0	3	3	0	0	0	0	3	0.0%	-	-	-	-	0.0%
Lunenburg County	LO	2	0	0	0	0	2	7	0	0	0	0	7	5.1%	-	-	-	-	5.1%
New London	LO	47	2	0	0	0	49	47	2	0	0	0	49	0.0%	0.0%	-	-	-	0.0%
New Market	LO	23	2	0	0	2	27	23	2	0	0	2	27	0.0%	0.0%	-	-	0.0%	0.0%
Smith Mountain Lake	LO	11	1	0	0	0	12	11	1	0	0	0	12	0.0%	0.0%	-	-	-	0.0%
Total GA Airports		2,575	209	125	82	165	3,156	3,086	247	268	270	304	4,175	0.7%	0.7%	3.1%	4.9%	2.5%	1.1%
Total VATSP Airports		2,921	321	163	219	204	3,828	3,431	336	311	509	359	4,946	0.6%	0.2%	2.6%	3.4%	2.3%	1.0%

Source: DOAV Based Aircraft Surveys and ICF SH&E

2.2.3 General Aviation Operations

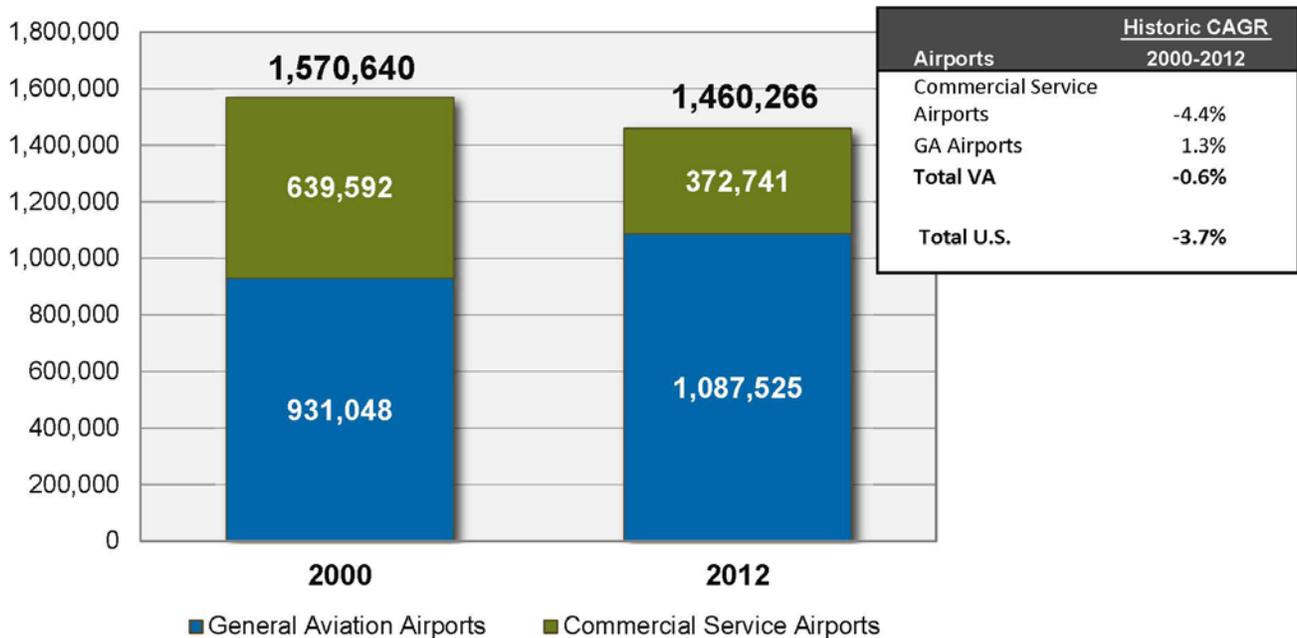
General aviation operations consist of aircraft take-offs and landings conducted by general aviation aircraft. Some airports in the Virginia system, primarily commercial service airports, have air traffic control towers that record aircraft operations by operational category. However, most general aviation airports in Virginia lack an air traffic control tower. As a result, historical and current annual general aviation aircraft operations for these airports are based on an estimate using industry accepted methodologies to arrive at an annualized total.

For the VATSP Update, the following sources for annual general aviation operations were used:

- For airports with air traffic control towers, tower records from the FAA Air Traffic Activity System (ATADS) or data from the FAA Terminal Area Forecasts (TAF) were used as the source for 2012 annual general aviation operations. In the ATADS and TAF operation counts, some on-demand air taxi and fractional aircraft operations are included in the Commuter/Air Taxi category along with commercial operations by small commuter passenger airlines. In reality these air taxi and fractional aircraft operations are performed largely with general aviation aircraft. The base year operations in this study were adjusted so that all air taxi and fractional aircraft operations are treated as general aviation. Commercial airline operations from the US DOT T-100 database were compared to FAA ATADS/TAF data to identify the portion of Commuter/Air Taxi operations that were reclassified as general aviation operations.
- For all NPIAS airports, data from the TAF was used for their general aviation operations.
- If an airport is not included in the TAF, annual operations reported on the airport's FAA Form 5010 were used as the 2012 base year operations.

Using data from these three sources, as shown in **Figure 2-11**, total annual general aviation operations declined from 1.57 million in 2000 to 1.46 million in 2012. Similarly, there was a national decline in general aviation activity. The FAA Aerospace Forecast noted total general aviation operations at U.S. towered airports fell from 40 million to 26 million from 2000 to 2011.

Figure 2 - 11: Actual 2000 and 2012 Statewide General Aviation Operations



Source: 2003 VATSP; FAA ATADS; FAA TAF FY12-FY40; Form 5010; U.S. DOT, T100 (YENov12)

Decreases in general aviation activity are attributed to many factors. These factors include, but are not necessarily limited to, the high costs of private aircraft ownership, high fuel costs, a declining pilot base, production of fewer new general aviation aircraft, and a weak economy. As shown in Figure 2-11, the greatest decrease in general aviation operations in Virginia occurred at the commercial airports, where activity fell from nearly 640,000 operations in 2000 to almost 373,000 operations in 2012. Annual operations at the general aviation airports reportedly increased from 931,000 in 2000 to just under 1.09 million in 2012.

The average annual rate of decrease between 2000 and 2012 for general aviation operations at commercial service airports was -4.4 percent. Over the same time frame, annual general aviation operations at the general aviation airports increased by 1.3 percent. Overall, general aviation operations in Virginia decreased at an average annual rate of -0.6 percent between 2000 and 2012. According to FAA data for towered airports, general aviation operations in the U.S. declined at an average annual rate of -3.7 percent between 2000 and 2012. Although overall general aviation operations decreased in Virginia between 2000 and 2012, the rate of decrease was below that for the U.S. as a whole.

In Virginia, all study airports, both commercial service and general aviation, have some level of annual general aviation aircraft operations. Each airport's total annual general aviation operations are influenced by several factors, some of which are summarized as follows:

- Airports that have higher levels of based general aviation aircraft also typically have higher estimated total annual general aviation operations.

- The proximity of neighboring airports which provide a wider array of facilities and services can limit an airport's annual general aviation activity. In the case of commercial service airports, general aviation activity can be reduced if there are suitable reliever airports to serve general aviation demand.
- Airports that have one or more flight schools tend to have higher annual general aviation operational estimates. Flight training most often involves repetitive operations which are referred to as a touch and go. When training, a pilot approaches the runway, touches down briefly, and without coming to a full stop on the runway, takes off. These repetitive training operations typically increase an airport's estimated annual general aviation operations without impacting facility requirements.
- Airports that have higher levels of visiting aircraft also tend to have higher estimates of total annual general aviation operations. Visiting or transient aircraft operations are often higher in resort areas or areas with other attractions. Airports that serve business centers also most often have a higher level of transient aircraft activity which boosts their total annual general aviation operations.

As noted, between 2000 and 2012, based on the previously noted sources, total general aviation operations for all airports in Virginia reportedly declined. Since most of Virginia's commercial airports have air traffic control towers, reports of annual general aviation operations at the commercial airports are more reliable than estimates of annual general aviation operations provided by the non-towered airports. The downward trend in annual general aviation operations, noted for the commercial airports in Virginia, is considered more reliable than the upward trend estimated for the non-towered general aviation airports in Virginia.

Several methodologies were initially considered to project future general aviation operations for all commercial and general aviation airports included in the VATSP Update. Within the context of a state aviation system plan, it is important to select a methodology that works best for the majority of all airports included in the analysis since one consistent methodology is typically used for all airports. The methodologies considered to project annual general aviation operations in the VATSP Update included:

- **Trend Analysis** – Trend analysis considers past rates of growth and uses historical trends in those rates to project future demand. This methodology is generally most applicable when historical growth has exhibited a consistent trend. In the case of annual general aviation operations at Virginia study airports, trends in annual general aviation operations have been inconsistent, with some airports exhibiting increasing general aviation operations and others showing an overall decline. As a result of the fact that airports have shown such a wide range of trends in terms of their historical annual general aviation operations, this methodology was discarded from further consideration.
- **Regression Analysis** – Regression analysis considers the historical correlation between aviation demand and various socio-economic or demographic predictors. If a positive relationship can be established, then factors such as population, income or employment can be used as predictors to forecast annual general aviation operations. Analysis of the relationship between Virginia's population, income, and employment revealed no statically valid correlation with the state's total annual general aviation operations. With no statistically valid correlation, this methodology was dropped from further review.

- Application of FAA Growth Rates** – Within its National Aerospace Forecast, the FAA has projections for two indicators, as they relate to annual general aviation activity. One of these factors is hours flown by general aviation aircraft and the other is annual general aviation operations at towered airports. Available aviation statistics for Virginia do not include reported hours flown by general aviation aircraft; as a result, there is no way to compare this national indicator to general aviation activity in Virginia. As previously noted, between 2000 and 2012, general aviation operations at towered airports in the U.S. (both commercial and general aviation airports) decreased at an average annual rate of -3.7 percent. With the exception of Manassas Regional, all towered airports in Virginia are commercial airports, and annual general aviation operations at these airports decreased at a rate of -4.4 percent between 2000 and 2012. Overall, annual general aviation at all Virginia airports decreased at an average annual rate of -0.6 percent between 2000 and 2012. Historical changes in general aviation activity at airports in Virginia have not mirrored trends in total U.S. activity; therefore, it was not logical to assume that Virginia’s general aviation operations will mirror U.S. trends in the future. Further consideration of this methodology was also discontinued.
- Operations Per Based Aircraft (OPBA)** – An OPBA for an airport is established by dividing total annual general aviation operations by total based aircraft. To use this methodology to project future annual general aviation operations, an OPBA ratio is multiplied times the airport’s selected forecast for total based aircraft. While not all operations at an airport are conducted by aircraft that are based at the airport, an OPBA ratio serves as a proxy to reflect operations by both based and visiting (transient) aircraft. In this update to the VATSP, OPBA ratios were developed for each study airport. An individualized OPBA helps to capture unique characteristics of each airport’s general aviation activity. For instance, general aviation airports in Virginia with flight training programs have an OPBA ratio that is higher than a similar airport without a flight training program. Airports such as Ingalls Field that attract a high volume of visitor related travel have a higher OPBA ratio than an airport that has limited visitor related traffic.

To provide projections of general aviation operations for Virginia airports, the OPBA methodology was selected for the VATSP Update. This methodology was selected because other tested methodologies proved less applicable for the task at hand. Further, using the OPBA methodology allows for each airport’s unique characteristics to be factored into their projection of future general aviation operational demand.

Illustrated in **Table 2-7** are the total average OPBA for airports in Virginia. In 2000 an average of 498 OPBA were recorded; and in 2012, this ratio fell to 381. The average OPBA for general aviation operations at the commercial service airports declined from 859 in 2000 to 555 in 2012. For all general aviation airports in Virginia, the average OPBA decreased from 387 in 2000 to 345 in 2012. The OPBA for general aviation aircraft at the commercial service airports in Virginia is higher than the statewide OPBA and the OPBA at the general aviation airports. This higher OPBA is most likely associated with the fact that general aviation aircraft at the commercial service airports are flown largely for business related activities and are flown on a more frequent basis. These airports often also attract a higher number of transient or visiting general aviation operations.

**Table 2 - 7: Actual Operations per Based Aircraft at Virginia Airports
2000 and 2012**

	Average General Aviation OPBA	
	CY 2000	CY 2012
At Commercial Service Airports	859	555
At GA Airports	387	345
Weighted Average at Virginia Airports*	498	381

*The OPBA for Virginia airports represents a weighted average of OPBA for Virginia's commercial service airports and the OPBA for Virginia's general aviation airports.

Source: 2003 VATSP; FAA ATADS; FAA TAF FY12-FY40; Form 5010; U.S. DOT, T100 (YENov12)

For each of the study airports, historical OPBA were calculated. The historical OPBA for each airport are shown in **Table 2-8**. In the forecasting process, the historical OPBA for each airport was applied to its forecast of total based general aviation aircraft to develop a forecast of annual general aviation operations. These projections are shown in **Table 2-9**.

Table 2 - 8: Actual and Assumed Future Year Operations per Based Aircraft Assumptions for Virginia Airports 2000 to 2037

Airport Name	VATSP Service Role	Actual OPBA 2012	Assumed OPBA				
			2012-2017	2017-2022	2022-2027	2027-2032	2032-2037
Charlottesville-Albemarle	CM	845	840	832	824	816	808
Lynchburg Regional	CM	1,214	1,210	1,198	1,186	1,174	1,162
Newport News-Williamsburg International	CM	655	650	644	638	632	626
Norfolk International	CM	276	280	277	274	271	268
Richmond International	CM	539	540	535	530	525	520
Roanoke-Blacksburg Regional	CM	234	230	228	226	224	222
Ronald Reagan Washington National	CM	-	0	0	0	0	0
Shenandoah Valley Regional	CM	188	190	188	186	184	182
Washington Dulles International	CM	709	710	703	696	689	682
Total Air Carrier Airports		555	545	539	533	528	522
Chesapeake Regional	RL	319	320	317	314	311	308
Hampton Roads Executive	RL	306	310	307	304	301	298
Hanover County Municipal	RL	289	290	287	284	281	278
Leesburg Executive	RL	456	460	455	450	446	442
Manassas Regional	RL	213	210	208	206	204	202
Richmond Executive-Chesterfield County	RL	477	480	475	470	465	460
Stafford Regional	RL	337	383	413	447	481	516
Warrenton-Fauquier	RL	266	270	267	264	261	258
Accomack County	GR	241	240	238	236	234	232
Blue Ridge Regional	GR	468	470	465	460	455	450
Culpeper Regional	GR	431	430	426	422	418	414
Danville Regional	GR	482	480	475	470	465	460
Dinwiddie County	GR	386	390	386	382	378	374
Emporia-Greenville Regional	GR	193	190	188	186	184	182
Farmville Municipal	GR	493	490	485	480	475	470
Ingalls Field	GR	2,501	2,500	2,475	2,450	2,426	2,402
Lonesome Pine	GR	433	430	426	422	418	414

Table 2 - 8: Actual and Assumed Future Year Operations per Based Aircraft Assumptions for Virginia Airports 2000 to 2037 (Continued)

Airport Name	VATSP Service Role	Actual OPBA 2012	Assumed OPBA				
			2012-2017	2017-2022	2022-2027	2027-2032	2032-2037
Mecklenburg-Brunswick Regional	GR	327	330	327	324	321	318
Middle Peninsula Regional	GR	309	310	307	304	301	298
Mountain Empire	GR	393	390	386	382	378	374
New River Valley	GR	145	140	139	138	137	136
Suffolk Executive	GR	527	530	525	520	515	510
Tappahannock-Essex County	GR	429	430	426	422	418	414
Tazewell County	GR	497	500	495	490	485	480
Virginia Highlands	GR	165	160	158	156	154	152
William M. Tuck	GR	414	410	406	402	398	394
Winchester Regional	GR	335	340	337	334	331	328
Blackstone AAF	GC	81	80	79	78	77	76
Brookneal-Campbell County	GC	-	370	369	368	367	366
Franklin Municipal	GC	149	150	149	148	147	146
Front Royal-Warren County	GC	235	230	228	226	224	222
Lee County	GC	389	390	386	382	378	374
Louisa County	GC	436	440	436	432	428	424
Luray Caverns	GC	151	150	149	148	147	146
Lake Country Regional	GC	772	770	762	754	746	739
New Kent County	GC	306	310	307	304	301	298
Orange County	GC	250	250	248	246	244	242
Shannon	GC	292	290	287	284	281	278
Tangier Island	GC	-	0	0	0	0	0
Twin County	GC	744	740	733	726	719	712
Virginia Tech-Montgomery Executive	GC	365	370	366	362	358	354
Wakefield Municipal	GC	629	630	624	618	612	606
Williamsburg-Jamestown	GC	376	380	376	372	368	364
Bridgewater Air Park	LO	148	150	149	148	147	146

Table 2 - 8: Actual and Assumed Future Year Operations per Based Aircraft Assumptions for Virginia Airports 2000 to 2037 (Continued)

Airport Name	VATSP Service Role	Actual OPBA 2012	Assumed OPBA				
			2012-2017	2017-2022	2022-2027	2027-2032	2032-2037
Chase City Municipal	LO	650	650	644	638	632	626
Crewe Municipal	LO	420	420	416	412	408	404
Waynesboro-Eagle's Nest	LO	246	250	248	246	244	242
Falwell	LO	755	750	743	736	729	722
Gordonsville Municipal	LO	416	420	416	412	408	404
Grundy Municipal	LO	380	380	376	372	368	364
Hummel Field	LO	382	380	376	372	368	364
Lake Anna	LO	380	380	376	372	368	364
Lawrenceville-Brunswick	LO	900	900	891	882	873	864
Lunenburg County	LO	196	200	198	196	194	192
New London	LO	671	670	663	656	649	643
New Market	LO	599	600	594	588	582	576
Smith Mountain Lake	LO	427	430	426	422	418	414
Total GA Airports		345	345	342	338	335	332
Total VATSP Airports		381	381	377	372	368	364

Source: FAA ATADS; FAA TAF FY12-FY40; Form 5010; U.S. DOT, T100 (YENov12) and ICF SH&E.

**Table 2 - 9: Actual and Forecast General Aviation Operations for Virginia Airports
Actual 2000-2037**

Airport Name	VATSP Service Role	Actual 2012	Forecast					AAG 2012-2037
			2017	2022	2027	2032	2037	
Charlottesville-Albemarle	CM	57,454	57,120	56,576	56,032	55,488	54,944	-0.2%
Lynchburg Regional	CM	98,342	102,850	106,622	110,298	113,878	117,362	0.7%
Newport News-Williamsburg International	CM	62,182	64,220	66,074	67,883	69,646	71,364	0.6%
Norfolk International	CM	26,231	26,600	26,315	26,030	25,745	25,460	-0.1%
Richmond International	CM	35,045	35,100	34,775	34,450	34,125	33,800	-0.1%
Roanoke-Blacksburg Regional	CM	28,987	30,130	31,464	32,770	34,048	35,298	0.8%
Ronald Reagan Washington National	CM	6,183	6,200	6,200	6,200	6,200	6,200	0.0%
Shenandoah Valley Regional	CM	15,777	16,530	16,920	17,298	17,664	18,018	0.5%
Washington Dulles International	CM	42,540	44,670	45,228	45,794	46,368	46,951	0.4%
Total Air Carrier Airports		372,741	383,420	390,174	396,755	403,163	409,397	0.4%
Chesapeake Regional	RL	45,000	48,960	52,305	55,578	58,779	62,524	1.3%
Hampton Roads Executive	RL	62,495	68,820	73,680	78,432	83,076	87,612	1.4%
Hanover County Municipal	RL	33,189	35,960	38,171	40,328	42,431	44,480	1.2%
Leesburg Executive	RL	105,819	106,720	105,560	104,400	103,472	102,544	-0.1%
Manassas Regional	RL	86,048	86,730	88,192	89,816	91,596	93,728	0.3%
Richmond Executive-Chesterfield County	RL	57,750	64,320	69,825	75,200	80,445	85,100	1.6%
Stafford Regional	RL	23,609	29,500	34,719	40,704	47,175	55,222	3.5%
Warrenton-Fauquier	RL	43,950	49,140	53,133	57,024	60,813	65,016	1.6%
Accomack County	GR	6,753	7,440	8,092	8,732	9,360	9,976	1.6%
Blue Ridge Regional	GR	23,400	23,500	23,250	23,000	22,750	22,500	-0.2%
Culpeper Regional	GR	56,925	59,340	61,344	63,300	65,208	67,068	0.7%
Danville Regional	GR	19,264	19,200	19,000	18,800	18,600	18,400	-0.2%

**Table 2 - 9: Actual and Forecast General Aviation Operations for Virginia Airports
Actual 2000-2037 (Continued)**

Airport Name	VATSP Service Role	Actual 2012	Forecast					AAG 2012-2037
			2017	2022	2027	2032	2037	
Dinwiddie County	GR	30,485	32,370	33,582	34,762	35,910	37,026	0.8%
Emporia-Greenville Regional	GR	1,160	1,330	1,504	1,674	1,840	2,002	2.2%
Farmville Municipal	GR	14,300	14,210	14,065	13,920	13,775	13,630	-0.2%
Ingalls Field	GR	10,003	10,000	9,900	9,800	9,704	9,608	-0.2%
Lonesome Pine	GR	9,531	9,460	9,372	9,284	9,196	9,108	-0.2%
Mecklenburg-Brunswick Regional	GR	9,800	10,560	11,118	11,664	12,198	12,402	0.9%
Middle Peninsula Regional	GR	11,424	13,950	16,271	18,544	20,769	22,946	2.8%
Mountain Empire	GR	10,212	10,140	10,036	9,932	9,828	9,724	-0.2%
New River Valley	GR	6,373	6,580	6,950	7,314	7,672	8,160	1.0%
Suffolk Executive	GR	40,582	40,810	40,425	40,040	39,655	39,270	-0.1%
Tappahannock-Essex County	GR	12,000	14,620	17,040	19,412	21,736	24,012	2.8%
Tazewell County	GR	4,968	5,500	5,940	6,370	6,790	7,200	1.5%
Virginia Highlands	GR	11,218	11,360	11,692	12,012	12,320	12,616	0.5%
William M. Tuck	GR	7,452	7,380	7,308	7,236	7,164	7,092	-0.2%
Winchester Regional	GR	39,250	41,480	42,799	44,088	45,347	46,576	0.7%
Blackstone AAF	GC	1,053	1,200	1,343	1,482	1,617	1,748	2.0%
Brookneal-Campbell County	GC	735	740	1,476	1,472	1,468	1,464	2.8%
Franklin Municipal	GC	3,724	4,050	4,321	4,588	4,851	5,256	1.4%
Front Royal-Warren County	GC	15,270	15,870	16,644	17,402	18,144	19,092	0.9%
Lee County	GC	3,499	3,510	3,474	3,438	3,402	3,366	-0.2%
Louisa County	GC	22,678	23,760	24,416	25,056	25,680	26,288	0.6%
Luray Caverns	GC	3,315	3,450	3,576	3,700	3,822	4,234	1.0%
Lake Country Regional	GC	4,633	5,390	6,096	6,786	7,460	8,129	2.3%
New Kent County	GC	15,608	18,290	20,569	22,800	24,983	27,118	2.2%

**Table 2 - 9: Actual and Forecast General Aviation Operations for Virginia Airports
Actual 2000-2037 (Continued)**

Airport Name	VATSP Service Role	Actual 2012	Forecast					AAG 2012-2037
			2017	2022	2027	2032	2037	
Orange County	GC	8,506	8,500	8,432	8,364	8,296	8,228	-0.1%
Shannon	GC	30,063	29,870	29,561	29,252	28,943	28,634	-0.2%
Tangier Island	GC	938	1,000	1,000	1,000	1,000	1,000	0.3%
Twin County	GC	8,925	8,880	8,796	8,712	8,628	8,544	-0.2%
Virginia Tech-Montgomery Executive	GC	17,539	20,350	22,692	24,978	27,208	29,382	2.1%
Wakefield Municipal	GC	16,347	16,380	16,224	16,068	15,912	15,756	-0.1%
Williamsburg-Jamestown	GC	27,482	29,260	30,456	31,620	32,752	33,852	0.8%
Bridgewater Air Park	LO	11,975	15,900	19,519	23,088	26,607	30,076	3.8%
Chase City Municipal	LO	2,600	2,600	2,576	2,552	2,528	2,504	-0.2%
Crewe Municipal	LO	4,200	4,200	4,160	4,120	4,080	4,040	-0.2%
Waynesboro-Eagle's Nest	LO	12,800	13,750	14,384	15,006	15,616	16,698	1.1%
Falwell	LO	8,300	8,250	8,173	8,096	8,019	7,942	-0.2%
Gordonsville Municipal	LO	9,152	10,080	10,816	11,536	12,240	12,928	1.4%
Grundy Municipal	LO	4,177	4,180	4,136	4,092	4,048	4,004	-0.2%
Hummel Field	LO	12,990	12,920	12,784	12,648	12,512	12,376	-0.2%
Lake Anna	LO	760	760	1,128	1,488	1,840	2,184	4.3%
Lawrenceville-Brunswick	LO	2,700	2,700	2,673	2,646	2,619	2,592	-0.2%
Lunenburg County	LO	392	600	792	980	1,164	1,344	5.1%
New London	LO	32,902	32,830	32,487	32,144	31,801	31,507	-0.2%
New Market	LO	16,174	16,200	16,038	15,876	15,714	15,552	-0.2%
Smith Mountain Lake	LO	5,128	5,160	5,112	5,064	5,016	4,968	-0.1%
Total GA Airports		1,087,525	1,150,010	1,199,127	1,247,420	1,295,579	1,346,348	0.9%
Total VATSP Airports		1,460,266	1,533,430	1,589,301	1,644,175	1,698,742	1,755,745	0.7%

Note: All growth rates, including growth rates for subtotals and totals, are compound growth rates based on the actual 2012 and forecast 2037 operations shown in the table.
Source: FAA ATADS; FAA TAF FY12-FY40; Form 5010; U.S. DOT, T100 (YENov12) and ICF SH&E

In order to validate the OPBA approach used in the VATSP Update, a review was undertaken to compare Virginia’s OPBA at towered and non-towered airports to OPBA ratios in neighboring states. Research was undertaken to compare general aviation activity in Virginia to general aviation activity in Kentucky, Maryland, North Carolina, Tennessee, and West Virginia. This research was completed using available and comparable information for each state as reported by the Federal Aviation Administration (FAA) in their most recent Terminal Area Forecast (TAF).

Two indicators of general aviation activity, total based general aviation aircraft and general aviation operations per based aircraft (OPBA), were reviewed. These two indicators were reviewed for all TAF airports in each state. It is important to note, for the states included in this review, there are some airports included in the state airport system that are not included in the FAA’s TAF. The TAF contains only airports that are in the National Plan of Integrated Airport Systems (NPIAS).

For instance, of the 57 general aviation airports included in the VATSP, 19 are non-NPIAS airports. As a result, based aircraft and annual OPBA ratios for these non-NPIAS airports were not considered in this analysis. For Virginia, 33 percent of the 57 general aviation airports included in the state system are not included in the TAF. While the percentages vary, the same is true for neighboring states; portions of their state airport systems are comprised of non-NPIAS airports. Activity indicators for any non-NPIAS airport are not reflected in this analysis.

Tables 2-10 and 2-11 provide comparative information on total based aircraft and OPBA ratios for all NPIAS airports in Virginia and neighboring states considered as part of this research.

Table 2 - 10: Comparison of Based General Aviation Aircraft at NPIAS Airports in Virginia and Neighboring States

Year	Kentucky	Maryland	North Carolina	Tennessee	Virginia	West Virginia
2000	1,748	1,819	2,890	3,072	2,515	832
2001	1,859	2,108	3,194	3,206	2,605	823
2002	1,812	2,115	3,278	3,129	2,578	830
2003	1,792	2,146	3,306	3,127	2,599	833
2004	1,860	2,184	3,534	3,225	2,761	799
2005	1,976	2,148	3,712	3,249	2,948	855
2006	1,981	2,189	3,729	3,255	3,136	886
2007	1,911	2,196	3,755	3,325	3,168	883
2008	1,703	1,939	3,538	3,057	3,004	807
2009	1,660	2,009	3,595	2,961	3,018	800
2010	1,567	1,714	3,375	2,724	2,890	706
2011	1,432	1,662	3,409	2,638	2,838	705
2012	1,453	1,679	3,422	2,644	2,859	717

Review of the information in Table 2-10 shows that between 2000 and 2007 all states experienced an increasing trend in their number of based general aviation aircraft. In contrast to this trend, between 2007 and 2008, most states showed a decrease in the number of reported based general aviation aircraft at NPIAS airports.

There are two factors that contributed to this decrease. One, the U.S. entered into a major economic downturn during the same time frame. As a result many pilots who owned general aviation aircraft that were flown mainly for recreational purposes exited the general aviation market around 2008. Second, the FAA undertook a program to better account for actual based aircraft during that same period. Previously, some aircraft that were not air-worthy were included in an airport's based aircraft count. In some instances an aircraft splits its time between two different airports; and therefore, may be counted as a based aircraft at both airports. By recording actual tail numbers for based general aviation aircraft, aircraft are now assigned to only one airport, as opposed to multiple airports. This resulted in a decrease of the based aircraft numbers overall and directly at the affected individual airports.

Since 2000, Virginia and North Carolina are the only two states included in this review that show an increasing trend for based general aviation aircraft at airports included in the NPIAS. Other neighboring states exhibited a downward trend.

Table 2 - 11: Comparison of Operations per Based Aircraft (OBPA) at all NPIAS Airports

Year	Kentucky	Maryland	North Carolina	Tennessee	Virginia	West Virginia
2000	445	379	531	498	516	491
2001	405	476	510	488	484	464
2002	422	480	509	487	499	491
2003	410	454	482	475	463	443
2004	400	450	453	462	450	496
2005	370	468	444	462	433	427
2006	377	456	455	448	428	429
2007	390	453	462	435	409	428
2008	423	462	511	473	399	419
2009	420	408	462	436	389	373
2010	440	455	496	453	397	412
2011	497	422	517	453	406	431
2012	491	370	512	457	409	410

Patterns for changes in the OPBA ratio among the states included in this research are not as discernible or as consistent. It is important to note while based aircraft at an airport can actually be counted, total annual general aviation operations cannot be recorded as easily. In fact, for almost all non-towered NPIAS airports included in this research, the total annual general aviation aircraft operations number is airport management's best estimate related to annual takeoffs and landings.

An airport's OPBA ratio is calculated by dividing total annual general aviation operations (both local and itinerant) by total based aircraft. Not all annual general aviation aircraft operations are conducted by aircraft based at the airport. Each airport's annual general aviation operations are a mix of flights attributed to aircraft which are based at the airport as well as to aircraft that are visiting the airport. Therefore, the OPBA reflects operations by both based and visiting aircraft. OPBA are recognized by the FAA as a valid proxy for estimating total annual general aviation activity.

Since all states included in this research experienced a decrease in their number of based aircraft at NPIAS airports between 2007 and 2008, a commensurate decrease in the reported statewide OPBA ratio could have been expected. However, as Table 2-11 reflects, only Virginia and West Virginia reportedly experienced a decrease in the statewide OPBA ratio between 2007 and 2008, according to available TAF data.

Because there are no hard data for operational activity at non-towered airports, there is a lower level of confidence in trends in general aviation operations, as reflected here by the total statewide OPBA for both towered and non-towered airports. With the contraction of the number of based aircraft in the U.S. between 2007 and 2008 and as result of the economic downturn, there has been a sense in the aviation industry that those aircraft that have remained in the general aviation fleet are more active or they are completing a higher number of takeoffs and landing. Part of this assumption is based on the conclusion that general aviation aircraft that remain active in the fleet are often being flown to support business activities. General aviation aircraft that are flown to support business activities are often flown on a more frequent basis. If general aviation aircraft based at NPIAS airports in the states considered in this research are being flown more often, that could account for the lack of a decrease in the statewide OPBA.

Over the past five years (2008-2012) the statewide average OPBA for airports included in this research is reported in **Table 2-12**.

Table 2 - 12: Unweighted Statewide 5-Year (2008-2012) Average OPBA for all NPIAS Airports (Virginia and Neighboring States)

State	OPBA
Kentucky	454
Maryland	423
North Carolina	499
Tennessee	454
Virginia	400
West Virginia	409

Since the number of annual general aviation operations for non-towered airports are estimates, the research was re-focused to consider only general aviation OPBA ratios at airports with an air traffic control tower. Airports with FAA and contract air traffic control towers are listed in the TAF. For this additional review, general aviation operations at both commercial and general aviation airports were considered. However, general aviation activity at Large Hub Commercial Service Airports was excluded from the analysis.

General aviation, based aircraft and annual general aviation operations from 2008-2012 were considered for the towered airports listed in **Table 2-13**.

Table 2 - 13: Towered Airports in Virginia and Neighboring States

State	Towered Airports
Kentucky	Blue Grass (LEX), Bowman Field (LOU), Owensboro-Daviess County (OWB), Barkley Regional (PAH), Louisville-International (SDF)
Maryland	Easton/Newnam Field (ESN), Frederick Municipal (FDK), Hagerstown Regional (HGR), Martin State (MTN), Salisbury (SBY)
North Carolina	Asheville Regional (AVL), Coastal Carolina Regional (EWN), Fayetteville Regional /Grannis Field (FAY), Piedmont Triad International (GSO), Hickory Regional (HKY), Wilmington International (ILM), Smith Reynolds (INT), Kinston Regional Jetport at Stallings Field (ISO), Concord Regional (JQF), Raleigh-Durham International (RDU)
Tennessee	Nashville International (BNA), Lovell Field (CHA), Memphis International (MEM), Mc Kellar-Sipes Regional (MKL), Smyrna (MQY), Millington Regional Jetport (NQA), Tri-Cities Regional (TRI), Mc Ghee Tyson (TYS)
Virginia	Charlottesville-Albemarle (CHO), Manassas Regional (HEF), Lynchburg Regional (LYN), Norfolk International (ORF), Newport News/Williamsburg International (PHF), Richmond International (RIC), Roanoke-Blacksburg Regional (ROA)
West Virginia	North Central West Virginia (CKB), Yeager (CRW), Wheeling Ohio County (HLG), Tri-State (HTS), Greenbrier Valley (LWB), Morgantown Municipal (MGW), Mid-Ohio Valley Regional (PKB)

Note: Ronald Reagan Washington National was not included in this comparison because it does not have based general aviation aircraft. As a result of the metropolitan setting for Washington Dulles and this airport's very different activity characteristics, it was also excluded from this particular comparative review.

Using information from the TAF for 2008 and 2012 for the airports noted above, averages for operations per based aircraft at towered airports in Virginia and its neighboring states were developed. The average OPBA ratios at towered airports are shown in **Table 2-14**.

Table 2 - 14: Towered Airport Operations per Based Aircraft in Virginia and Neighboring States

	2008 (Towered Airport OPBA)	2012 (Towered Airport OPBA)	2012 (5 Year Average OPBA - All NPIAS Airports)
Kentucky	446	426	454
Maryland	478	278	423
North Carolina	378	307	499
Tennessee	336	342	454
Virginia	404	395	400
West Virginia	419	376	409

Several points are noteworthy related to the information shown above; these are as follows:

- For each state included in the research, the five-year average general aviation OPBA ratio for all NPIAS airports is higher than the OPBA average for just the towered airports. This may support the assumption that in many cases annual general aviation operational estimates for non-towered airports are currently overstated.
- With the exception of towered airports in Tennessee, towered airports in all other states included in the research show a lower general aviation OPBA ratio in 2012 than in 2008.
- For several of the states included in the research, there is a notable difference between the OPBA for towered airports and the general aviation OPBA average for all NPIAS airports; in all cases, the statewide OPBA for all NPIAS airports is higher and in some instances by more than 100 operations per aircraft.
- Virginia’s statewide OPBA for all airports included in the NPIAS at 400 is the closest to the average OPBA for only towered airports at 395; Virginia also shows the least change in the OPBA ratio at its towered airports between 2008 and 2012 in comparison to states included in this research. This may indicate that non-towered airports in Virginia are providing reasonable estimates of their annual takeoffs and landings.

Since statewide OPBA, as discussed in this research, are highly influenced by estimated as opposed to actual operational counts, the OPBA for towered airports are considered more accurate. At a ratio of 395, the 2012 general aviation OPBA for towered airports in Virginia is the second highest among all airports included in the research. Only Kentucky, with an OPBA of 426 is higher.

OPBA ratios are important to the VATSP Update because they support the preferred methodology for projecting future general aviation operations at all airports included in the Virginia system. This research shows that OPBA for airports in Virginia are comparable to those in neighboring states and are therefore reasonable proxies for projecting future general aviation operations. The research also shows that non-

towered airports in Virginia are providing reasonable estimates for total annual takeoffs and landings of general aviation aircraft. These findings are important to support the assumptions used to produce forecasts of general aviation operations for the VATSP Update.

This analysis revealed that the average OPBA for Virginia's airports is comparable to the OPBA in all neighboring states. This finding helped to confirm that the approach and assumptions used to develop projections of general aviation operations for all study airports is reasonable.

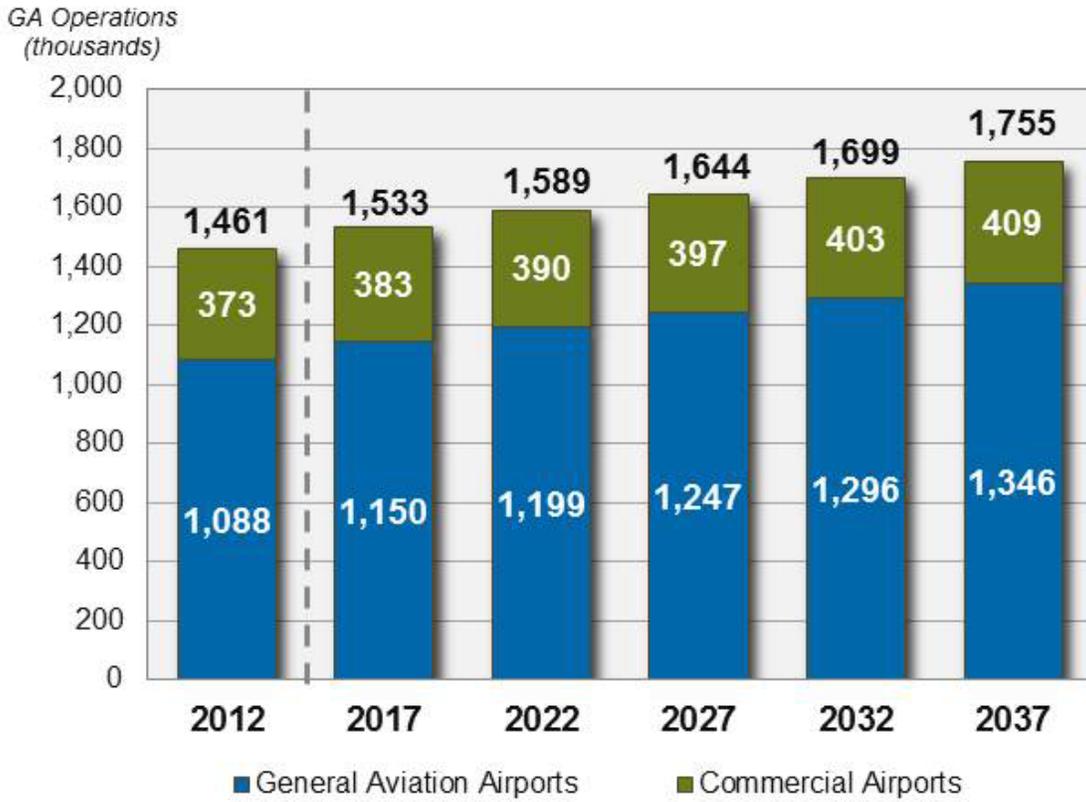
Statewide, total annual general aviation operations are expected to increase from 1,460,000 in 2012 to close to 1,756,000 by 2037. Between 2012 and 2037, annual general aviation operations at the commercial airports in Virginia are projected to increase at an average annual rate of 0.4 percent, while general aviation operations at the general aviation airports are expected to increase at an average annual rate of 0.9 percent. This results in a projected average annual rate of growth for the Commonwealth of 0.7 percent. The FAA's most current Aerospace Forecast extends to 2032. Between 2012 and 2032, the FAA projects general aviation operations nationally to grow at a rate of 0.4 percent, less than the rate of growth projected for general aviation operations in Virginia.

Within the TAF, the FAA has general aviation operations projections for all airports that are included in this FAA document. The rate of growth provided by the FAA in the TAF for all annual general aviation operations at Virginia airports is also 0.7 percent. The FAA TAF includes forecasts of general aviation operations for 47 study airports. The similarity of these two average annual rates of growth helps to validate the results of the methodology selected for use in the VATSP Update to project general aviation operations.

As noted, general aviation operations at the Virginia airports are forecast by applying an OPBA ratio to the based aircraft forecasts. The FAA national forecast of general aviation activity assumes a very slight decline in OPBA in the U.S. through 2032. The forecasts for Virginia assume that the base year OPBA ratios at the individual airports decline slightly over the forecast period, consistent with the FAA's national forecast. For each of the study airports, the actual base year and future assumed OPBA are shown in Table 2-8. The future year OPBA ratios were applied to each airport's forecast of total based general aviation aircraft to develop a forecast of annual general aviation operations. The resulting projections of annual general aviation operations are also shown in Table 2-9.

Figure 2-12 summarizes the statewide forecast of annual general aviation operations. As shown, total annual general aviation operations are expected to increase from 1,460,000 in 2012 to 1,756,000 by 2037. Annual general aviation operations at Virginia's commercial airports are forecast to increase at an average annual rate of 0.4 percent, while general aviation operations at the general aviation airports are expected to increase at an average annual rate of 0.9 percent. This results in a forecast average annual growth rate of 0.7 percent for the Virginia Airport System. According to the FAA, general aviation operations at the Virginia airports included in the TAF will grow by 0.7 percent between 2012 and 2032.

Figure 2 - 12: Forecast of Statewide General Aviation Operations



Note: Totals have been rounded.

Source: FAA ATADS; FAA TAF FY12-FY40; Form 5010; U.S. DOT, T100 (YENov12); and ICF SH&E

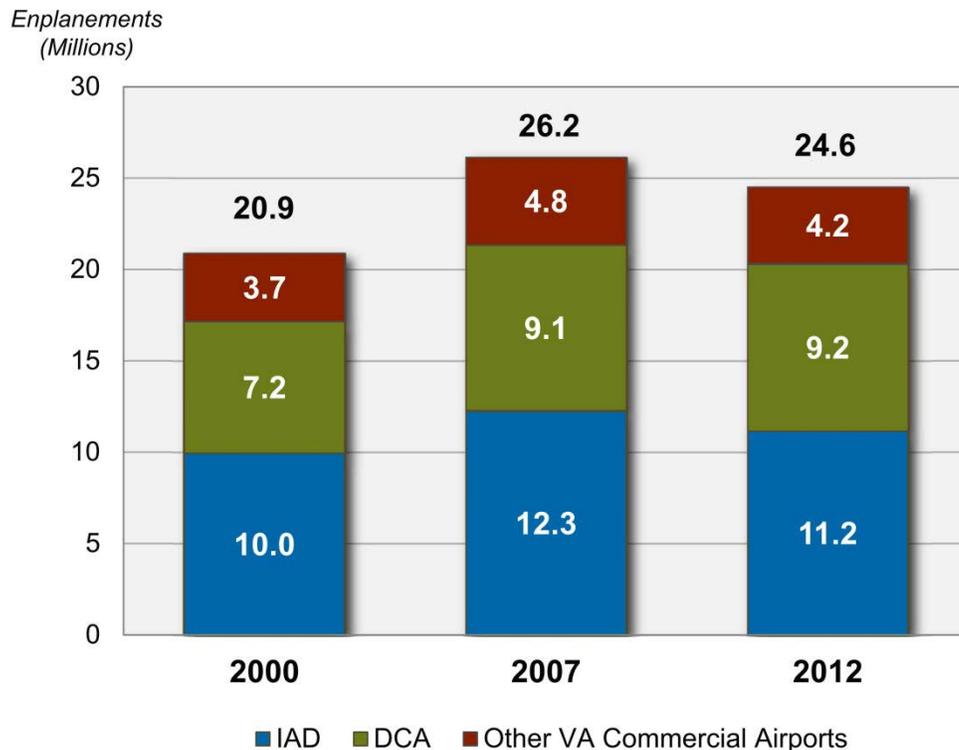
2.3 Commercial Airline Activity

Commercial activity includes activity by scheduled and charter commercial passenger airlines. The specific types of activity included in the commercial forecasts are enplaned passengers and commercial passenger aircraft operations. Historical trends and forecasts for passenger enplanements and aircraft operations are described in the following sections.

2.3.1 Historical Enplaned Passengers

Figure 2-13 presents historical enplanements for all Virginia commercial airports. For the VATSP Update, it is important to examine and consider the impacts of Ronald Reagan Washington National and Washington Dulles International airports on statewide demand. Figure 2-13 shows historical changes in enplanements for these two large hub airports and the combined change for all other commercial airports in Virginia. **Table 2-15** presents historical average annual rates of growth for enplanements at Virginia’s commercial airports and compares these to rates for growth for enplanements in the U.S.

**Figure 2 - 13: Virginia Historical Passenger Enplanements
2000, 2007 and 2012**



Note: Totals have been rounded.

Source: 2003 VATSP; Airport Records; U.S. DOT T100; FAA Aerospace Forecast FY12-FY32

**Table 2 - 15: Historical Enplanement Growth for Virginia Airports and the U.S.
Actual 2000, 2007, and 2012**

Airports	Average Annual Growth		
	2000-2007	2007-2012	2000-2012
IAD	3.0%	-1.9%	1.0%
DCA	3.4%	0.2%	2.0%
Other Virginia Airports	3.7%	-2.7%	1.0%
Total Virginia	3.3%	-1.3%	1.3%
Total U.S. *	1.1%	-1.2%	0.1%

*U.S. commercial carriers only

Source: 2003 VATSP; Airport Records; U.S. DOT T100

As shown in Figure 2-13, total enplanements for all commercial airports in Virginia grew between 2000 and 2007, but then declined between 2007 and 2012. From information shown in Table 2-15, this trend was mirrored by total enplanements in the U.S. As information in Table 2-15 shows, enplanement growth at Virginia’s commercial airports has been more robust than enplanement growth for the U.S. as a whole.

From 2000 to 2007 total enplanements for all Virginia commercial airports increased at an average annual rate of 3.3 percent, while U.S. enplanements for the same period increased at a slower rate of 1.1 percent per year. Over the most recent five-year period from 2007 to 2012, enplanements for all Virginia commercial airports decreased at an average annual rate of -1.3 percent, and total U.S. enplanements fell at a similar rate of -1.2 percent. Over the long-term period (2000 to 2012), Virginia’s enplaned passengers increased at an average annual rate of 1.3 percent, while U.S. enplanements increased only slightly by 0.1 percent per year.

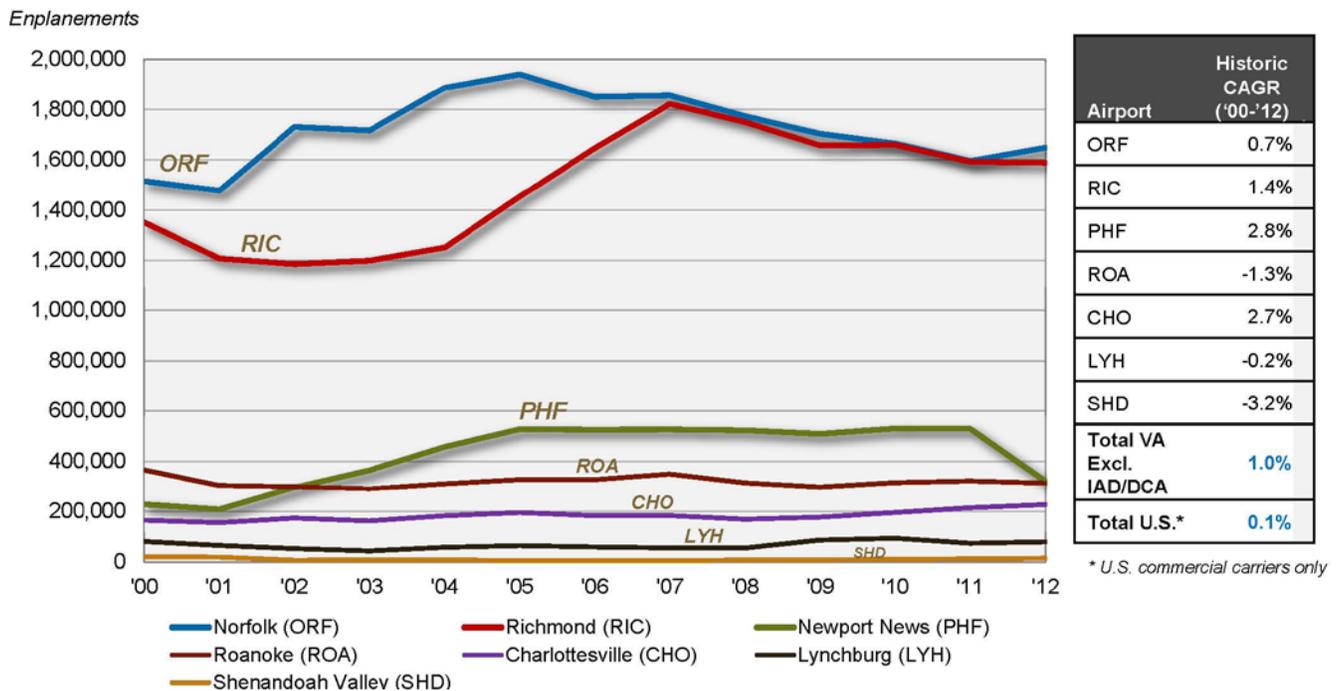
Table 2-15 also shows that between 2007 and 2012 enplanements at Washington Dulles International fell by -1.9 percent annually, while enplanements at Ronald Reagan Washington National increased slightly at a rate of 0.2 percent per year. Over the same period, enplanements at all other commercial airports in Virginia fell at an average annual rate of -2.7 percent. Some of the decrease in enplanements over the most recent five year period is attributable to a drop in demand due to the economic recession and global financial collapse in 2008/2009 and a sluggish economic recovery.

Related factors that have led to declining passenger enplanements include rising and sustained high fuel prices and restructuring and consolidation in the airline industry. With high operating costs (fuel) and a renewed emphasis on profitable flying, airlines have retired many of the small turboprop and regional jets (with 50 or fewer seats) because these aircraft are no longer economically viable. This has resulted in service cuts to many commercial airports and a corresponding decrease in enplanements.

Between 2007 and 2012, there was further consolidation in the airline industry with significant mergers between major carriers such as Delta/Northwest and United/Continental. This has resulted in the closure or significant downsizing of several airline connecting hubs. Carrier consolidation and fewer connecting hubs east of the Mississippi have resulted in service cuts at some Virginia airports, with an adverse impact on enplanements. Further, as low cost carriers (LCCs) continue to expand at larger airports, there is often a tendency for enplanements at smaller commercial airports to decline as passengers choose to drive longer distances for LCC services at larger competing facilities.

Figure 2-14 charts historic enplanements at Virginia’s commercial airports, excluding Ronald Reagan Washington National and Washington Dulles International. As shown, enplanements at these airports increased at an average annual rate of 1.0 percent from 2000 to 2012. For the period, total enplanements in the U.S. increased at a much slower rate of 0.1 percent. Over the long-term historic period, Virginia’s commercial airports experienced higher than average enplanement growth.

Figure 2 - 14: Historical Passenger Enplanements at Virginia Airports
Metropolitan Washington Airports Authority (MWAA) Airports are excluded from this analysis
2000 – 2012



Source: 2003 VATSP; Airport Records; U.S. DOT T100

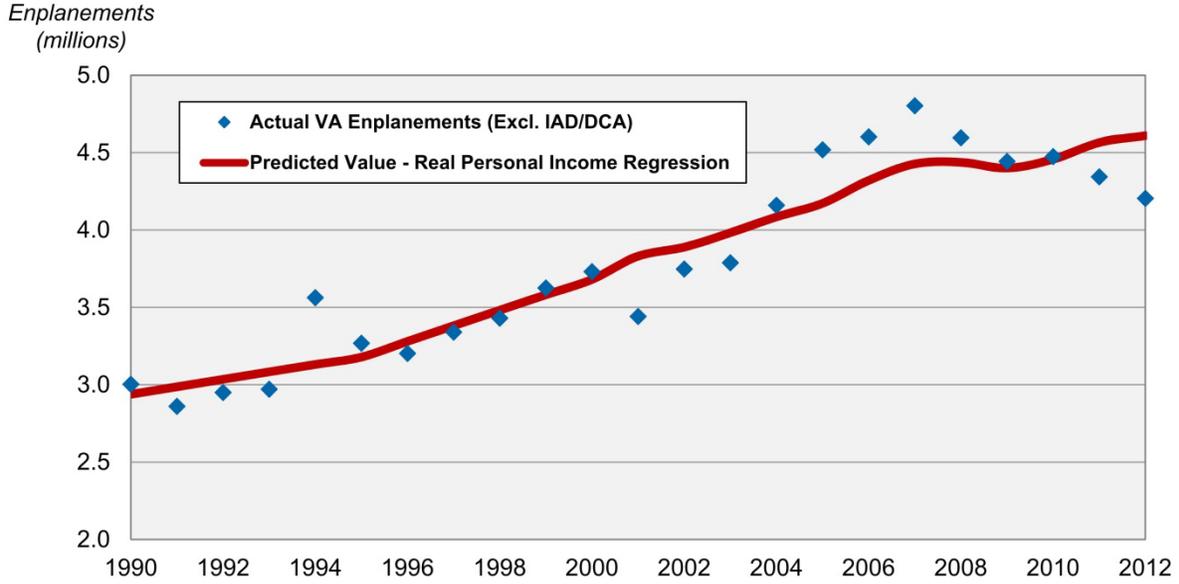
2.3.2 Forecast of Commercial Passenger Enplanements

Historic trends in enplanements at Virginia’s commercial airports were not considered as a viable approach for projecting future enplanement levels. Actual declines in enplanements from various external “shocks” and structural changes in the airline industry between 2000 and 2012 render trend analysis an unreliable tool for projecting future enplanements. Using trend analysis would result in a continuing decline in passenger enplanements which would not be suitable for system planning purposes.

Several potential methodologies were considered for forecasting future enplanements. One of these methodologies considered the correlation of enplaned passengers at Virginia’s commercial airports to local real personal income. Analysis shows that changes in real personal income are highly correlated to changes in historical passenger enplanements at commercial airports in Virginia. A regression analysis that included all commercial airports, with the exception of Ronald Reagan Washington National and Washington Dulles International, shows a strong correlation between enplanements and real personal income over the 1990 to 2012 period.

Figure 2-15 shows the regression analysis results. Using a log-log formulation, the regression resulted in an estimated income elasticity of 0.82 which is within the range of expected income elasticity for airline passengers. The income elasticity was applied to forecasts of personal income growth in Virginia to forecast passenger enplanements at Virginia’s commercial airports, excluding Ronald Reagan Washington National and Washington Dulles International airports.

Figure 2 - 15: Econometric Forecast Model for Virginia Commercial Service Airport Enplanements (MWWA Airports are excluded from this analysis)



Equation:	ln(Enplanements) = constant + ln(Personal Income)	
Coefficients:	5.3166	0.8249
(t-stats)	(6.8989)	(12.7407)
No. of Observations:	23	
R ² = 88.54%		

Source: Woods and Poole 2012 CEDDS; ICF SH&E analysis

Table 2-16 shows the real personal income growth assumptions for Virginia excluding the Virginia portions of the Washington, DC-Arlington-Alexandria MSA, which encompass portions within the service areas of the MWAA airports. As shown in Table 2-16, real personal income is expected to increase at an average annual rate of 2.6 percent over the forecast period from 2012 to 2037.

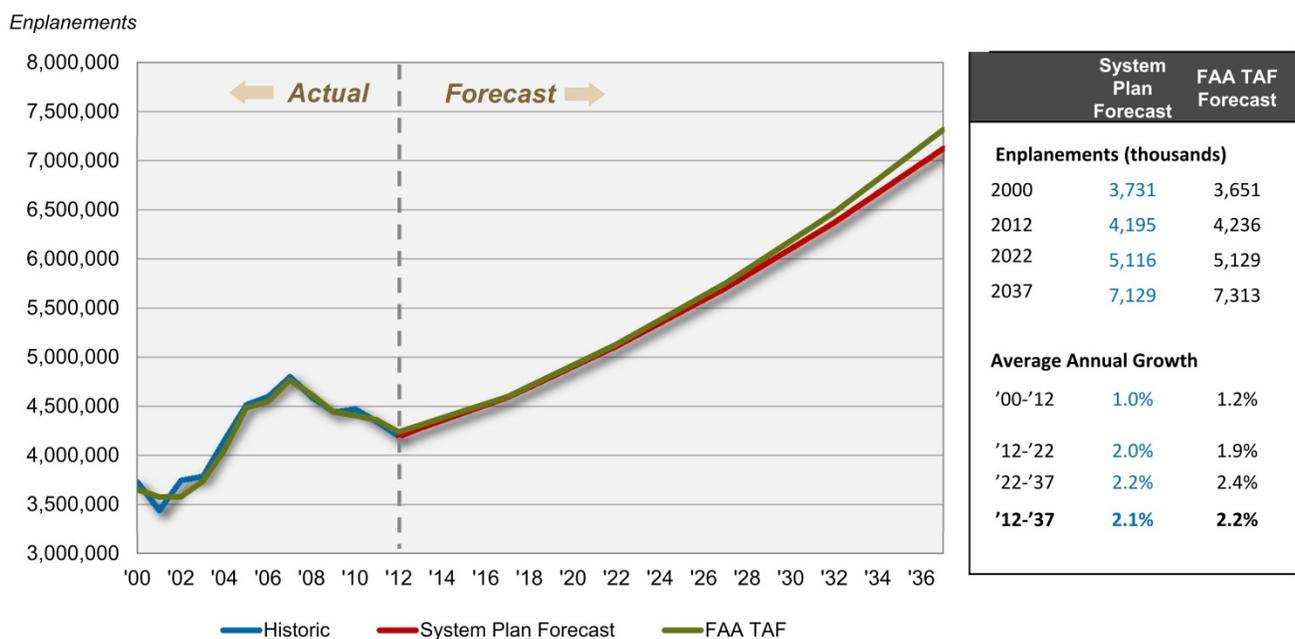
**Table 2 - 16: Historical and Forecast Virginia Real Personal Income
(Excluding Washington, DC – Arlington –Alexandria MSA)**

Year	Real Personal Income (Millions of 2005 USD)
Actual	
2000	\$144,694
2001	\$151,875
2002	\$154,688
2003	\$159,189
2004	\$164,169
2005	\$168,453
2006	\$175,727
2007	\$180,995
2008	\$181,509
2009	\$179,664
2010	\$182,474
2011	\$187,854
2012	\$190,067
Forecast	
2017	\$211,653
2022	\$241,132
2027	\$275,228
2032	\$314,828
2037	\$360,493
Average Annual Growth	
1990-2012	2.5%
2012-2017	2.2%
2017-2037	2.7%
2012-2037	2.6%

Source: Woods & Poole 2012 CEDDS

Figure 2-16 presents historical and projected enplanements for all Virginia commercial airports, excluding the two MWAAs airports. Figure 2-16 also compares the VATSP forecast growth rate to the FAA TAF growth rate for the same Virginia airports. The VATSP forecast shows total enplanements to increase at an average annual rate of 2.1 percent from 4.2 million in 2012 to 7.1 million in 2037. According to the TAF, the FAA forecasts total enplanements for the Virginia airports to increase by a similar rate of 2.2 percent per year over the same time horizon.

Figure 2 - 16: Forecast of Passenger Enplanements at Virginia Commercial Service Airports (MWAAs Airports are excluded from this analysis)



Source: ICF SH&E; FAA TAF FY12-FY40

To determine how the forecast of statewide enplanements would be distributed by individual airport over the forecast period, historic airport enplanement shares and forecasts of local area personal income were reviewed. **Table 2-17** presents each commercial airport’s historic and projected shares of total statewide enplanements. Future market shares, shown in Table 2-17, were developed by considering changes in each airport’s market share between 2000 and 2012, forecasts of real personal income growth in the market area served by the airport, the competitive setting for each airport, and anticipated changes in commercial airline services. The future market share assumptions were applied to the statewide enplanements forecast to develop enplanement projections for individual study airports.

**Table 2 - 17: Actual and Forecast Airport Shares of Total Virginia Enplanements
(MWAAs Airports are excluded from this analysis)**

Airport	Actual Share		Forecast Share
	2000	2012	2037
Charlottesville-Albemarle (CHO)	4.4%	5.4%	4.9%
Lynchburg Regional (LYH)	2.2%	1.9%	1.4%
Newport News-Williamsburg International (PHF)	6.1%	7.7%	7.1%
Norfolk International (ORF)	40.6%	39.3%	33.8%
Richmond International (RIC)	36.2%	37.9%	46.6%
Roanoke-Blacksburg Regional (ROA)	9.8%	7.5%	6.0%
Shenandoah Valley Regional (SHD)	0.3%	0.3%	0.3%

Source: ICF SH&E; FAA TAF FY12-FY40

Table 2-18 shows the real personal income forecast growth rates for each airport market area. The Richmond and Lynchburg MSAs are forecast to be the fastest growing with real total personal income increasing by 3.0 percent annually over the forecast period, compared to 2.6 percent growth for the state (excluding the Washington, DC-Arlington-Alexandria MSA). Real personal income for the Virginia Beach-Norfolk-Newport News MSA is forecast to grow at the same rate as the state average and the other MSAs are forecast to grow below average state rates.

Table 2 - 18: Actual and Forecast Real Personal Income for Virginia Commercial Service Airport Market Areas

Real Personal Income by MSA (2005 USD, million)								
MSA:	Richmond, Virginia	Virginia Beach-Norfolk-Newport News, Virginia-North Carolina			Roanoke, Virginia	Charlottesville, Virginia	Lynchburg, Virginia	Staunton-Waynesboro, Virginia
Year	Airport:	RIC	ORF	PHF	ROA	CHO	LYH	SHD
Actual								
2012		\$49,575	\$63,345	\$63,345	\$11,100	\$8,113	\$8,160	\$3,820
Forecast								
2017		56,329	70,565	70,565	12,193	8,788	9,257	4,108
2022		65,487	80,247	80,247	13,716	9,773	10,767	4,522
2027		76,190	91,383	91,383	15,460	10,886	12,560	4,994
2032		88,782	104,236	104,236	17,455	12,136	14,712	5,532
2037		\$103,500	\$118,963	\$118,963	\$19,717	\$13,526	\$17,283	\$6,139
Average Annual Growth								
2012-2017		2.6%	2.2%	2.2%	1.9%	1.6%	2.6%	1.5%
2017-2037		3.1%	2.6%	2.6%	2.4%	2.2%	3.2%	2.0%
2012-2037		3.0%	2.6%	2.6%	2.3%	2.1%	3.0%	1.9%

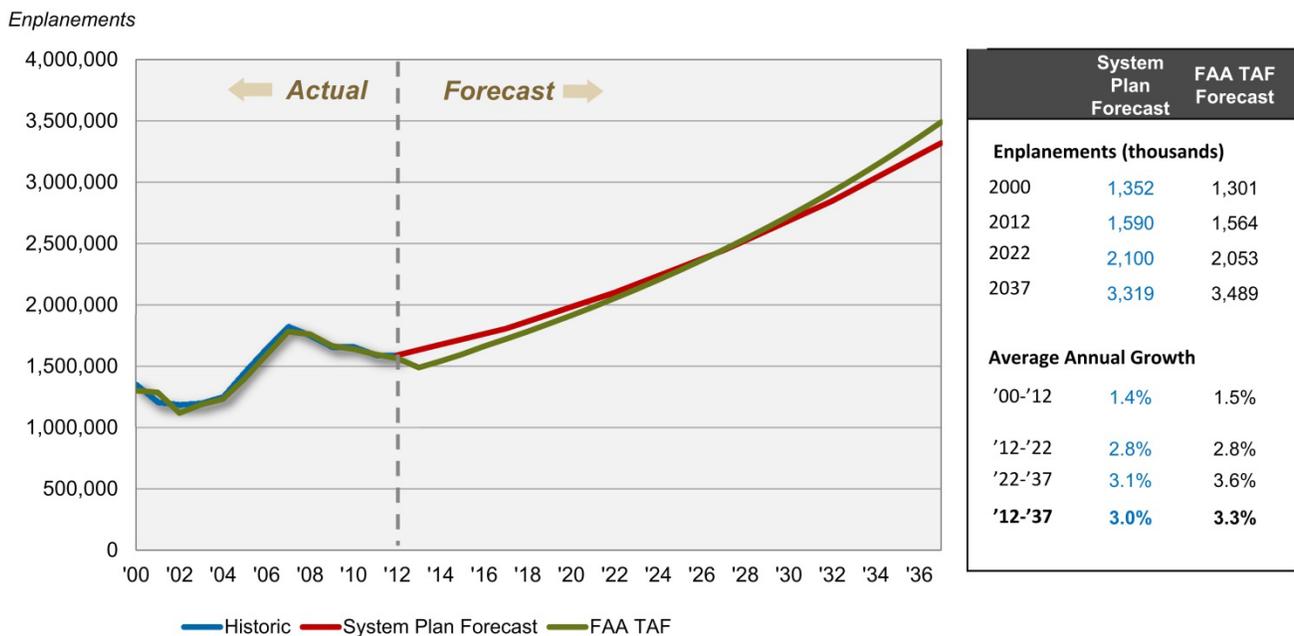
Source: Woods & Poole 2012 CEDDS

Figures 2-17 through 2-23 show individual enplanement forecasts for Virginia’s commercial airports with the exception of the MWAA airports. These figures show historic enplanements and forecast enplanements for each airport, and comparisons to FAA forecasts from the TAF. These figures also show implied average annual rates of growth for the VATSP and the TAF forecasts. It should be noted that the TAF forecasts are for federal fiscal years ending September 30th. A brief discussion for each airport’s enplanement forecast follows.

Richmond International Airport – As shown in **Figure 2-17**, enplanements at Richmond International are forecast to increase from 1,590,000 in 2012 to 3,319,000 by 2037. The 2012-2037 average annual rate of growth implied in the VATSP enplanement forecast is 3.0 percent which is slightly lower than the TAF’s forecast growth rate of 3.3 percent.

Historic enplanement growth at Richmond International has also been strong at 1.4 percent per year from 2000 to 2012. New LCC service by AirTran and JetBlue, starting in 2005 and 2006 respectively, helped to offset substantial cuts by US Airways over the last decade. Enplanements at Richmond International peaked at 1,824,000 in 2007 and have declined slightly in recent years due to the economic recession and airlines’ tighter capacity control. The Richmond MSA is projected to have the fastest personal income growth in the state, and passenger traffic levels at Richmond International are expected to resume strong growth over the forecast period.

Figure 2 - 17: Actual and Forecast of Passenger Enplanements at Richmond Int. Airport

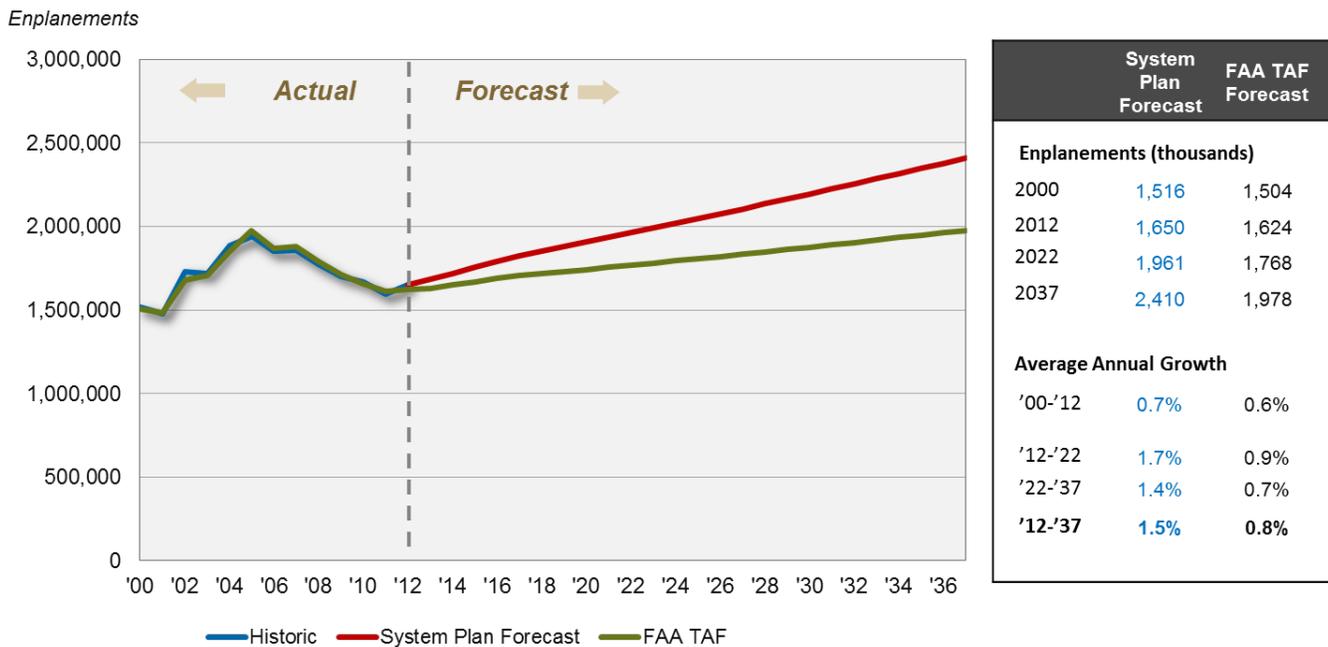


Source: ICF SH&E; FAA TAF FY12-FY40

Norfolk International Airport – **Figure 2-18** shows the enplaned passenger forecast for Norfolk International. Enplanements at Norfolk International are projected to increase at an average annual rate of 1.5 percent from 1,650,000 in 2012 to 2,410,000 by 2037. The forecast rate of growth is higher than the FAA TAF projected growth rate of 0.8 percent.

Norfolk International is the larger of the two commercial airports serving the Virginia Beach-Norfolk-Newport News MSA. Historic enplanements at Norfolk International increased by an average 0.7 percent per year between 2000 and 2012, peaking at 1,942,000 in 2005. While US Airways, American, Delta and United have all implemented service cuts at Norfolk over the past decade, Southwest introduced service at the airport in 2001 and has expanded operations significantly. Southwest is the largest carrier at Norfolk International today, serving seven destinations (ATL, BNA, BWI, JAX, MCO, MDW and TPA) and accounting for close to 30 percent of scheduled seats. Average annual personal income growth for the Virginia Beach-Norfolk-Newport News MSA is forecast at 2.5 percent compared to 3.0 percent for the Richmond MSA. However, the Virginia Beach-Norfolk-Newport News MSA is projected to continue to exceed the Richmond MSA in terms of population and total personal income over the forecast period.

Figure 2 - 18: Actual and Forecast of Passenger Enplanements at Norfolk International Airport



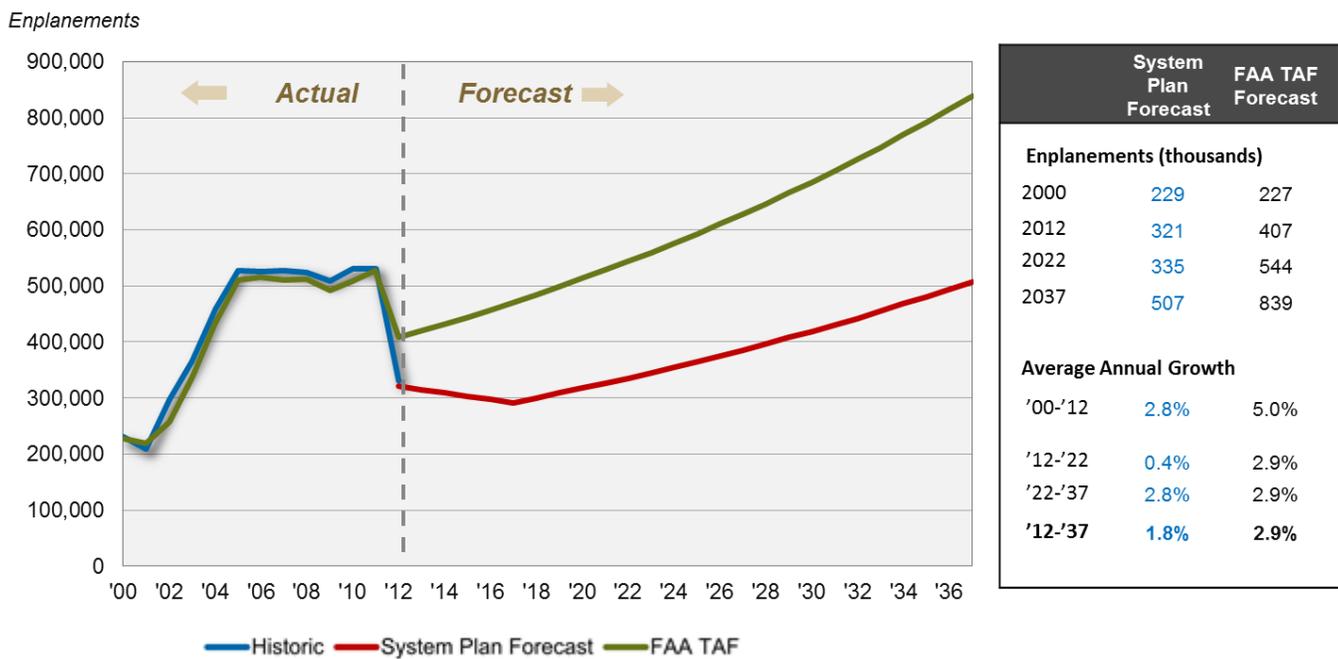
Source: ICF SH&E; FAA TAF FY12-FY40

Newport News-Williamsburg International Airport – As shown in **Figure 2-19**, enplanements at Newport News-Williamsburg International are forecast to increase from 321,000 in 2012 to 507,000 by 2037. The average annual growth rate implied in the VATSP enplanement forecast between 2012 and 2037 is 1.8 percent, lower than the FAA TAF growth rate of 2.9 percent.

Historic enplanements growth at Newport News-Williamsburg International has been relatively strong at 2.8 percent per year from 2000 to 2012. Enplanements exceeded 500,000 in 2005 and peaked at 532,000 in 2010. However, the withdrawal of all AirTran services in February 2012 due to the Southwest/AirTran merger and network consolidation has severely impacted passenger levels. AirTran was the largest carrier at Newport News-Williamsburg International, providing over 40 percent of all scheduled seats. Following AirTran’s exit, Newport News-Williamsburg has nonstop service by US Airways Express, Delta Connection, Frontier and Allegiant to 5 destinations. Enplanements at the airport dropped to 321,000 in 2012 and have continued to decline through 2013.

The VATSP enplanements forecast for Newport News-Williamsburg shows a 1.9 percent average annual decline from 2012 to 2017 before a return to historic levels as shown in Table 2-19. The VATSP forecast projects a conservative recovery in enplanements to 507,000 enplanements by 2037, approaching previous peak enplanement levels the airport supported. The forecast assumes that, over the 25 year forecast period, Newport News may attract replacement services by other airlines with business models that involve serving secondary airports in multi-airport markets (for example Frontier and/or Allegiant).

Figure 2 - 19: Actual and Forecast of Passenger Enplanements at Newport News-Williamsburg International Airport

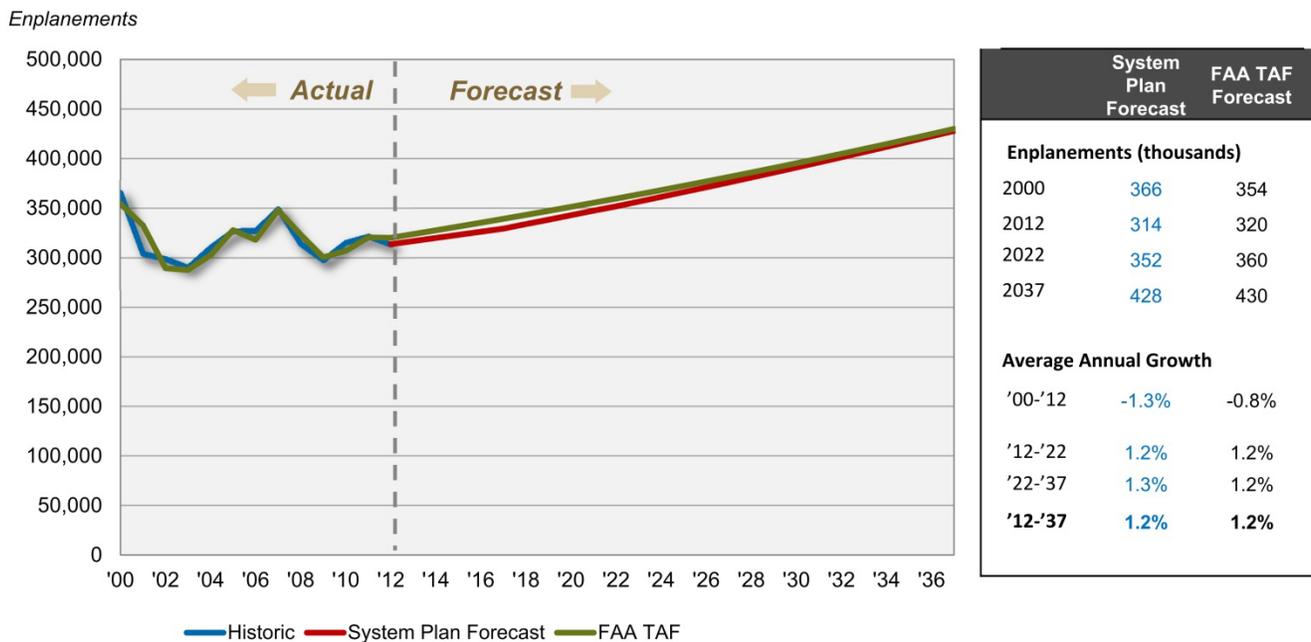


Source: ICF SH&E; FAA TAF FY12-FY40

Roanoke-Blacksburg Regional Airport – As shown in **Figure 2-20**, passenger enplanements for Roanoke-Blacksburg Regional Airport are forecast to increase from 314,000 in 2012 to 428,000 in 2037. The VATSP long-term forecast growth rate for the airport is 1.2 percent; the FAA TAF growth rate for the airport over the same time frame is also 1.2 percent.

Historic enplanements at Roanoke-Blacksburg Regional have decreased by an average 1.3 percent per year from 366,000 in 2000 to 314,000 in 2012. The airport is currently served by US Airways Express, Delta Connection, United Express and Allegiant. Forecast personal income average annual growth for the Roanoke MSA is 2.3 percent over the forecast period.

Figure 2 - 20: Actual and Forecast of Passenger Enplanements at Roanoke-Blacksburg Regional Airport

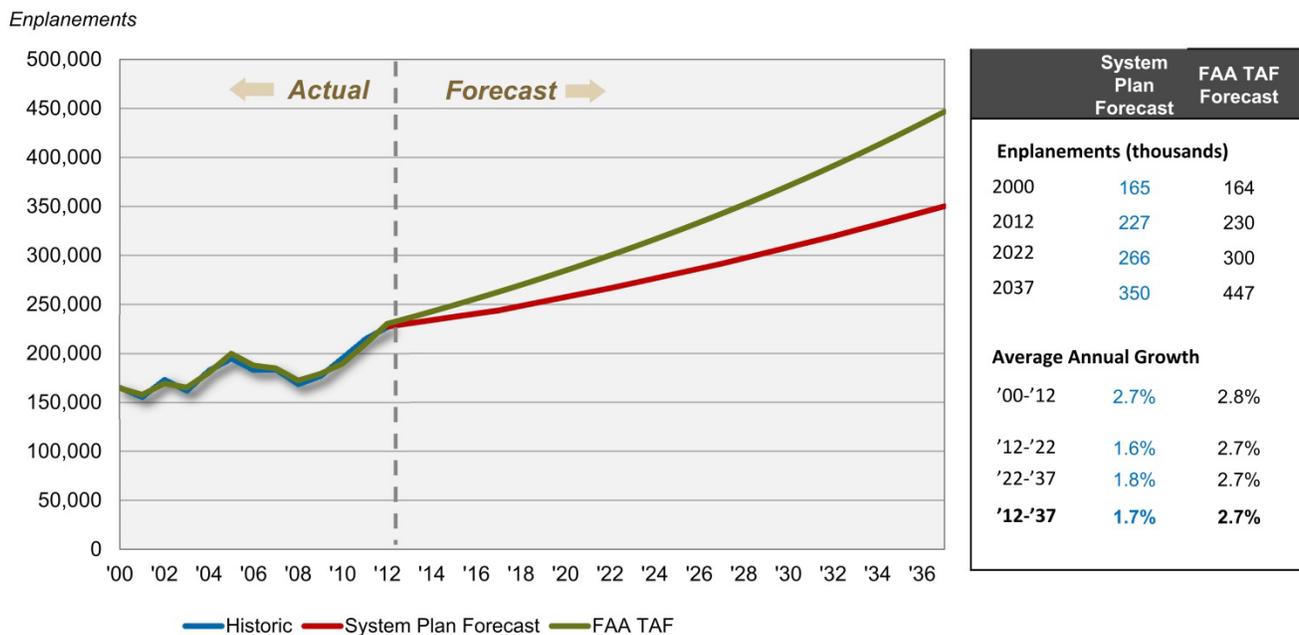


Source: ICF SH&E; FAA TAF FY12-FY40

Charlottesville-Albemarle Airport – The forecast of passenger enplanements for Charlottesville-Albemarle are shown in **Figure 2-21**. Enplaned passengers are forecast to grow from 227,000 in 2012 to 350,000 in 2037. In the VATSP forecast, enplanements at Charlottesville-Albemarle increase by 1.7 percent per year over the forecast period compared to the FAA TAF forecast growth rate of 2.7 percent.

Historic enplanements at Charlottesville grew by an average 2.7 percent per year from 2000 to 2012. Enplanements in 2012 represented a new peak, exceeding the previous peak of 195,000 in 2005. This strong historic passenger growth corresponded with strong economic growth in the Charlottesville MSA. The historic personal income average annual growth for the Charlottesville MSA was 3.4 percent from 1990 to 2012, the highest in the state. Forecast personal income growth in the Charlottesville MSA, however, is expected to drop to 2.1 percent per year over the forecast period.

Figure 2 - 21: Actual and Forecast of Passenger Enplanements at Charlottesville-Albemarle Airport

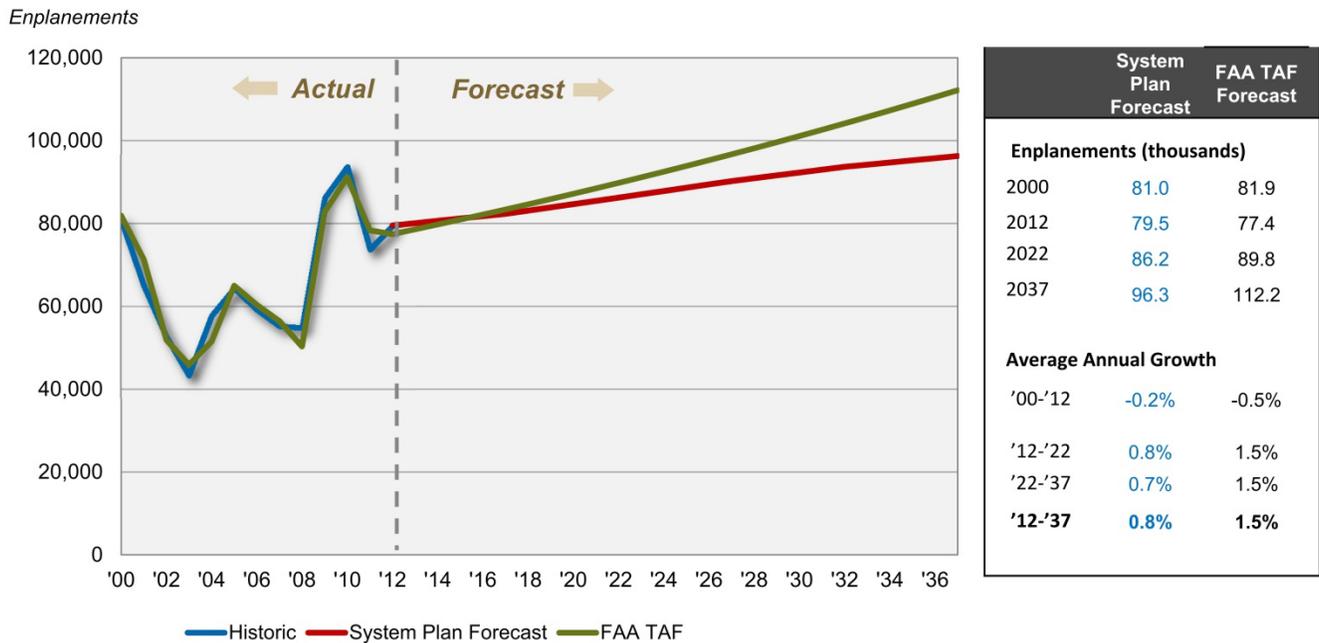


Source: ICF SH&E; FAA TAF FY12-FY40

Lynchburg Regional Airport – As shown in **Figure 2-22**, enplanements at Lynchburg Regional are projected to increase from 79,500 in 2012 to 96,300 by 2037. The average annual rate of growth implied in the VATSP enplanement projection between 2012 and 2037 is 0.8 percent, and the FAA TAF forecast growth rate for the same period is 1.5 percent.

Historic enplanements at Lynchburg Regional have decreased by an average 0.2 percent per year falling to 79,500 in 2012. US Airways Express service to Charlotte is the only service at the airport, following the discontinuation of United Express service in 2001 and Delta service in 2011.

Figure 2 - 22: Actual and Forecast of Passenger Enplanements at Lynchburg Regional Airport

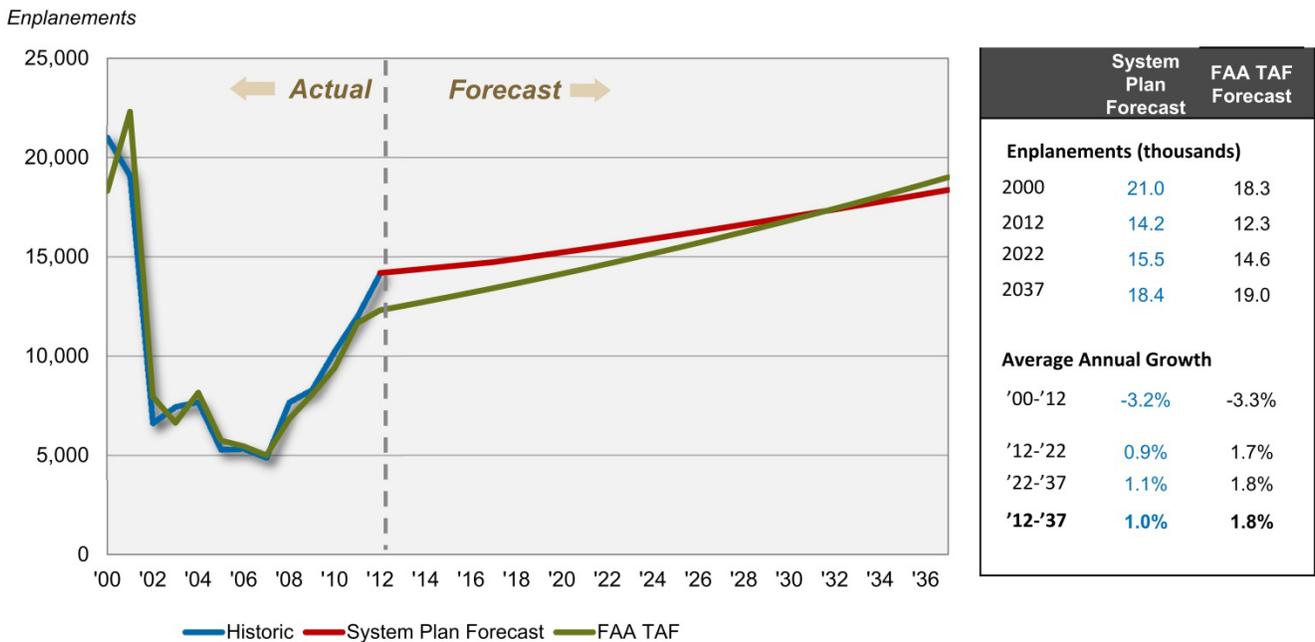


Source: ICF SH&E; FAA TAF FY12-FY40

Shenandoah Valley Regional Airport – At Shenandoah Valley Regional, enplaned passengers (see **Figure 2-23**) are forecast to increase at an average rate of 1.0 percent per year, growing from 14,200 in 2012 to 18,400 in 2037. This VATSP forecast enplanement growth (at an average annual rate of 1.0 percent) is lower than the FAA TAF growth rate of 1.8 percent.

Historic enplanements at Shenandoah Valley Regional decreased by an average of 3.2 percent per year between 2000 and 2012. Enplanements peaked at 21,000 in 2000, but dropped below the 10,000 level for 2002 through 2009. In 2012 they returned to 1990 comparable levels. The only current service at the airport is an Essential Air Service (EAS) subsidized United Express service to Washington Dulles.

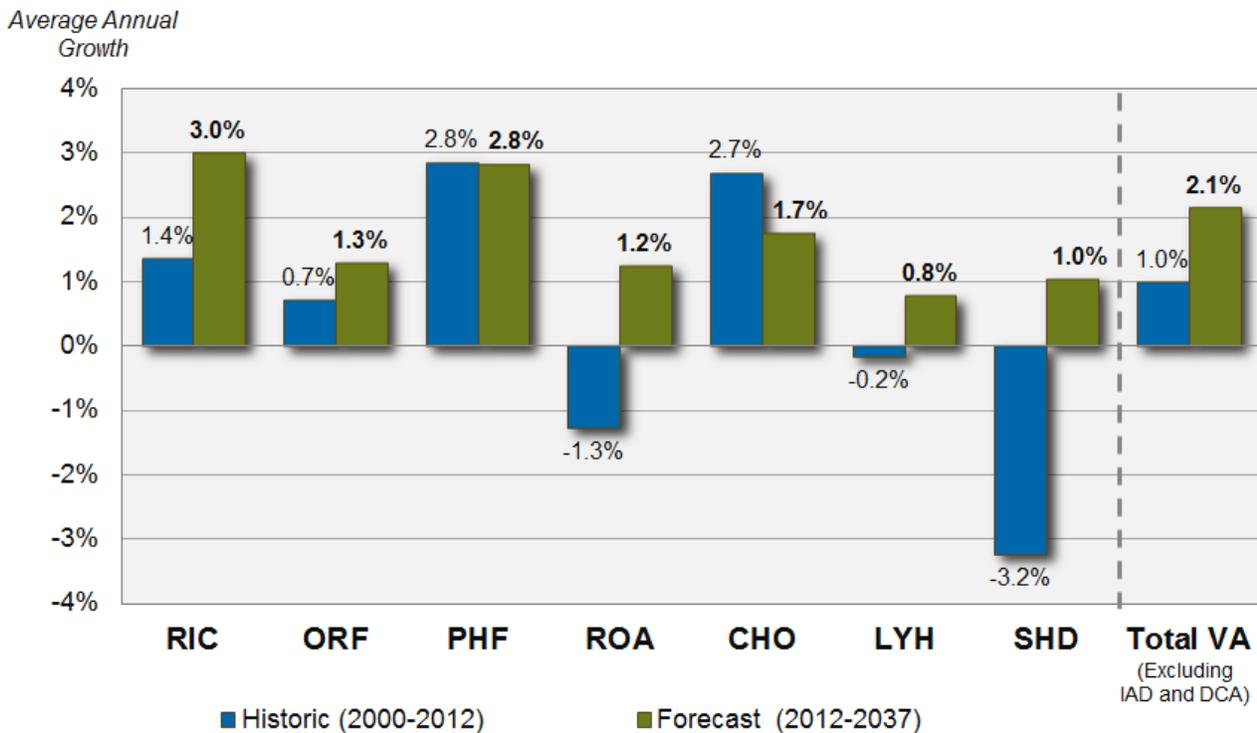
Figure 2 - 23: Actual and Forecast of Passenger Enplanements at Shenandoah Valley Regional Airport



Source: ICF SH&E; FAA TAF FY12-FY40

Figure 2-24 compares the historic average annual rate of growth in enplanements for each of the commercial airports to the implied average annual rate of growth from the VATSP projections. As shown, from 2000 to 2012 the average annual rate of growth for enplanements at Virginia’s commercial service airports was 1.0 percent. In comparison, the forecast growth rate over the long-term, 2012-2037 planning horizon is 2.1 percent. The historic period reflects several external shocks as well as a prolonged economic slowdown and structural changes in the airline industry. Over the forecast period, growth is projected to be more in line with expected economic growth.

Figure 2 - 24: Actual and Forecast Average Annual Enplanement Growth for Virginia Commercial Service Airports (MWA Airports are excluded from this analysis)



Source: ICF SH&E

Table 2-19 presents forecast passenger enplanements for each of the Virginia airports, except for the MWA Airports. Information on actual historic enplanements is also presented.

Table 2 - 19: Actual and Forecast Passenger Enplanements at Virginia Commercial Service Airports

Year	Passenger Enplanements							Total
	RIC	ORF	PHF	ROA	CHO	LYH	SHD	
Actual								
1990	931,337	1,345,407	149,896	340,388	131,287	90,813	13,902	3,003,030
1991	880,893	1,262,623	163,775	310,461	124,551	94,277	24,110	2,860,690
1992	947,523	1,268,532	162,063	319,625	150,817	87,814	13,421	2,949,795
1993	1,002,039	1,244,484	153,823	320,921	152,348	84,784	12,804	2,971,203
1994	1,101,461	1,682,705	162,006	362,256	155,392	88,926	10,273	3,563,019
1995	1,096,129	1,423,899	169,992	333,639	148,686	86,675	8,952	3,267,972
1996	1,082,375	1,380,789	182,733	321,672	141,898	82,645	10,690	3,202,802
1997	1,164,855	1,430,583	162,419	321,130	158,542	82,402	19,735	3,339,666
1998	1,241,588	1,429,023	161,481	331,131	161,008	87,815	18,338	3,430,384
1999	1,314,927	1,488,519	205,010	345,153	170,535	83,993	17,370	3,625,507
2000	1,351,925	1,516,361	229,381	365,503	165,416	81,010	21,025	3,730,621
2001	1,208,477	1,478,687	209,520	304,328	155,863	65,120	19,092	3,441,087
2002	1,186,841	1,732,123	297,203	299,039	173,543	52,699	6,633	3,748,081
2003	1,200,436	1,718,196	365,924	290,324	162,405	43,378	7,457	3,788,119
2004	1,252,384	1,889,108	458,839	310,689	183,037	57,742	7,703	4,159,502
2005	1,455,330	1,942,211	528,678	327,270	195,306	64,402	5,300	4,518,497
2006	1,647,655	1,851,832	527,121	327,463	183,501	59,271	5,337	4,602,180
2007	1,823,879	1,857,162	527,879	349,428	184,017	55,245	4,893	4,802,502
2008	1,750,875	1,774,602	524,393	314,282	168,969	54,831	7,681	4,595,633
2009	1,658,627	1,704,728	510,253	297,811	177,410	86,232	8,308	4,443,369
2010	1,660,876	1,666,233	531,503	315,516	195,964	93,771	10,267	4,474,130
2011	1,593,900	1,596,694	530,713	321,766	214,781	73,773	12,023	4,343,650
2012	1,589,727	1,649,856	321,165	313,564	227,300	79,502	14,181	4,195,295

Table 2 - 19: Actual and Forecast Passenger Enplanements at Virginia Commercial Service Airports (Continued)

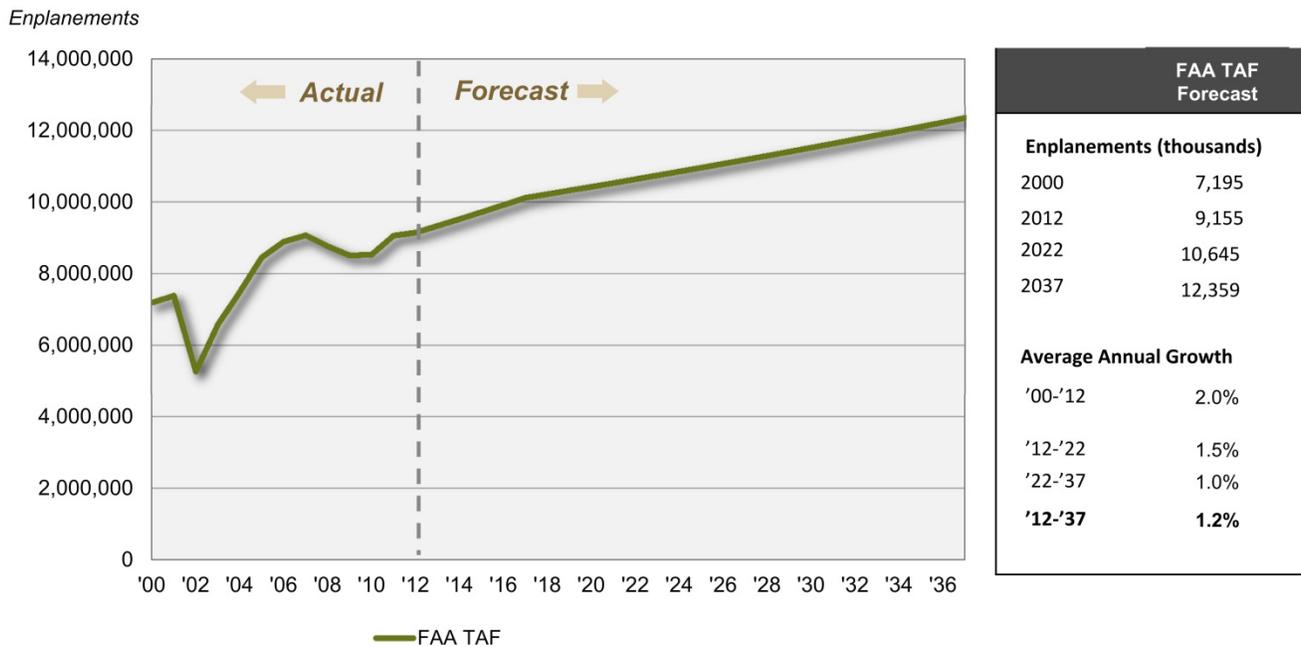
Year	Passenger Enplanements							Total
	RIC	ORF	PHF	ROA	CHO	LYH	SHD	
Forecast								
2017	1,806,308	1,826,400	291,575	329,262	243,834	82,328	14,732	4,594,440
2022	2,099,987	1,961,368	334,878	351,733	266,449	86,227	15,549	5,116,191
2027	2,443,194	2,104,352	384,612	375,639	291,503	90,229	16,432	5,705,962
2032	2,847,014	2,254,864	441,733	401,099	319,364	93,664	17,375	6,375,114
2037	3,318,979	2,410,011	507,337	427,724	350,045	96,280	18,365	7,128,741
Average Annual Growth								
1990-2012	3.1%	0.9%	5.3%	-0.2%	2.9%	-0.4%	0.3%	2.0%
2000-2012	2.4%	0.7%	6.1%	-0.9%	3.3%	0.1%	-2.9%	1.8%
2007-2012	-0.2%	-2.3%	-2.5%	-1.2%	5.8%	8.3%	24.7%	-0.9%
2012-2017	2.6%	2.1%	-1.9%	1.0%	1.4%	0.7%	0.8%	1.8%
2017-2037	3.1%	1.4%	2.8%	1.3%	1.8%	0.8%	1.1%	2.2%
2012-2037	3.0%	1.5%	1.8%	1.2%	1.7%	0.8%	1.0%	2.1%

Source: 2003 VATSP; Airport Records; U.S. DOT T100 and ICF SH&E
 Note: Data excludes MWAAs airports

2.3.3 Enplanement Forecasts for Ronald Reagan Washington National and Washington Dulles International

For Ronald Reagan Washington National and Washington Dulles International Airports, existing forecasts developed by Metropolitan Washington Airports Authority (MWAA) and the FAA as part of the TAF were adopted for use in the VATSP Update. **Figure 2-25** shows the actual and forecast enplanements for Ronald Reagan Washington National based on the TAF. As shown, the FAA anticipates that the airport’s enplanements will increase from their 2012 level of 9,155,000 to 12,359,000 in 2037. The TAF forecast implies an average annual growth rate of 1.2 percent for enplaned passengers at Ronald Reagan Washington National.

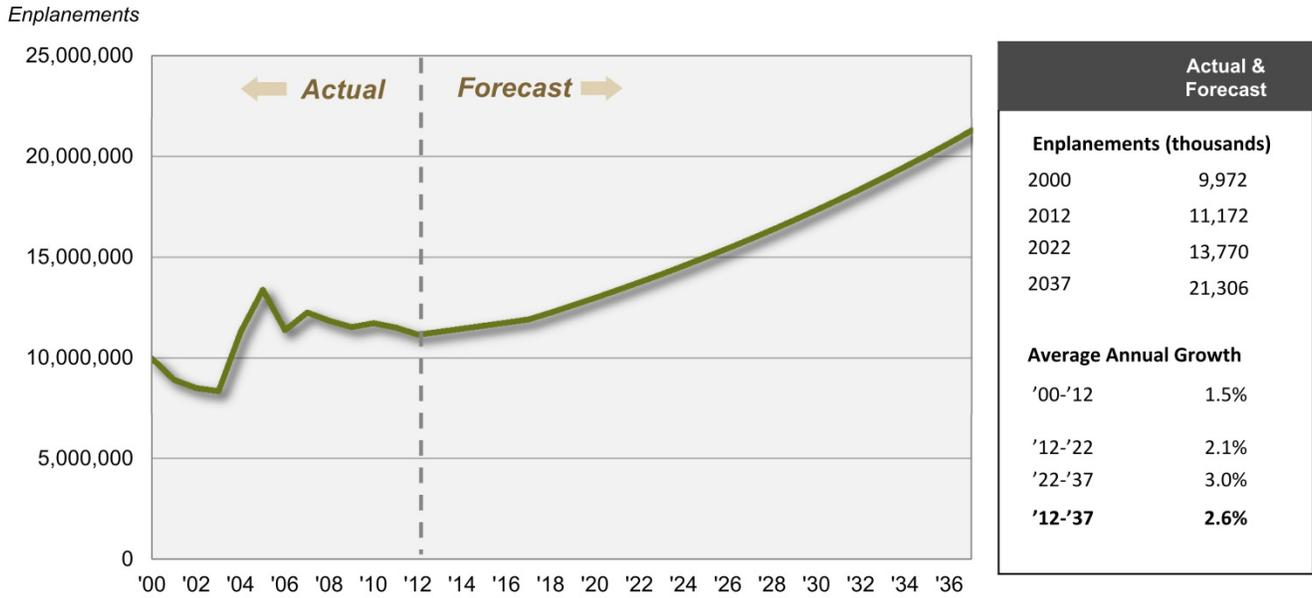
Figure 2 - 25: Actual and Forecast Passenger Enplanements at Ronald Reagan Washington National Airport



Note: Historic enplanements as reported in TAF
Source: FAA TAF FY12-FY40

For Washington Dulles International Airport the VATSP Update adopted MWAA’s existing short-term forecast through 2017 and forecast growth rates from the FAA TAF for 2018 to 2037. **Figure 2-26** presents the actual and forecast enplanements for Washington Dulles International. As shown, enplanements at Washington Dulles are forecast to grow at an average annual rate of 2.6 percent from 11,172,000 in the base year to 21,306,000 in 2037.

Figure 2 - 26: Actual and Forecast Passenger Enplanements at Washington Dulles International Airport



Source: MWAA Airport Records; Leigh Fisher Dulles Forecast (September 2012); TAF FY2012-FY2040 forecast growth rates for 2017-2037

Table 2-20 shows the actual and forecast enplanements for Ronald Reagan Washington National and Washington Dulles International airports.

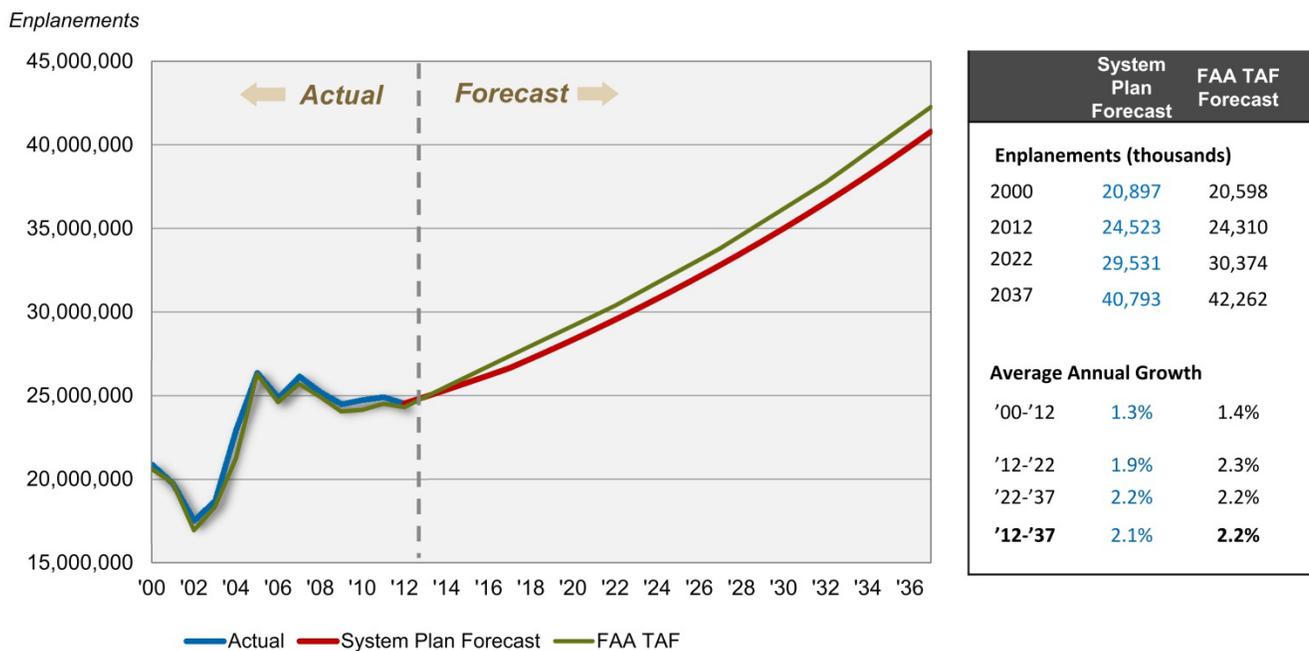
Table 2 - 20: Actual and Forecast Passenger Enplanements at Ronald Reagan Washington National and Washington Dulles International Airports

Year	Ronald Reagan	
	Washington National	Washington Dulles International
Actual		
1990	7,809,100	5,112,324
1995	7,380,226	6,147,787
2000	7,195,127	9,971,632
2001	7,393,527	8,920,196
2002	5,275,407	8,515,498
2003	6,577,550	8,366,486
2004	7,495,648	11,324,186
2005	8,461,237	13,396,377
2006	8,899,405	11,392,066
2007	9,080,444	12,273,506
2008	8,770,029	11,857,947
2009	8,516,173	11,546,771
2010	8,538,775	11,742,060
2011	9,070,150	11,517,956
2012	9,155,426	11,172,236
Forecast		
2017	10,128,485	11,925,000
2022	10,645,138	13,770,144
2027	11,188,148	15,913,509
2032	11,758,859	18,405,535
2037	12,358,679	21,305,585
Average Annual Growth		
1990-2012	1.2%	3.9%
2000-2012	2.9%	1.5%
2007-2012	2.2%	-0.6%
2012-2017	2.0%	1.3%
2017-2037	1.0%	2.9%
2012-2037	1.2%	2.6%

Sources: Ronald Reagan Washington National (FAA TAF FY2012-FY2040) and Washington Dulles International (MWWA Airport Records; Leigh Fisher Dulles Forecast (September 2012); and FAA TAF FY2012-FY2040 forecast growth rates for 2017-2037)

When all commercial airports in Virginia are considered, the VATSP Update projects total enplanements to increase from 24,523,000 in 2012 to 40,793,000 in 2037. **Figure 2-27** shows actual and forecast statewide enplanements and compares the VATSP forecast to the FAA TAF projection. As shown, the VATSP forecast for 2037 is slightly lower than the FAA TAF forecast of 42,262,000 enplanements. The average annual rate of growth for enplanements is similar; the VATSP forecast 2.1 percent annual growth compared to 2.2 percent in the TAF.

Figure 2 - 27: Actual and Forecast Passenger Enplanements at All Virginia Commercial Service Airports



Sources: DCA - MWA Airport Records; Leigh Fisher Dulles Forecast (September 2012); TAF FY2012-FY2040 forecast growth rates for 2017-2037; IAD - FAA TAF FY12-FY40; Other Virginia - ICF SH&E.

2.3.4 Forecast of Commercial Aircraft Operations

As part of the VATSP, forecasts of passenger aircraft operations were developed for each of the system airports (excluding MWA airports) based on the enplanement forecasts for each airport and assumptions regarding changes in the commercial passenger aircraft fleet mix and passenger load factors (the percentage of seats filled with passengers). Assumptions for each airport were based on the historic types of passenger aircraft serving each of the commercial airports; on historical passenger load factors; and on anticipated trends in airline fleet mixes and load factor performance.

Future passenger airline fleet mix trends include the continued reduction of small turboprop and regional jet aircraft (with 50 or fewer seats) from the operating fleet. The VATSP forecast assumes that these aircraft will continue to be replaced with larger more fuel efficient aircraft with seating capacities between 70 and 90 passengers. Another trend that will influence passenger aircraft operations at the larger airports is a slight increase in the size of narrow-body aircraft in the commercial airline fleet; this trend is expected to continue

over the forecast period as legacy and LCC airlines transition to larger capacity next generation narrow-body aircraft.

The VATSP forecast also assumes that passenger load factors in Virginia will increase over the forecast period to bring Virginia load factors more in line with national averages. Overall passenger load factors for the commercial system airports (excluding MWAA airports) are below the current national average, as shown in **Table 2-21**. The VATSP forecast assumes that jet and regional jet load factors, in particular at the commercial service airports, will increase over the forecast period towards national averages.

Table 2 - 21: Current Average Passenger Load Factors at Virginia Commercial Service Airports Year-Ending November 2012

Aircraft Type	RIC	ORF	PHF	ROA	CHO	LYH	SHD	Total ¹	U.S. Domestic Average
Average Passenger Load Factor									
Jet	76.8%	75.5%	65.2%	78.6%	41.5%	37.4%	56.9%	75.1%	82.4%
Regional Jet	76.0%	74.0%	79.3%	73.4%	80.2%	76.8%	52.0%	75.5%	78.4%
Piston/ Turboprop	71.0%	67.8%	60.3%	64.6%	68.0%	79.4%	36.4%	64.9%	59.3%
Total/Average	76.3%	74.4%	70.6%	71.1%	73.1%	76.9%	37.2%	74.2%	79.4%

¹ Excludes MWAA airports.

Sources: U.S. DOT, T100 Database

Table 2-22 summarizes the actual average aircraft size and average passenger load factor for each system airport (excluding MWAA Airports) for the base year. Future year assumptions for average aircraft sizes and load factors are also presented in **Table 2-23**.

The VATSP and FAA TAF forecasts of passenger aircraft operations for all system airports (excluding MWAA airports) are summarized in Table 2-23.

**Table 2 - 22: Average Aircraft Size and Load Factor Assumptions for Virginia Commercial Service Airports
2012 to 2037**

Year	RIC	ORF	PHF	ROA	CHO	LYH	SHD	Total ¹	
Average Passenger Aircraft Size									
Actual:	2012	76.5	83.1	65.6	51.3	43.6	49.7	34.4	70.7
Forecast:	2017	79.5	84.7	69.7	52.3	45.7	50.5	34.4	72.8
	2022	82.4	87.8	73.8	53.4	47.9	51.3	34.4	75.7
	2027	85.2	90.8	78.1	54.4	50.0	52.1	34.4	78.6
	2032	88.0	93.8	82.3	55.5	52.1	52.9	34.4	81.4
	2037	90.7	96.7	86.7	56.5	54.2	53.6	34.4	84.2
Average Passenger Load Factor									
Actual:	2012	76.3%	74.4%	70.6%	71.1%	73.1%	76.9%	37.2%	73.7%
Forecast:	2017	76.7%	75.0%	71.0%	71.4%	73.1%	77.1%	37.3%	74.6%
	2022	77.1%	75.5%	71.5%	71.7%	73.2%	77.3%	37.2%	75.1%
	2027	77.4%	76.0%	72.1%	72.0%	73.2%	77.6%	37.2%	75.6%
	2032	77.8%	76.6%	72.8%	72.3%	73.3%	77.8%	37.2%	76.1%
	2037	78.2%	77.1%	73.7%	72.7%	73.3%	78.0%	37.2%	76.6%

¹ Excludes MWAAs airports

**Table 2 - 23: Actual and Forecast Commercial Passenger Aircraft Operations at Virginia Airports
(Metropolitan Washington Airports Authority (MWA) Airports are excluded from this analysis)**

Year	RIC	ORF	PHF	ROA	CHO	LYH	SHD	Total ¹	
VATSP Update									
Actual:	2012	53,994	54,299	14,572	17,631	14,245	4,155	2,636	161,532
Forecast:	2017	59,258	57,541	11,787	17,627	14,578	4,231	2,738	167,760
	2022	66,141	59,181	12,687	18,377	15,212	4,350	2,890	178,838
	2027	74,033	60,941	13,666	19,163	15,925	4,470	3,054	191,252
	2032	83,153	62,796	14,728	19,987	16,727	4,558	3,230	205,179
	2037	93,589	64,654	15,879	20,829	17,607	4,603	3,414	220,575
Average Annual Growth									
	2012-2017	1.9%	1.2%	-4.2%	0.0%	0.5%	0.4%	0.8%	0.8%
	2017-2037	2.3%	0.6%	1.5%	0.8%	0.9%	0.4%	1.1%	1.4%
	2012-2037	2.2%	0.7%	0.3%	0.7%	0.9%	0.4%	1.0%	1.3%
FAA TAF									
Average Annual Growth									
	2012-2017	2.1%	0.2%	1.8%	0.6%	1.4%	0.5%	0.0%	1.1%
	2017-2037	3.7%	0.5%	1.8%	0.6%	1.4%	0.5%	0.0%	2.0%
	2012-2037	3.3%	0.4%	1.8%	0.6%	1.4%	0.5%	0.0%	1.9%

Note: FAA TAF growth rates based on Air Carrier and Commuter/Air Taxi operations.

¹ Excludes MWA airports

Source: ICF SH&E; FAA Aerospace Forecast FY12-FY32; U.S. DOT, T100; FAA TAF FY12-FY40

The following sections describe the forecasts of passenger aircraft operations for each study airport.

Richmond International Airport – In 2012, there were 54,000 commercial passenger aircraft operations reported at Richmond International. The VATSP Update projects the airport’s passenger aircraft operations to increase to 93,600 by 2037. The average annual rate of growth implied in the VATSP forecast is 2.2 percent between 2012 and 2037. For the same time frame, the FAA TAF shows that commercial operations at Richmond will increase at a higher average annual rate of 3.3 percent. The average seating capacity of commercial aircraft serving the airport in 2012 was 77 seats. The VATSP expects that this seating capacity will increase to 91 by 2037, as shown in Table 2-22. In 2012, the average load factor for all passenger aircraft departing the airport was 76.3 percent. By 2037, the average load factor is expected to increase to 78.2 percent.

Norfolk International Airport – There were 54,300 commercial passenger aircraft operations at Norfolk International Airport in 2012. The airport’s passenger aircraft operations are forecast to increase to 64,700 by 2037 at an average annual rate of 0.7 percent. The FAA TAF shows a lower forecast average annual growth of 0.4 percent for commercial operations at Norfolk. As shown in Table 2-22, the average seating capacity of commercial aircraft serving the airport is assumed to increase from 83 seats in 2012 to 97 seats by 2037. Norfolk’s average load factor is assumed to increase from 74.4 percent in 2012 to 77.1 percent by 2037.

Newport News/Williamsburg International Airport – In 2012, there were 14,600 commercial passenger aircraft operations at the Newport News/Williamsburg Airport. The airport’s passenger aircraft operations are forecast to increase to 15,900 by 2037 at an average annual rate of 0.3 percent. For the same time frame, the FAA TAF predicts that commercial operations will increase at a higher average annual rate of 1.8 percent. The VATSP forecast assumes that the average seating capacity of commercial aircraft serving the airport will increase from 66 seats in 2012 to 87 seats by 2037 (see Table 2-22). The average load is assumed to increase from 70.6 percent in 2012 to 73.7 percent in 2037.

Roanoke-Blacksburg Regional Airport – In 2012, Roanoke-Blacksburg Regional’s total commercial passenger aircraft operations were reported at 17,600. In the VATSP Update, the airport’s passenger aircraft operations are forecast to increase to 20,800 by 2037. The average annual rate of growth implied in the VATSP forecast is 0.7 percent between 2012 and 2037. For the same time frame, as part of the TAF, the FAA forecasts Roanoke-Blacksburg Regional’s commercial operations to increase at a similar average annual rate of 0.6 percent. As shown in Table 2-22, the average seating capacity of commercial aircraft serving the airport is assumed to increase from 51 seats in 2012 to 57 seats by 2037. Roanoke’s average load factor for all passenger aircraft departing the airport is expected to increase from 71.1 percent in the base year to 72.7 percent by 2037.

Charlottesville-Albemarle Airport – In 2012, the Charlottesville-Albemarle Airport handled 14,200 commercial passenger aircraft operations. The VATSP Update projects the airport’s passenger aircraft operations to increase to 17,600 by 2037. The average annual rate of growth implied in the VATSP forecast is 0.9 percent between 2012 and 2037. The FAA TAF predicts a higher growth rate of 1.4 percent per year for commercial airline aircraft operations at Charlottesville. As shown in Table 2-22, the VATSP forecast assumes that the average seating capacity of commercial aircraft serving the airport will grow from 44 seats

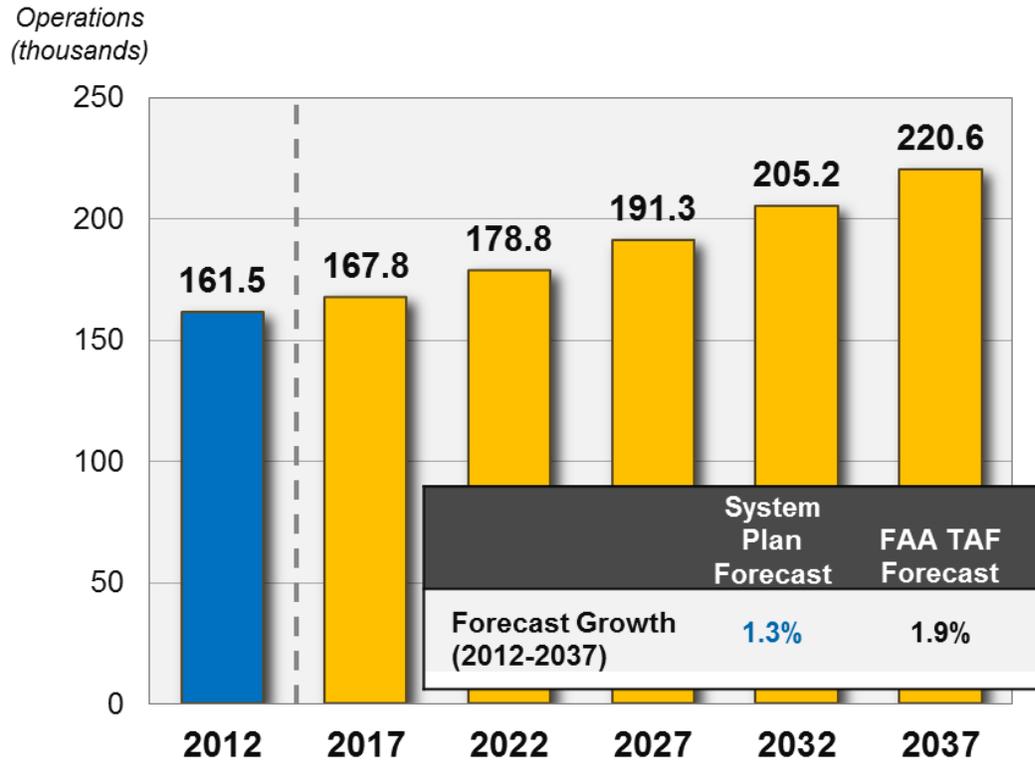
in 2012 to 54 seats by 2037. In 2012, the average load factor at Charlottesville was 73.1 percent. By 2037, the average load factor is expected to increase slightly to 73.3 percent.

Lynchburg Regional Airport – There were 4,160 commercial passenger aircraft operations at Lynchburg in the study base year. The VATSP Update forecast shows the airport’s passenger aircraft operations increasing to 4,600 by 2037. The average annual rate of growth implied in the VATSP forecast is 0.4 percent between 2012 and 2037. For the same time frame, the FAA anticipates that commercial operations at Lynchburg will increase at an average annual rate of 0.5 percent. As shown in Table 2-22, the VATSP forecast assumes that the average aircraft size increases from 50 seats in 2012 to 54 by 2037. In 2012, the average load factor for all passenger aircraft departing the airport was 76.9 percent. By 2037, the average load factor is assumed to increase to 78.0 percent.

Shenandoah Valley Regional Airport – The Shenandoah Valley Regional Airport accommodated 2,600 commercial passenger aircraft operations in the base year. The VATSP projects the airport’s passenger aircraft operations to increase to 3,400 by 2037 at an average annual growth rate of 1.0 percent. For the same time frame, the FAA anticipates that commercial operations at Shenandoah Valley will not increase. As shown in Table 2-22, The VATSP forecast assumes that the airport’s average aircraft size of 34 seats remains constant over the forecast period. In 2012, the average load factor for all passenger aircraft departing the airport was 37.2 percent and this percent is expected to remain unchanged through 2037.

Figure 2-28 provides a summary of projected passenger aircraft operations for all commercial service study airports, excluding MWAA airports. In 2012, these commercial airports in Virginia accommodated 161,500 commercial passenger aircraft operations. The VATSP Update forecasts total passenger aircraft operations for the non-Washington airports to increase at an average annual rate of 1.3 percent and reach 220,600 operations by 2037. Over the same time period, the FAA forecasts that the combined commercial airline operations at these airports will increase by 1.9 percent per year. The average seating capacity of all commercial service aircraft serving these study airports in 2012 was 71 seats. The VATSP Update assumes that the average seating capacity will increase to 84 by 2037. The VATSP Update also assumes that the average load factor for all passenger aircraft increases from 73.7 percent in the base year to 76.6 percent by 2037.

Figure 2 - 28: Actual and Forecast Passenger Aircraft Operations at All Virginia Commercial Service Airports (MWAAs Airports are excluded from this analysis)

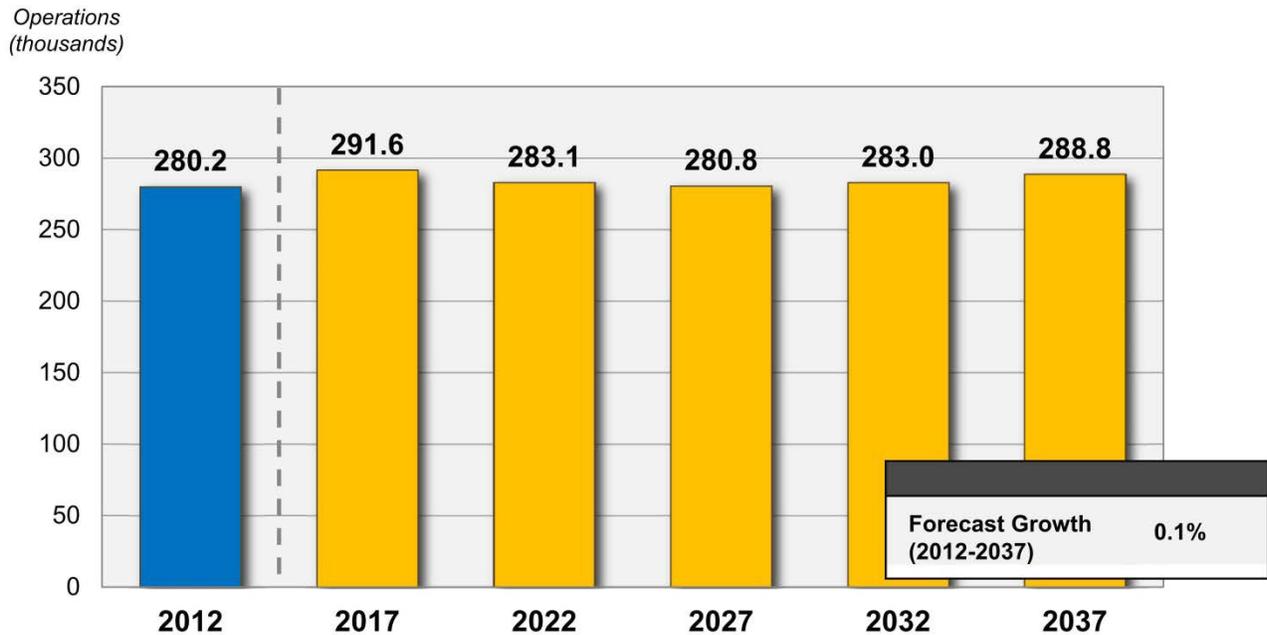


Source: ICF SH&E; FAA Aerospace Forecast FY12-FY32; U.S. DOT, T100; FAA TAF FY12-FY40

2.3.5 Commercial Aircraft Operations Forecast for Ronald Reagan Washington National and Washington Dulles International Airports

As with commercial passenger enplanements forecast, the VATSP Update adopted existing commercial aircraft operations (including aircraft operations recorded by the FAA Towers as Air Taxi) forecasts for Ronald Reagan Washington National and Washington Dulles International airports. **Figures 2-29** and **2-30** present the forecasts of commercial aircraft operations for these two airports.

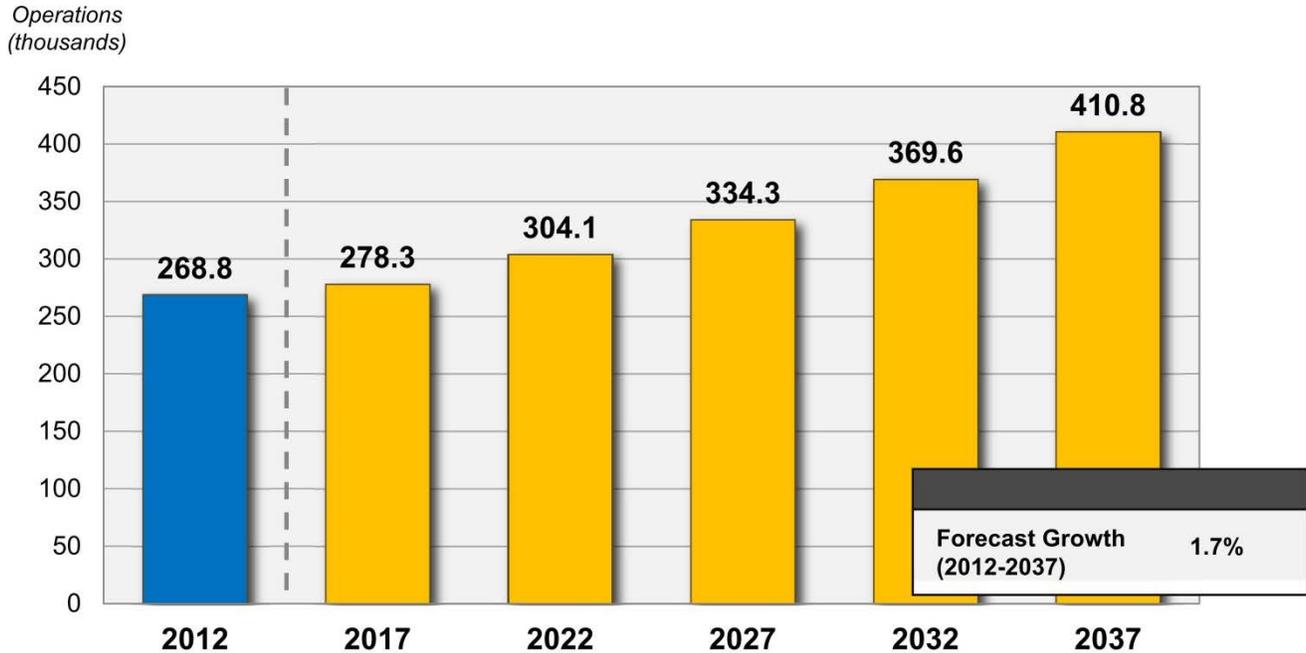
Figure 2 - 29: Actual and Forecast Commercial Airline Operations at Ronald Reagan Washington National Airport



Note: Includes Air Carrier and Air Taxi operations (represents passenger aircraft operations only)

Source: FAA TAF FY12-FY40

Figure 2 - 30: Actual and Forecast Commercial Airline Operations at Washington Dulles International Airport



Source: MWAA Airport Records; Leigh Fisher Dulles Forecast (September 2012); TAF FY2012-FY2040 forecast growth rates for 2017-2037

As shown in Figure 2-29, Ronald Reagan Washington National handled 280,200 commercial operations in the base year. The FAA forecasts commercial operations to increase by 0.1 percent annually over the forecast period and to reach 288,800 annual operations in 2037.

Figure 2-30 summarizes the base year and forecast airline operations at Washington Dulles International. In 2012, there were 269,000 annual commercial aircraft operations at Dulles International. According to the MWAA and FAA TAF projections, passenger aircraft operations are expected to increase at an average annual rate of 1.7 percent and to reach 411,000 annual operations in 2037.

Actual and forecast commercial aircraft operations for the Washington airports are also presented in **Table 2-24**.

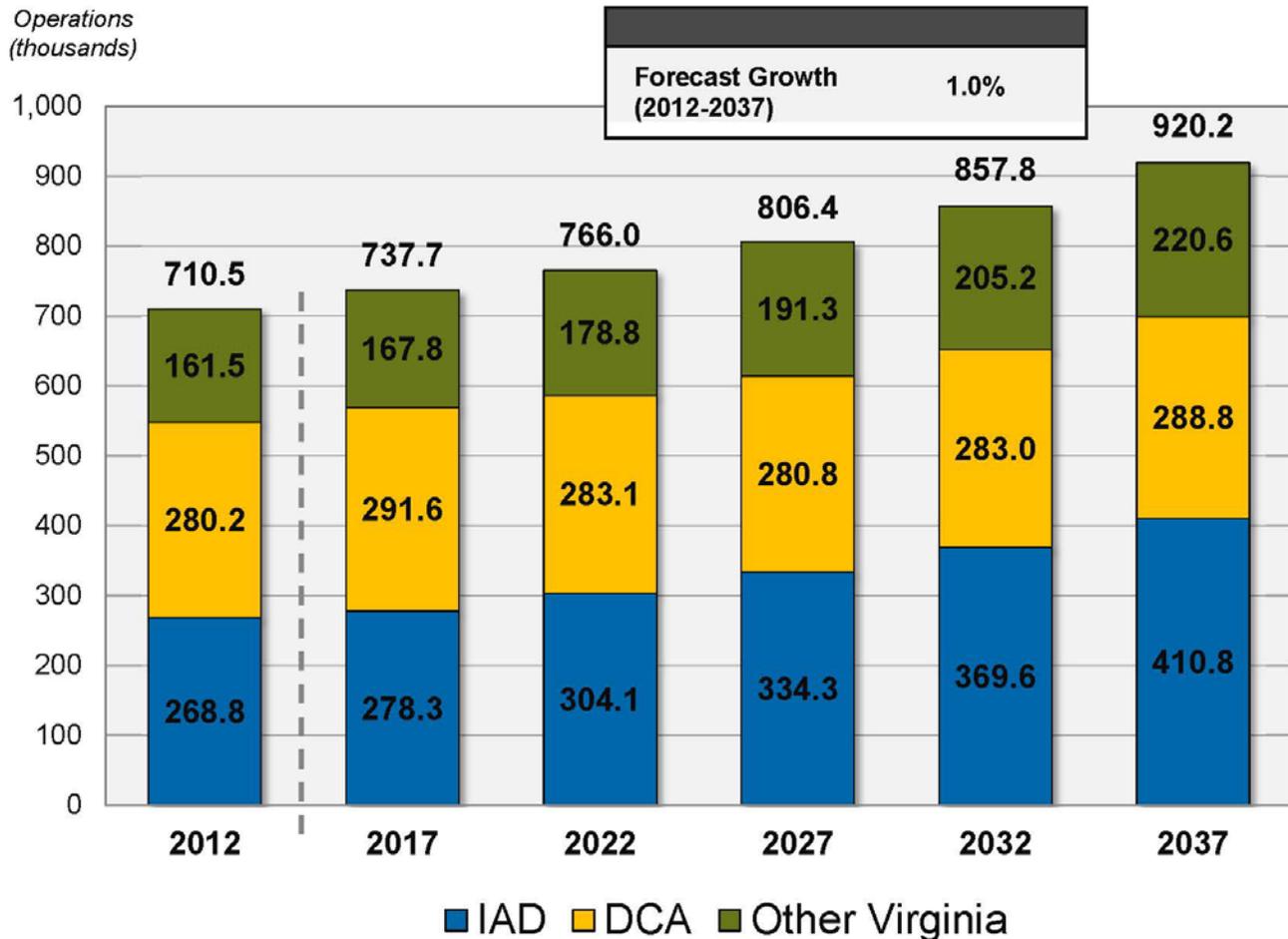
Table 2 - 24: Actual and Forecast Commercial Aircraft Operations at Ronald Reagan Washington National and Washington Dulles International Airports

Year	Ronald Reagan Washington National	Washington Dulles International
1990	255,689	178,635
1995	262,014	251,365
2000	259,317	389,314
2001	263,781	327,609
2002	176,007	289,020
2003	247,302	259,945
2004	264,784	393,332
2005	274,038	434,750
2006	274,433	310,637
2007	274,419	317,578
2008	272,617	304,660
2009	269,369	291,577
2010	263,069	288,053
2011	279,099	280,196
2012	280,223	268,777
2017	291,583	278,300
2022	283,095	304,116
2027	280,752	334,318
2032	283,015	369,604
2037	288,789	410,777
Average Annual Growth		
1990-2012	0.4%	1.9%
2000-2012	0.6%	-3.0%
2007-2012	0.4%	-3.3%
2012-2017	0.8%	0.7%
2017-2037	0.0%	2.0%
2012-2037	0.1%	1.7%

Source: Ronald Reagan Washington National (FAA TAF FY2012-FY2040) and Washington Dulles International (MWAAs Airport Records; Leigh Fisher Dulles Forecast (September 2012); TAF FY2012-FY2040 forecast growth)

As shown in **Figure 2-31**, total commercial airline operations for all of Virginia’s commercial service airports, including the MWAAs Airports, are forecast to increase from 710,500 in the base year to 920,100 in 2037. The implied growth in commercial aircraft operations for the commercial airport system is 1.0 percent per year.

**Figure 2 - 31: Actual and Forecast Commercial Airline Operations
(All VATSP Commercial Service Airports)**



Sources: Washington Dulles International MWWA Airport Records; Leigh Fisher Dulles Forecast (September 2012); TAF FY2012-FY2040 forecast growth rates for 2017-2037); Ronald Reagan Washington National (FAA TAF FY12-FY40; Other Virginia - ICF SH&E)

2.4 Summary

Table 2-25 provides a summary of aviation demand projections prepared for the VATSP. Summaries for several of the demand indicators presented in this table have been discussed in previous sections of this chapter. Table 2-25 provides information that shows the distribution of based aircraft for system airports and the distribution of general aviation annual operations for the state system.

As shown in this table, total annual passenger enplanements are projected to increase from 24.5 million in 2012 to almost 40.8 million by 2037. While the average annual rate of increase for passenger aircraft operations is not expected to be as high, total commercial passenger aircraft operations are projected to increase from their 2012 level of 710,500 to 920,100 by the end of the forecast period in 2037. When general aviation and commercial passenger aircraft operations are combined, Virginia is projected to see a

growth in annual aircraft takeoffs and landings. Annual operations in both categories are expected to increase from their 2012 level of 2,170,800 to 2,675,900 by 2037.

Projections of demand presented in this chapter of the VATSP will be used to help establish future facility needs for system airports, to measure the system's ability to adequately process annual operations, to determine the need for airport role changes, and to evaluate the system in terms of its future adequacy to meet Virginia's transportation and economic needs.

Table 2 - 25: Summary of Aviation Demand Projections

	2012	2017	2022	2027	2032	2037
Based Aircraft						
IAD/DCA	60	62	64	66	68	70
Other Commercial Service Airports	612	630	648	665	683	701
All General Aviation Airports	3,156	3,402	3,651	3,901	4,152	4,405
Total	3,828	4,094	4,363	4,632	4,903	5,176
Total Annual General Aviation Operations						
IAD/DCA	48,723	50,870	51,428	51,994	52,568	53,151
Other Commercial Service Airports	324,018	323,850	328,056	329,090	335,952	339,641
All General Aviation Airports	1,087,525	1,157,510	1,211,847	1,264,916	1,316,933	1,367,868
Total	1,460,266	1,532,230	1,591,331	1,646,000	1,705,513	1,760,660
Commercial Enplanements						
IAD/DCA	20,327,662	22,053,485	24,415,282	27,101,657	30,164,394	33,664,264
Other Commercial Service Airports	4,195,295	4,594,440	5,116,191	5,705,962	6,375,114	7,128,741
Total	24,522,957	26,647,925	29,531,473	32,807,619	36,539,508	40,793,005
Commercial Passenger Aircraft Operations						
IAD/DCA	549,000	569,883	587,211	615,070	652,619	699,566
Other Commercial Service Airports	161,532	169,315	180,152	192,323	206,011	221,176
Total	710,532	739,198	767,363	807,393	858,630	920,742
Total Annual Operations All Airports	2,170,798	2,271,428	2,358,694	2,456,393	2,564,143	2,681,402

All forecasts are subject to uncertainty. The above forecast is based on information that is available as of the date of publication. Various factors, other than those included in the forecast models, can influence future aviation demand. Unexpected events may occur and some underlying forecast assumptions may not materialize. Therefore actual performance may differ from the forecasts presented in this chapter and these differences could be significant.

