VIRGINIA AIRPORT SYSTEM ECONOMIC IMPACT STUDY

TECHNICAL REPORT

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Chapter I: Introduction & Background

Virginia's airports not only serve as major sources of employment and economic activity, they also spur employment and economic activity throughout the Commonwealth. Visitors who come to Virginia via its airports also contribute substantial spending, which supports local businesses and the hospitality industry. The contributions of the airports (and airlines operating at those facilities) are quantified in an *economic impact analysis*.

This chapter explains the fundamental concepts in an economic impact analysis of commercial service and general aviation airports. It discusses the number and types of these airports in the Commonwealth of Virginia and describes the type of employment supported by airports. Much of that is not seen by the general public. The chapter also describes how economic impact analyses categorize the different units of employment and activity, and how they are summarized. In addition, a short description of this study's methodology is included to provide a basic understanding of how the analysis was generated.

Introduction to Virginia's Public Use Airports

Airports across Virginia provide a range of services and public benefits to citizens and visitors. Airports support scheduled commercial air service for the traveling public, freight transportation, medical flights, aerial firefighting, disaster relief, pilot training, general recreational flying, and more. In doing so, airports are important sources of economic activity in the communities and regions they serve. Many citizens are familiar with commercial aviation, having flown for personal or business reasons. But even experienced travelers often do not fully understand the enormous range of activities that occur in order for airports to function, since so many are "behind the scenes." These could be air traffic control, security, engineering, health and safety, or even food preparation.

Similarly, most citizens are not generally aware of "general aviation" (GA) activities even though they often see small aircraft or helicopters flying overhead. GA is defined as the operation of any type of aircraft certificated by the U.S. Federal Aviation Administration (FAA) other than those used for scheduled airline service, government or the military. General aviation aircraft include fixed-wing piston and turboprop airplanes, jets, helicopters, gliders, and hot-air balloons. General aviation covers everything from the personal use of aircraft by recreational pilots to operations of corporate aircraft to transport people and/or cargo for business purposes. The term general aviation also incorporates sight-seeing flights, aerial photography, air medical services, agriculture-related flights and flight training. The facilities primarily used by GA aircraft are commonly referred to as general aviation airports.

The Commonwealth of Virginia is home to 66 public use airports.[1] Nine of those airports have scheduled service from commercial airlines. The "commercial service airports" vary widely in size and in the number of airlines that provide service. On the one hand, both of the two large hub airports serving

[1] "Public use" airports are distinct from private use airports in that the former are available to be used by any aircraft operating in the U.S. "Private use" airports are privately-owned and may be intended for use only by the airport's owners. These could include, for example, helipads on corporate land that are reserved for corporate aircraft. In addition, "public use" airports *generally* refer to those intended for civil, non-military use. However, some public use airports have military operators as tenants, and host military operations on the airfield. Blackstone AAF, Richmond International, Richmond Executive-Chesterfield County, and Washington Dulles International are examples.

the metropolitan Washington area served more than 20 million passengers in 2016. Reagan Washington National airport handled the highest total number of passenger enplanements. In December 2016, the airport had nonstop service from 10 carriers to 81 destinations. Washington Dulles International Airport was the pre-eminent international gateway to the entire mid-Atlantic region; in December 2016, it had service from 30 international airlines (along with United Airlines, which operated a hub at that airport) to 49 international destinations along with service from 10 U.S. carriers to 73 destinations. (Since then, Air India began operating flights from Dulles to Delhi, India in July 2017.) On the other hand, Shenandoah Valley Regional Airport in Weyer's Cave was served by a single airline with service to two locations. The nine commercial service airports are

- Charlottesville Albemarle Airport
- Lynchburg Regional Airport
- Newport News -Williamsburg International Airport
- Norfolk International Airport
- Richmond International Airport
- Roanoke-Blacksburg Regional Airport
- Ronald Reagan Washington National Airport
- Shenandoah Valley Regional Airport
- Washington Dulles International Airport

Figure I-1: Virginia's Commercial Service Airports

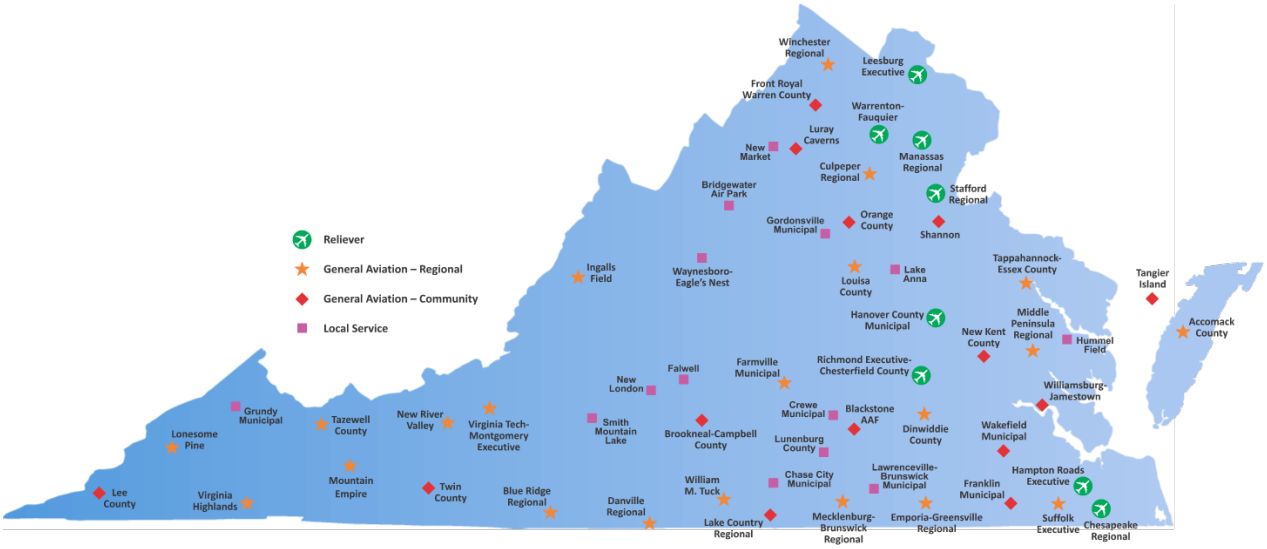
GA airports are classified depending on their size, operational limits, and how they might be used.[2]

- "Reliever" airports are specifically-designated GA airports that provide access to areas served by commercial service where GA activity might cause congestion in the surrounding airspace or on the airfield. Naturally, they tend to be located relatively near commercial service airports. Of Virginia's 59 public use GA airports, eight are classified as reliever airports. An example is Richmond Executive-Chesterfield County Airport.

[2] For additional information on the classification of the GA airports, see the Virginia Air Transportation System Plan Update 2016 (VATSP), available at http://www.doav.virginia.gov/VATSP_update_2016.htm.

- GA Regional Airports (21 airports) serve large geographic areas. These airports typically provide a full range of aviation facilities and services able to accommodate most business and recreational users, including jet fuel, instrument approaches, full service fixed based operations, corporate hangars and GA terminals. An example of a GA Regional airport is Culpeper Regional Airport.
- GA Community Airports (14 airports) serve their local communities or a smaller geographic area. They tend to have facilities and services that support a mix of business and recreational GA users with less demanding runway needs. An example of a GA Community airport is New Kent County Airport.
- Local Service Airports (14 airports) –serve smaller communities and have lower levels of demand than other airports. These airports typically serve smaller general aviation aircraft. These airports might have constraints limiting substantial expansion, including restrictions like airspace conflicts or topography. An example of a Local Service airport is Lawrenceville-Brunswick Municipal Airport.

Figure I-2: Location and Categories of Virginia's GA airports



Airport Ownership

Airports in Virginia are owned and operated by a wide variety of organizations. The Virginia Department of Aviation (DOAV) defines the entity that is legally, financially, and otherwise able to assume and carry out the certifications, representations, warranties, assurances, covenants, and other obligations required as an airport "sponsor."[3] An airport sponsor has many obligations for its airport, ranging from financial dealings and long-term development planning to daily maintenance and operational activities. A sponsor is solely responsible for insuring that the airport is compliant with federal and state grant assurances, Virginia Aviation Board policies, and relevant federal and state regulations.

[3] Virginia Department of Aviation, Airport Program Manual, Document 500 DOAVAS 20131121, p. 1-2, effective Nov. 2013. [hereafter, *Airport Program Manual*]

Virginia's airport sponsors vary considerably. Many are municipality-owned airport. These include GA facilities that may be owned and sponsored by individual counties, cities or towns, such as Danville Regional Airport (owned by the City of Danville) and Lee County Airport (owned by Lee County). Airport authorities or commissions are the other most common form of sponsorship. The two northern Virginia Airports are operated by a unique interstate compact, the Metropolitan Washington Airports Authority (MWAA), which was created in 1987 by federal legislation.[4] Prior to that, the airports were owned and operated by the FAA. Other public use GA airports may be privately owned/public use (e.g., Eagle's Nest Airport near Waynesboro or Bridgewater Air Park).

Virginia Public Use Airport Sponsors: Type of Ownership

Type	Number
Interstate Compact	2
Municipal Government (City or County)	27
Authority or Commission	27
Privately Owned	10

Airports Support Local and Regional Economic Activity

Airports make substantial contributions to local and regional economies. They facilitate the movement of people, goods, and services throughout the nation and the world, allowing the economy to operate more efficiently. As the head of the Federal Aviation Administration's Air Traffic Organization noted, "In today's ever-changing and innovative world, aviation provides a vital link to economic opportunities at home and abroad. In the wake of global economic and financial uncertainties, runways have become the new main streets for cities and towns to get down to business and soar once more."[5] Aviation is also critical for local and regional tourism. Air transportation is a major means of bringing in tourists and their related spending on food, hotel, entertainment, and other items. Airports are also centers of significant economic activity themselves, as the site of activity directly associated with passenger and cargo air travel.

Most people have had the experience of flying on commercial aircraft and have encountered employees at the airport who make that possible. But many other positions are also required for the industry to function. In general, these include:

- **Airline Services** includes employment of pilots and flight attendants who fly into Virginia's airports. Airlines also employ many other individuals, including check-in agents, gate agents, customer service, supervisors, dispatchers, and the airline's overhead staff. Depending on the airport, airlines might also have maintenance staff and mechanics on site.
    - **Ground Support** includes jobs in aircraft ground handling, bag room, fueling, and aircraft cabin cleaning and catering. Also in this category are cargo agents and supervisors. At many airports, cargo and freight activities represent a sizeable portion of the airport's total operations.
- **Airport Support** is employment of other non-airline workers within the terminal. These include governmental and private sector employment.
    - Federal Government employees commonly working at domestic and international airports include FAA air traffic controllers, aircraft and airport

[4] Metropolitan Washington Airports Act of 1986, Title VI of Public Law 99-500.

[5] U.S. Department of Transportation, Federal Aviation Administration, *The Economic Impact of Civil Aviation on the U.S. Economy*, August 2011, Washington, D.C.

inspectors, security officers of the U.S. Transportation Security Administration (TSA), U.S. Customs and Border Protection (CBP) officers, and Immigrations and Customs Enforcement (ICE) officers. Other federal officials at airports might include agricultural inspectors and health officers.

- Local and state government employees are critical to airport operations. As noted above, because public use airports typically are instruments of local government, many airport employees are members of the local city or county government. Airport management might include not only clerical, administrative, and management staff, but also information technology, maintenance and engineering, grounds keeping, waste management, and other miscellaneous jobs. In addition, local and state law enforcement officers regularly patrol airports.
- Airports also support many retail and restaurant operations, car rental, and other private firms that cater to air travelers. Some airports include privately-contracted janitorial, maintenance, and security employees.

- **GA operations,** especially at commercial service airports, are typically managed by private companies called "fixed base operators" (FBOs). An FBO is a commercial business authorized by the airport sponsor to operate on an airport and provide aeronautical services such as fueling, hangaring, tie-down and parking, aircraft rental, aircraft maintenance, flight instruction, etc. FBOs serve functions similar to terminals for commercial airline passengers. In addition to the functions directly related to servicing aircraft, they may include meeting spaces and food service. At smaller GA airports, these functions might be handled by the airport's management. Larger commercial service airports may have more than one FBO, and they compete for customers based on service offerings, amenities and prices.

- **Off-Site** accounts for all employees located off-airport working within the accommodation or ground transportation industries directly associated with airport and airline operations. These cover facilities that sometimes are located on airport properties (e.g., some rental car centers) but are often off-property. They also cover activities clearly and directly associated with airline operations (e.g., where flight crew arriving on late flights must spend the night before working another flight in the morning or commuting elsewhere in an airline's system).

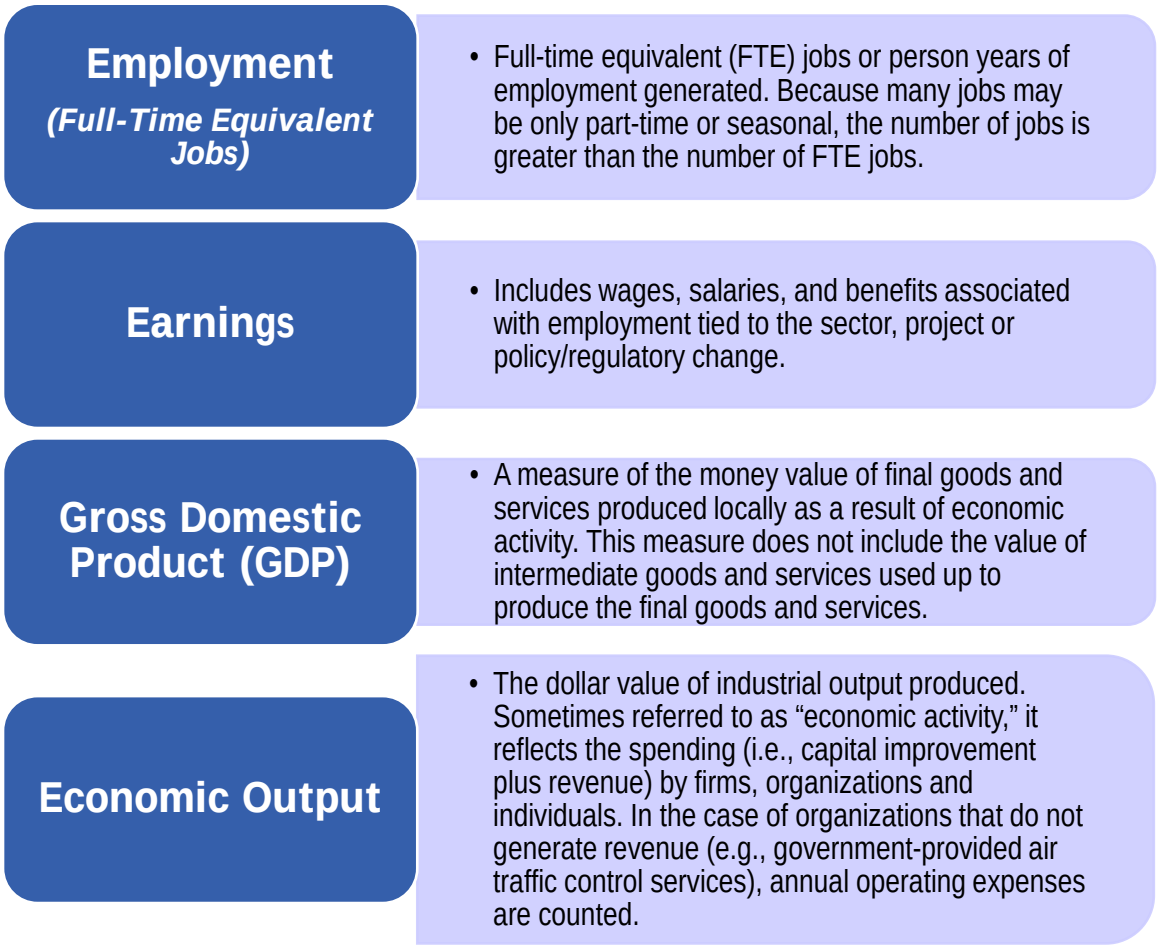
Visitors travel to Virginia by air for a number of reasons: to attend business meetings and conventions, to visit with family and friends, to enjoy a vacation, or many other reasons. They arrive in Virginia on scheduled commercial airline services, charter flights and general aviation aircraft.

In 2016, approximately 10 million visitors traveled to Virginia through one of the Commonwealth's 66 public use airports. The vast majority traveled to Virginia on commercial airlines at one of the state's nine commercial service airports. An estimated 920,000 additional visitors arrived on a general aviation aircraft at Virginia's public–use airports. While in the state, visitors typically spend money on lodging, food, retail purchases, entertainment and local ground transportation. The injection of visitor spending into the state economy supports jobs in these industry sectors, as well as other sectors through multiplier effects.

Overview of Economic Impact

Economic impact is a measure of the spending and employment associated with a sector of the economy, a specific project, or a change in government policy or regulation. Economic impact is most commonly measured in several ways, including employment, earnings or income, gross domestic product (GDP) and economic output. These measures are outlined in Figure I-3.

Figure I-3: Measures of Economic Impact



The three major components of economic impact are direct, indirect and induced impacts. These distinctions are used as a base for the estimation of total economic impact of an airport. Each of these three components requires different analytical tools. Employment impact analysis determines the economic impact in terms of jobs created and salaries and wages paid. In the case of the airport, the direct, indirect, induced and total numbers of full-time equivalent jobs at the airport are examined to produce a snapshot of airport operations.

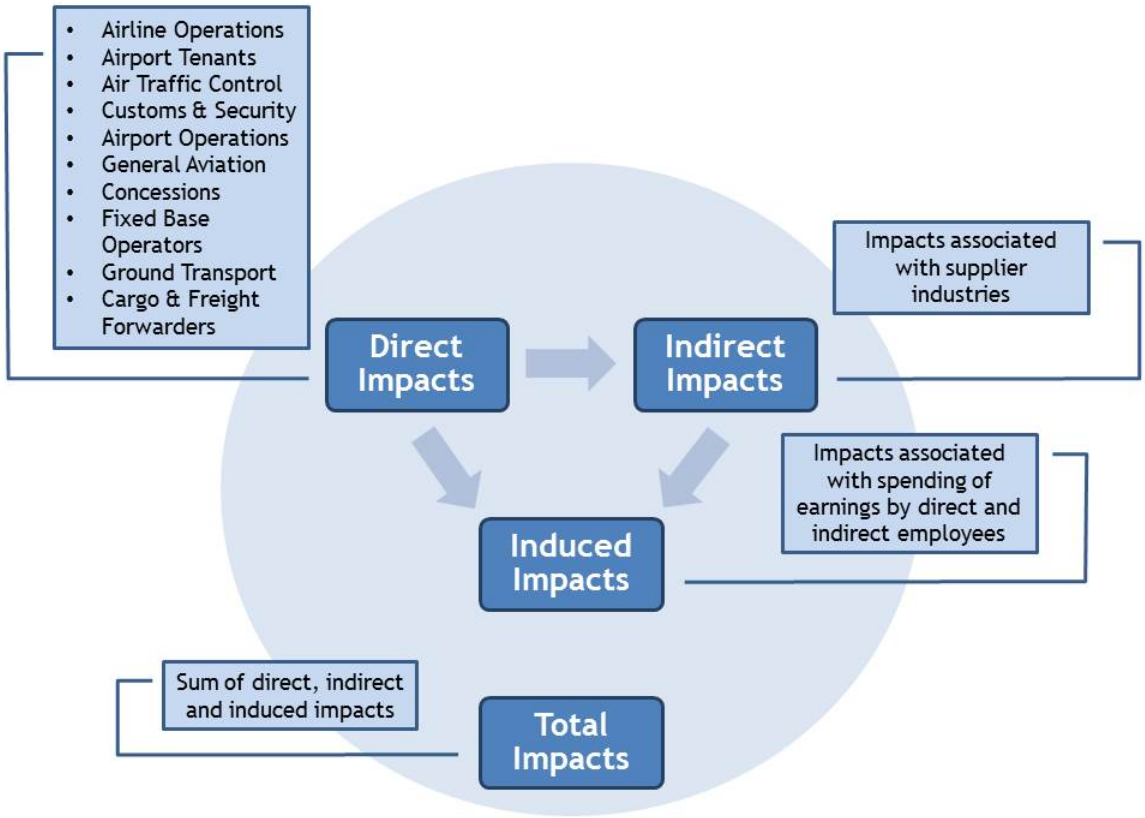
- *Direct aviation sector impacts* account for the economic activity of the target sector itself. Direct employment impacts are measured by counting those individuals who work in a particular sector of the economy. In the case of an airport, all of those people who work in an aviation-related capacity either on- or off-site represent direct employment (e.g. customer service, airline crew based near an airport like Washington Dulles International, ground handling, cleaning, maintenance and airport staff members, cargo and freight operations, etc.).

- *Indirect impacts* are those that result from the direct impacts. For an airport, indirect impacts include the economic activities of off-site firms that serve airport users. Indirect employment includes the portion of employment in supplier industries dependent on sales to the air transport sector. An example would be food wholesalers who supply food for catering on flights.
- *Induced impacts* are economic impacts created by the spending of wages, salaries and profits earned in the course of the direct and indirect economic activities. Induced employment is employment generated from expenditures by individuals employed indirectly or directly. If an airline maintenance firm employee decides to remodel his/her home, this would result in additional (induced) employment hours in the general economy. The home renovation project would support hours of induced employment in the construction industry, the construction materials industry, etc. Induced impact is often called the household-spending effect.
- *Total impacts* are the sum of direct, indirect and induced effects. Direct economic impact measures the employment and economic impact directly associated with the airport. This includes employment from organizations such as airlines, ground handling, airport operations, airport concessionaires, and air traffic control firms.

In addition, the economic impacts of major airport capital development programs are counted separately, to the extent that the capital improvements are not included in scheduled maintenance of airport infrastructure.

Finally, *Visitor spending impacts* from non-local visitors to a region who arrive and depart via the airport is considered a relevant economic impact. This includes visitor spending on lodging, meals, entertainment, transportation and retail. The direct employment associated with these categories of spending are counted as part of the economic impact of the airport.

Figure I-4: Elements of Economic Impact



Overview of the Project's Approach & Methodology

The data on airport operations, passenger traffic, and economic impacts are for calendar year 2016.

In general, the economic impacts of airport operations are estimated based on information on the total amount of employment supported by airport and airline activities. The project team worked closely with each airport's management to identify all the public organizations (e.g., the FAA) and private firms (e.g., airlines or FBOs) that have employees working at each airport. The project team surveyed all of those organizations and firms to gather data on total employment and compensation paid to their on-airport workforce. The team followed up with nonresponding organizations and firms to request their cooperation with the study. The team then supplemented the survey data with information from multiple other sources to generate estimated employment totals for firms and organizations that did not respond to the surveys.

The most commonly-accepted mechanism for estimating indirect economic impacts is via economic multipliers based on national economic data and analyses. The national data are essentially "input-output" tables that quantify the linkages between industries and economic sectors – between the sales of one and the purchases of another. The data are available on national, state, regional, and county levels. Input-output models thus create "multipliers" used to calculate the indirect effect on jobs, income and output generated per dollar of spending on various types of goods and services. The project team applied the IMPLAN model to generate the estimates of the indirect aviation-related economic

activity associated with the public use airports.[6] The ratios and multipliers used in this study were based on the 2015 Input-Output multipliers maintained by IMPLAN for each of the regions.

The project team estimated the induced impacts principally with the application of a model that quantifies the relationships between businesses. The project team applied the IMPLAN model to generate estimates of the induced effects associated with the airports' operations. IMPLAN's input-output tables not only allow users to understand the "backward" relationships between end users and suppliers (e.g., travelers' purchasing meals at airports cause the restaurants to purchase inputs - groceries, utilities, etc.), but also "forwards" (e.g., wages paid to restaurant employees yields further spending, such as on autos, home repair, groceries, etc.).

The team used a variety of approaches to develop estimates of the amount and distribution of spending by travelers who visited Virginia via airports. The methods applied at commercial service airports differed somewhat from those used at GA airports. In addition, the team applied different estimation techniques to different commercial service airports, based on the particular circumstances of each. In general, the economic impact of visitor spending is estimated by generating data on average spending by visitors at each airport. The total impact by visitor spending depends on the amount the visitors spend, the length of stay, and the different categories of spending – mostly in the hospitality sector: hotels, restaurants, retail, local transportation and entertainment industries. Econometric models applied to data on visitor spending convert those data into estimated person years of employment.

The project team developed and conducted in-terminal passenger intercept surveys at the Commonwealth's commercial service airports to produce statistically-reliable estimates of the spending and length of stay by non-resident visitors. The surveys captured differences in spending patterns by different passenger types: domestic and international travelers, as well as leisure and business travelers. The team estimated the total volume of domestic and international visitors by analyzing data on passenger traffic at each airport, coupled with other information on the directionality of travel (i.e., whether the travel originated in Virginia – indicating the travelers lived in Virginia or nearby – as opposed to at the destination end of the travel – say, Spokane or Tokyo).

The project team applied different analytic techniques to estimate the volume of travelers who visited Virginia using GA – either by flying to and from the commercial service airports or the GA airports. Because data on this segment of the industry is not reported to or included in any federal data systems, the team surveyed FBOs, airport management, and individual travelers to develop estimates of their experiences.

The project team examined changes in estimated employment and economic impact in the context of changes in airport activity since 2010. The team compared estimated changes in on-airport employment against changes in passenger traffic and aircraft operations. (An "operation" refers to either a takeoff or landing.) The team also closely examined all available data on estimated spending by

[6] IMPLAN is an economic impact assessment software system. The system traces its roots to the U.S. Forest Service, which needed an analytic tool to better understand the resource outputs of alternative land management strategies. Responsibility for IMPLAN (short for "impact analysis for planning") eventually shifted to the University of Minnesota before it was established as an independent corporation (then known as the Minnesota IMPLAN Group, or MIG) for the purpose of developing and selling all future iterations of the IMPLAN database and software. The name changed to IMPLAN in 2013.

domestic and international visitors to Virginia who arrive via the airports. Those estimates were benchmarked against reports for other major U.S. and global destinations to verify their reasonableness.

A more detailed discussion of the project's scope and methodology can be found in Appendix I. A definition of terms/glossary is included as Appendix II.

Organization of the Report

The report is organized as follows.

- Chapter II provides a discussion of the principal factors affecting economic activity at the commercial service and GA airports, and how they have changed since 2010. This includes changes in commercial passenger traffic, commercial airline activity (e.g., departures and the capacity offered for sale at each airport), and socio-economic variables such as population and employment.
- Chapter III describes the economic impact of the commercial service airports in Virginia. This includes discussions of the economic impact of airport operations (e.g., regular passenger operations at the airport), major capital development initiatives, and the impact of visitor spending.
- Chapter IV describes the economic impact of the GA airports in Virginia. As with the chapter on commercial service airports, this includes discussions of the economic impact of airport operations and the impact of visitor spending.
- Chapter V summarizes the analysis of the impact of Virginia's airports on state and local tax revenues. The chapter describes the contributions that commercial and GA aviation make to employment and property taxes. Further, the chapter provides an overview of how passenger and aircraft activity help fund the airports' operations. Virginia's commercial airline passengers also make substantial financial contributions to fund the FAA's air traffic control system and international aviation infrastructure via various taxes and fees paid on airfare and on international departures and arrivals.
- Chapter VI provides an overview of the catalytic economic impacts generated by the Commonwealth's airports, especially the two large hub airports that serve the greater Washington, DC metropolitan area. Air service connectivity – especially to major U.S. and international locations – facilitate business development near airports.
- Chapter VII summarizes the contributions to state and local governments that airports, their operations, and passengers make in terms of taxes and fees.
- Chapter VIII summarizes the differences in economic activity since the previous study was issued in 2011, covering aviation in 2010.

The report includes detailed appendices describing the approach and methodology in detail and showing airport-specific summaries of the economic impact of each facility.

Chapter II: Passenger and Aircraft Activity at Virginia's Public Use Airports

The major factors that drive employment activity at Virginia's airports are passenger traffic and aircraft operations. This does not relate exclusively to passenger and aircraft activity at commercial service airports. General aviation activity occurs at both GA and commercial service airports. However, commercial airlines and their regional partners carried 96 percent of all travelers in Virginia in 2016.

This chapter reviews the changes in these metrics since 2010, the year covered by the last economic impact study. The total amount of passenger traffic and aircraft activity provides important context for understanding the employment at each and all of the Commonwealth's public use airports.

Changes in Passenger Traffic at the Commercial Service Airports

Passenger traffic at Virginia's commercial service airports increased slightly between 2010 and 2016. As shown in Table II-1, the total number of passenger enplanements grew by 1.7 million (an overall increase of seven percent, or an average of 1.1 percent per year). Enplanements increased between 2010 and 2016 at only three airports – Charlottesville Albemarle (+51 percent), Richmond International (+9 percent), and Ronald Reagan Washington National (+30 percent) airports. The greatest absolute growth in passenger traffic was at Ronald Reagan Washington National Airport, where over 2.7 million more passengers enplaned aircraft in 2016 than in 2010.

Conversely, passenger traffic declined significantly at Newport News-Williamsburg International Airport, falling by nearly two-thirds. Passenger enplanements also dropped at Shenandoah Valley Regional (-44 percent), Lynchburg Regional (-19 percent), Washington Dulles International (-7 percent), Norfolk International (-4 percent), and Roanoke-Blacksburg Regional (-2 percent).

Table II-1: Changes in Total Passenger Enplanements at Virginia's Commercial Service Airports

Airport	2010	2016	Change	% Chg.
Charlottesville Albemarle	195,048	294,518	99,470	51%
Lynchburg Regional	93,469	75,407	(18,062)	-19%
Newport News-Williamsburg International	534,767	199,113	(335,654)	-63%
Norfolk International	1,672,594	1,599,917	(72,677)	-4%
Richmond International	1,640,921	1,792,402	151,481	9%
Roanoke-Blacksburg Regional	308,148	302,309	(5,839)	-2%
Ronald Reagan Washington National	9,035,544	11,767,262	2,731,718	30%
Shenandoah Valley Regional	12,283	6,864	(5,419)	-44%
Washington Dulles International	11,742,060	10,862,655	(879,405)	-7%
Total	**25,234,834**	**26,900,447**	**1,665,613**	**7%**

Source: DOT T-100 data via the Diio online portal, Norfolk International Airport, Metropolitan Washington Airports Authority.

The only airport in the Commonwealth with significant international traffic is Washington Dulles Internat

ional. In December 2016, 30 international airlines (including United Airlines, which operates a hub at the airport) were making 410 departures weekly from Washington Dulles to 49 foreign destinations. In 2016, Reagan Washington National had year-round nonstop flights to two points in Canada (Toronto

and Montreal), along with seasonal flights to Bermuda and Nassau (Bahamas). Richmond International formerly had nonstop service to Toronto, Canada, but those flights ended in 2013.

Changes in Airline Activity at the Commercial Service Airports

Overall, commercial airlines reduced their total operations and available seating capacity at Virginia's commercial service airports after 2010. As shown in Table II-2, airlines scheduled 37,000 fewer domestic departures in 2016 than in 2010 (about 100 total flights per day). However, the total relative reduction in seat capacity was smaller than the change in departures. Total available domestic seat capacity declined by only about three percent compared to a reduction of 10 percent of flights. This means that on average, airlines operated fewer flights but used larger aircraft.

With international operations, on the other hand, airlines added flights and available capacity, except at Richmond International where Air Canada ceased flights in 2013. The number of flights and available capacity grew at both of the Northern Virginia airports.

Table II-2: Changes in Departures and Available Seat Capacity, 2016 vs. 2010

Domestic Flights	2010		2016		Change		% Change	
Airport	Departures	Seats	Departures	Seats	Departures	Seats	Departures	Seats
Charlottesville Albemarle	6,879	290,226	7,103	365,570	224	75,344	3%	26%
Lynchburg Regional	2,579	126,766	2,068	103,037	(511)	(23,729)	-20%	-19%
Newport News-Williamsburg International	9,716	763,506	4,313	260,264	(5,403)	(503,242)	-56%	-66%
Norfolk International	29,604	2,377,523	24,396	2,061,863	(5,208)	(315,660)	-18%	-13%
Richmond International	28,559	2,178,994	26,019	2,211,964	(2,540)	32,970	-9%	2%
Roanoke-Blacksburg Regional	9,190	458,227	7,107	393,050	(2,083)	(65,177)	-23%	-14%
Ronald Reagan Washington National	133,692	12,631,857	144,329	14,651,664	10,637	2,019,807	8%	16%
Shenandoah Valley Regional	1,304	39,120	953	32,022	(351)	(7,098)	-27%	-18%
Washington Dulles International	122,414	10,769,546	90,605	8,641,266	(31,809)	(2,128,280)	-26%	-20%
Subtotal - Domestic Operations	**343,937**	**29,635,765**	**306,893**	**28,720,700**	**(37,044)**	**(915,065)**	**-11%**	**-3%**

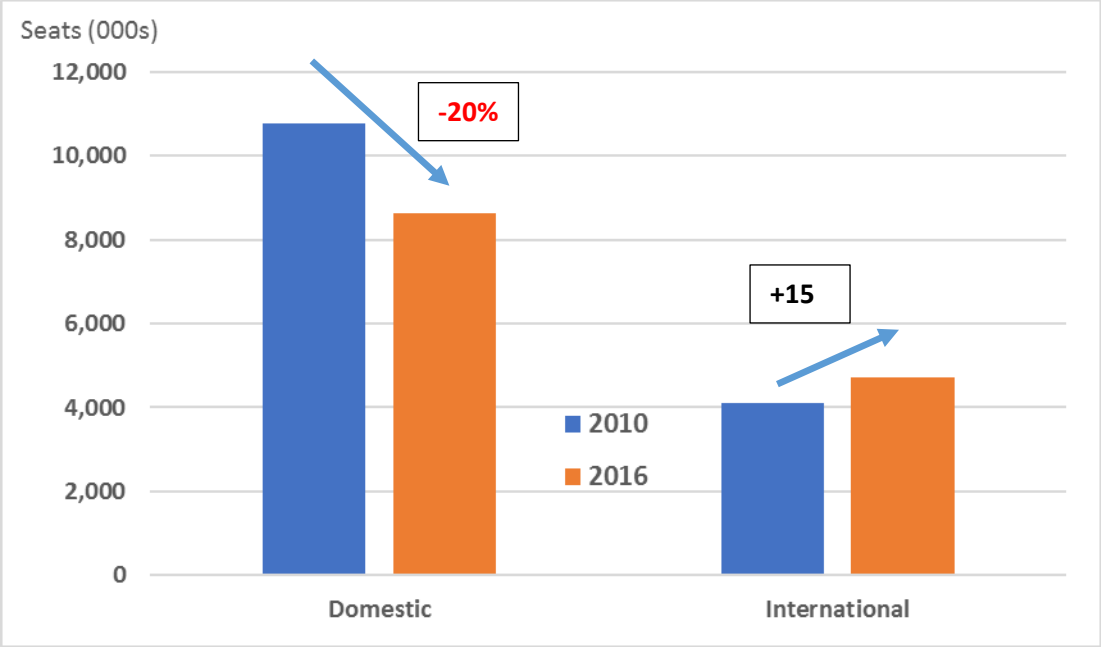
International Flights	2010		2016		Change		% Change	
Airport	Departures	Seats	Departures	Seats	Departures	Seats	Departures	Seats
Richmond International	569	15,410			(569)	(15,410)	-100%	-100%
Ronald Reagan Washington National	3,491	232,514	3,835	240,811	344	8,297	10%	4%
Washington Dulles International	21,732	4,087,645	22,814	4,720,879	1,082	633,234	5%	15%
Subtotal - International Operations	**25,792**	**4,335,569**	**26,649**	**4,961,690**	**857**	**626,121**	**3%**	**14%**

All Flights	2010		2016		Change		% Change	
Airport	Departures	Seats	Departures	Seats	Departures	Seats	Departures	Seats
Charlottesville Albemarle	6,879	290,226	7,103	365,570	224	75,344	3%	26%
Lynchburg Regional	2,579	126,766	2,068	103,037	(511)	(23,729)	-20%	-19%
Newport News-Williamsburg International	9,716	763,506	4,313	260,264	(5,403)	(503,242)	-56%	-66%
Norfolk International	29,604	2,377,523	24,396	2,061,863	(5,208)	(315,660)	-18%	-13%
Richmond International	29,128	2,194,404	26,019	2,211,964	(3,109)	17,560	-11%	1%
Roanoke-Blacksburg Regional	9,190	458,227	7,107	393,050	(2,083)	(65,177)	-23%	-14%
Ronald Reagan Washington National	137,183	12,864,371	148,164	14,892,475	10,981	2,028,104	8%	16%
Shenandoah Valley Regional	1,304	39,120	953	32,022	(351)	(7,098)	-27%	-18%
Washington Dulles International	144,146	14,857,191	113,419	13,362,145	(30,727)	(1,495,046)	-21%	-10%
Total	**369,729**	**33,971,334**	**333,542**	**33,682,390**	**(36,187)**	**(288,944)**	**-10%**	**-1%**

Source: Inter*VISTAS* analysis of industry T-100 data available via the Diio online portal.

Washington Dulles's international passenger enplanements and airline activity have increased in absolute and percentage terms since 2010. In addition, because domestic capacity decreased by so much, the relative share of the international operations grew. In 2010, international capacity represented 15 percent of the airport's total available capacity. By 2016, international capacity was 20 percent. Figure II-1 illustrates the change in domestic and international capacity at the airport.

Figure II-1: Increasing International Flights Have Offset Some Decreases in Domestic Capacity at Washington Dulles International



Ronald Reagan Washington National Airport (DCA), an operational hub for American Airlines (American), experienced the greatest growth in passenger traffic over the period. Total passenger enplanements at the airport increased by 2.7 million (30 percent). The increase was the result of several major changes in the industry, notably the merger of American and U.S. Airways, which had operated a hub at the airport. In 2010, U.S. Airways was the largest carrier at DCA in terms of passenger enplanements, carrying 41 percent of passenger traffic. Delta Air Lines (Delta) was the second largest, with a 19 percent share. In 2016, American carried 49 percent of the passengers at DCA, followed by Southwest Airlines (Southwest) with 15 percent. The amount of passenger traffic carried by low cost carriers jumped from about 725,000 passengers in 2010 (about 8 percent of the total) to nearly 2.9 million in 2016 (over 25 percent of the total).

The changes in airline activity and passenger traffic at each of Virginia's commercial service airports between 2010 and 2016 are briefly summarized below.

- Charlottesville Albemarle Airport (CHO). Passenger traffic increased significantly at Charlottesville Albemarle Airport between 2010 and 2016. Some of that increase is due to airlines operating larger aircraft at the airport. Total outbound seat capacity increased by 25 percent over the period, although the total number of departures increased by less than 3 percent. American was the dominant carrier at CHO in 2016, carrying 63 percent of enplanements, followed by Delta (26 percent) and United (11 percent).
- Lynchburg Regional Airport (LYH). Total passenger traffic declined by 19 percent during the period, mostly due to the decision by Delta to withdraw nonstop service to Atlanta from the market at the end of 2010. From 2011 to 2016, passenger traffic increased slightly, rising by 2 percent. Following Delta's withdrawal, LYH has maintained service from American.
- Newport News/Williamsburg International Airport (PHF). Between 2010 and 2016, PHF experienced losses of scheduled commercial service. Most importantly, the airport lost service

from AirTran Airways following its merger in 2012 with Southwest (see discussion below). Frontier Airways also dropped service at the airport in 2015. In 2010, PHF offered an average of about 26 departures per day to seven destinations.[7] In 2016, the airport hosted about 12 average daily departures to three destinations. The loss of service from AirTran and Frontier meant passengers lost nonstop service to four destinations and a competitor to Delta on service to Atlanta. American was the dominant airline at PHF in 2016, carrying 61 percent of passenger enplanements on flights to Philadelphia and Charlotte. Delta provides nonstop service to Atlanta.

- Norfolk International Airport (ORF). Total passenger enplanements at ORF declined by 4 percent during the period (less than 75,000 total enplanements). The airport had service from six different network airlines in 2010, but only four in 2016 due to industry consolidation. According to data from the U.S. Department of Transportation (DOT), traffic grew from 2015 to 2016 by 5 percent, largely due to notable increases in enplanements to Baltimore-Washington International Airport, John F. Kennedy International Airport, and Chicago O'Hare International Airport.
- Richmond International Airport (RIC). Passenger traffic increased at RIC by 9 percent during the period. Delta remained the largest airline by passenger share, with over 35 percent of traffic in 2016. In 2010, U.S. Airways had been the second largest carrier at the airport; in 2016, American was the second largest, with over 30 percent. Southwest carried fewer passengers in 2016 than its predecessor AirTran had carried in 2010. RIC lost service from Continental Airlines, Northwest Airlines, and U.S. Airways because of industry consolidation. It also lost its nonstop service to Toronto, Canada from Air Canada. It gained service from Allegiant.
- Roanoke-Blacksburg Regional Airport (ROA). Total passenger enplanements at ROA declined by 2 percent during the period. In 2010, U.S. Airways was the largest carrier at the airport, with over 40 percent of the market. Delta was the second largest. In 2016, the largest carrier was American, with 40 percent, followed by Delta. ROA lost nonstop service to Detroit after the merger of Delta and Northwest.
- Shenandoah Valley Regional Airport (SHD). SHD is the only commercial service airport in Virginia with service subsidized through the U.S. Essential Air Service (EAS) program. In 2010, SHD was served by Colgan Air, which provided 18 nonstop round trips a week using 34-seat Saab 340 aircraft to Washington Dulles International Airport, operating under a code-share agreement with United. Colgan's service lasted into 2012. DOT then selected Silver Airways to provide subsidized service to the airport also using 34-seat Saab 340 aircraft in June 2012. Silver Airways also had a code-sharing relationship with United. However, the community raised concerns about Silver's reliability and record of cancellations and delays. In 2016, DOT selected Via Airlines to provide EAS service at SHD beginning in November using 50-seat ERJ-145 jets and operating to Charlotte Douglas International Airport, a hub for American. The airline was to operate twice-daily flights. By using a larger aircraft but operating one less frequency, that arrangement maintained the overall amount of available seating capacity from the airport.

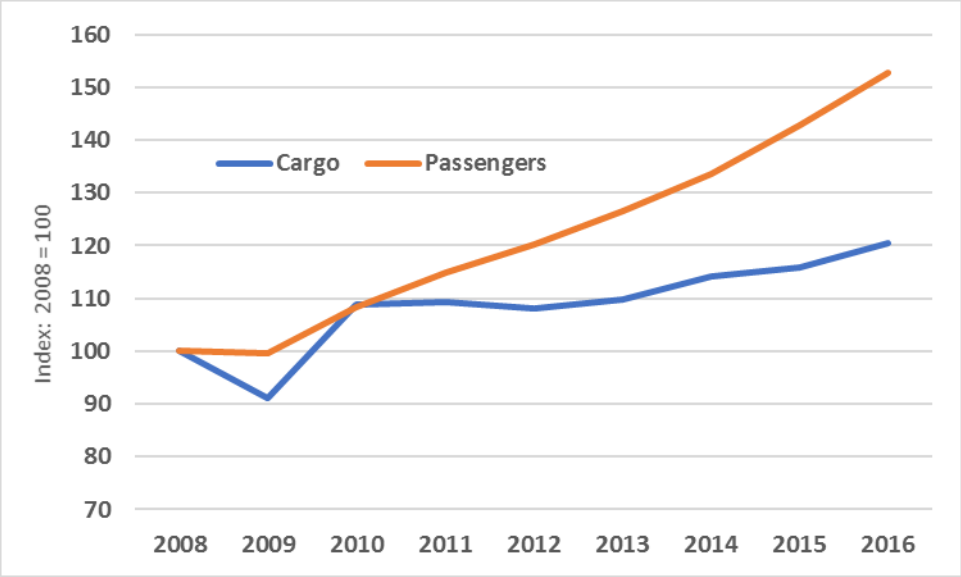
[7] Average daily flights are often described as "about" a particular whole number. The reason for the apparent ambiguity is that airlines do not schedule the same number of flights each day of the week. Although an airline might schedule six daily flights each day Monday-Friday, it could reduce scheduled flying to five departures on Saturday and Sunday. This creates an "average" daily number of departures of 5.7, which could be described as "about six."

Changes in Air Freight and Cargo

Air cargo is a significant contributor to a region's economic structure and a facilitator of economic activity. An airport's cargo and freight functions serve both the domestic and international markets by supporting imports to and exports from the region. Those functions enable local or regional economic activity that might not occur in those areas were it not for the airports' capabilities. Air cargo functions help attach or connect an area to both the broader domestic and global economies.

Data from the International Air Transport Association (IATA) show that, in contrast to passenger volumes, global air cargo has struggled to recover since the global financial crisis of 2007-2008. Figure II-2 shows the changes in the total tonnage of cargo shipped by air worldwide compared to the total volume of passengers on scheduled air service (indexed to 100 as of 2008). Global passenger traffic was essentially unchanged in 2009 compared to 2008, but then began recovering. On average, passenger traffic world-wide increased by almost six percent annually since 2008. By contrast, global air cargo volumes fell 10 percent in 2009 from 2008 and has recovered far more slowly. Global cargo volumes have increased at a rate less than half that of passenger traffic.

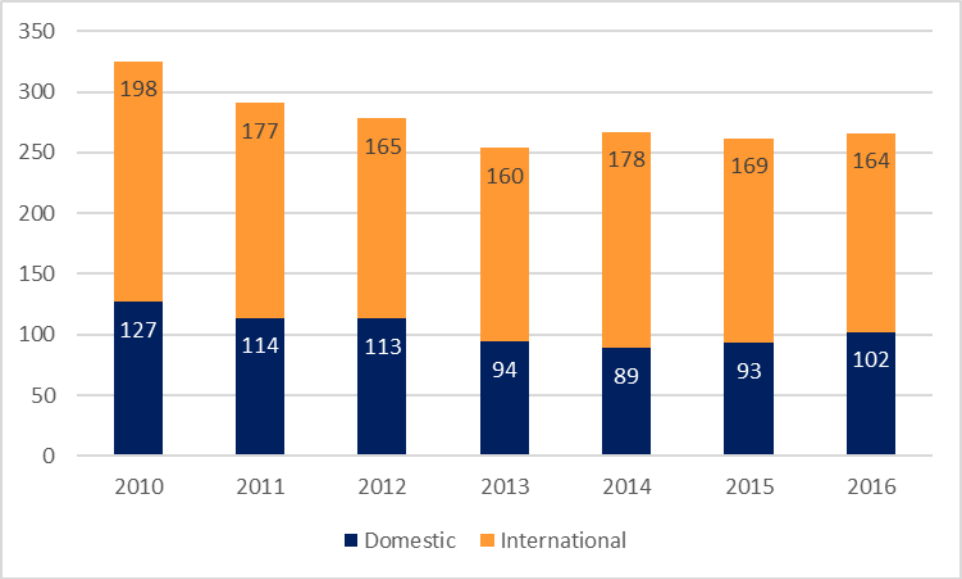
Figure II-2: Changes in Global Air Cargo Tonnage vs. Global Passenger Traffic, 2008-2016
(index of changes in cargo tonnage and passengers, 2008 = 100)



Source: Inter*VISTAS* analysis of data from the International Air Transport Association.

Cargo volumes shipped at Washington Dulles International have largely mirrored those global trends. Figure II-3 summarizes the changes in cargo tonnage shipped at Washington Dulles over time. Total tonnage shipped has generally declined since 2010 but has recovered slightly since then. In 2016, air cargo volumes at Washington Dulles beat expectations by increasing over 2015. Slight declines in international cargo were offset by growth in domestic cargo. Cargo is extremely price-sensitive, so shippers are inclined to move their business to gateways that provide the greatest financial benefit.

Figure II-3: Changes in Air Cargo Tonnage Shipped at Washington Dulles International



Broad Changes in Commercial Aviation Affected Virginia's Airports

Since the last economic impact study for the Commonwealth, several major changes have occurred in the commercial airline industry affecting Virginia's passenger traffic and airports. The most notable changes involved the mergers of major airlines. The newly-combined airlines then revised their network strategies, which resulted in changes in operations at several of Virginia's airports. In addition, the two Washington-area airports were affected by both mergers and changes in laws, which exerted significant impacts on both airports.

Airline Mergers

Since 2010, three major airline mergers that affected operations at Virginia's airports.

- United's merger with Continental, announced and closed in 2011, created what was then the world's largest airline. The impact was most evident at its hub at Washington Dulles International (IAD). Combined with its efforts to address financial challenges (see below), United decreased the total capacity it offered at IAD between 2010 and 2015. United reduced the total available capacity offered from IAD to domestic destinations by 1.3 million seats (more than 17 percent) – more than at any of the airline's other hubs. Only in 2016 did United begin to add domestic capacity back into the airport. United also decreased the capacity available on international operations at the airport, but not as drastically as it did with domestic operations. United's total available international capacity dropped by about 250,000 seats (nearly 12 percent) between 2010 and 2015. That decline continued in 2016, with the airline reducing available capacity by another 1.5 percent.

- Less than two years after declaring Chapter 11 bankruptcy in November 2011, American Airlines announced an agreement to merge with US Airways. After threatening to block the merger, the U.S. Department of Justice announced a settlement in late 2013 that allowed the transaction to

move ahead. The settlement agreement required American to give up 51 pairs of slots and US Airways to give up one slot pair at Reagan National. (An airline operation requires two individual slots: one for the arrival and one for the departure.) As part of the settlement, in 2014, eight slot pairs were permanently transferred to jetBlue (slots that had been leased from American). The remaining 44 slot pairs were awarded to Southwest, jetBlue, and Virgin America.

The immediate effect of this on Ronald Reagan Washington National Airport (DCA) was to significantly increase the total number of passengers who used the airport. Between 2013 and 2015, total passenger enplanements at DCA grew by more than 1.4 million. In general, American and US Airways surrendered slots they used to serve smaller communities or their hubs, generally served by smaller turboprop aircraft and regional jets. The combined carrier then used larger aircraft to "up-gauge" the service to small communities and their hubs. The net result was that American was able to provide the same capacity to those destinations but with fewer flights. At the same time, jetBlue, Southwest, and Virgin America all began service to new destinations with large aircraft (i.e. narrowbody aircraft like the 737 and A320-family) than the regional aircraft those slots were previously used for prior to the AA-US merger.

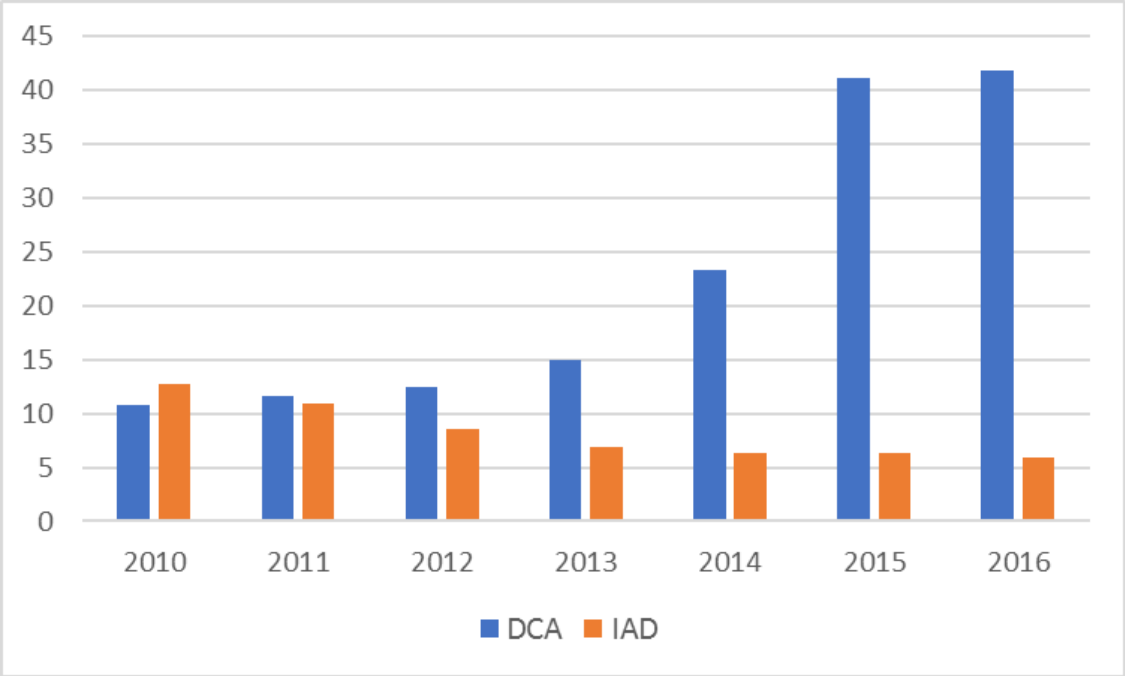
- Southwest-AirTran. The Justice Department approved the merger of two of the nation's largest low-cost carriers in 2011, allowing Southwest Airlines and AirTran to merge. For Southwest, the merger gave it access to Atlanta, new international operations, and access to new small markets. Over time, however, the new Southwest pruned many of the small markets that AirTran had served.

  In Virginia, one airport that became a victim of the merger was Newport News-Williamsburg International Airport. In 2010, AirTran served four destinations from the airport, making an average of eight nonstop flights each day, and enplaned more than 250,000 passengers. By March 2012, all of the AirTran operations had ceased. AirTran also flew from both Ronald Reagan Washington National and Washington Dulles International airport. At Dulles, in 2010, AirTran averaged four flights each day. By 2012, those operations had disappeared. At Reagan National, AirTran's operations ceased in 2014.

  Southwest continued to operate at Norfolk International and added service to Richmond International at the end of 2013. However, Southwest reduced the total number of departures it made at Norfolk in 2014, dropping from 13 departures per day in 2012 to six per day in 2014. (It has added flights since then and now makes about 11 flights per day in the combined Norfolk-Richmond region.)

  In northern Virginia, Southwest expanded greatly when it was able to consolidate operations at Ronald Reagan Washington National airport. Because Southwest had gained access to slots at DCA as part of the judicial and regulatory requirements attached to the American-US Airways merger, it greatly increased operations at that airport. When it increased flights at DCA, it eliminated flights from Washington Dulles International. It dropped its average flights at IAD from 12 (nine from Southwest and three by AirTran) to six per day between 2010 and 2014.

Figure II-4: Changes in Average Daily Departures by Southwest/AirTran at Northern Virginia Airports



Source: T-100 data from Diio-Mi online portal

Table II-3 summarizes the changes in service at Virginia's airports. Most lost service from at least one airline to various connecting point (former legacy network hub airports, such as Cincinnati or Memphis). Additionally, most saw a reduction in the number of carriers serving the airport.

Table II-3: Comparison of Number of Markets Served and Number of Carriers 2010 vs 2016

	Nonstop Markets Served			Number of Carriers		
Airport	2010	2016	Change	2010	2016	Change
Charlottesville Albemarle	5	6	1	3	3	0
Lynchburg Regional	2	1	(1)	2	1	(1)
Newport News - Williamsburg International	7	3	(4)	4	2	(2)
Norfolk International	23	17	(6)	6	4	(2)
Richmond International	19	17	(2)	8	6	(2)
Roanoke - Blacksburg Regional	7	6	(1)	4	4	0
Ronald Reagan Washington National	75	82	7	11	10	(1)
Shenandoah Valley Regional	2	1	(1)	1	1	0
Washington Dulles International	115	118	3	30	37	7

Source: OAG schedule data for the months of August 2010 and 2016, via Diio online portal
Note: "Service" defined as having at least three nonstop flights from the origin airport to the destination market each week.

Changes to the Perimeter Rule

Federal law generally prohibits nonstop flights from Ronald Reagan Washington National Airport to destinations more than 1,250 nautical miles from the airport. Exceptions to that restriction are granted only by specific exemptions written into law. The Federal Aviation Administration Modernization and Reform Act of 2012 created eight new slots to permit four daily round-trips to cities beyond 1,250 miles from DCA. In addition, the new law permitted four carriers already serving Reagan National to make use of eight existing slots to operate up to four round-trip flights beyond the perimeter.

After American and Delta were given exemptions, they added long-haul service (to Los Angeles and Salt Lake City respectively) and then dropped similar service from Washington Dulles International Airport.

Changes in Regional Air Service

With the continued retirement of smaller 37-50 seat regional jets (e.g., the Embraer ERJ-family and the Bombardier CRJ200), the proportion of departures operated by regional jet equipment remains a critical component in assessing changes in Virginia's transportation system. Virginia's airports rely heavily on regional jets to operate its departures. In June 2010, regional jets (including larger 70-80 seat models) made almost 70 percent of the departures from Virginia's airports, with almost half (45 percent) of total seat capacity. Those same proportions held in June 2016.

However, smaller aircraft (50 seats or fewer, including both small regional jets and turboprop aircraft) made half of all departures in June 2010, but less than one-third of all departures in June 2016. The financially-viable operations of those aircraft are vulnerable to fluctuations in fuel prices. Should fuel prices return to the higher levels seen earlier this decade, these services will be vulnerable to cuts.

Changes in General Aviation

Another significant component of the Commonwealth's overall air transportation system, GA contributes to commercial, industrial, recreational and economic activities throughout Virginia. The GA community represents all aviation activity not associated with military, government, cargo and scheduled passenger carriers. It incorporates both business and personal/recreational uses of aircraft. GA provides access to remote community areas, flight training schools, charter and emergency services, and other specialized services. According to data from the FAA's most recent (2015) survey of GA, about half of all GA hours flown is for personal and business purposes. Others include instruction (flight training), aerial application of agricultural products, aerial observation, medical transport, air tours, and air taxi operations.[8]

Nationally, GA activity has been declining. Data from the FAA show broad-based decreases in the number of GA pilots, the number of registered aircraft, and total annual and average flight hours. Overall:

- The number of "certificated active airmen"[9] declined from 2010 through 2016 by more than 43,000 (7 percent). Of those, the number of individuals holding a private pilot's license dropped by 39,707 (20 percent).
- The number of aircraft has declined overall. From 2010 to 2015, the number of active GA aircraft declined by more than 13,000 aircraft, a loss of six percent. (See Table II-4)
    - The number of active fixed-wing piston GA aircraft dropped by more than 14,000 (9 percent).

[8] Under federal regulations, certificated operators may provide on-demand air taxi (charter) services. FAA regulations cover specific requirements and limits relating to the size (passenger or cargo capacity) of the aircraft, its powerplant (piston or turboprop), qualifications of the flight crew, insurance, and management. Scheduled commercial operations and those using turboprop or jet engines are not included in the GA statistics.

[9] The FAA defines an "active airman" as one who holds both an airman certificate and a valid medical certificate. The term includes men and women certified as pilots, mechanics or other aviation technicians.

- Offsetting that decline, the number of active fixed-wing turboprop aircraft increased by almost 350 (4 percent) and the number of active fixed-wing turbojet aircraft increased by over 1,950 (17 percent).
- The number of active rotorcraft also increased. Turbine powered rotorcraft increased by over 700 (11 percent).

- GA hours flown in the U.S. have been declining since at least 1980. This is especially noticeable with piston aircraft traffic. Between 2010 and 2015, the total number of GA hours flown dropped by three percent. However, some GA sectors are growing. Hours flown by turboprop and turbojet aircraft, more often used for business rather than recreational purposes, increased over the period.

Table II-4: Changes in U.S. Active GA Aircraft

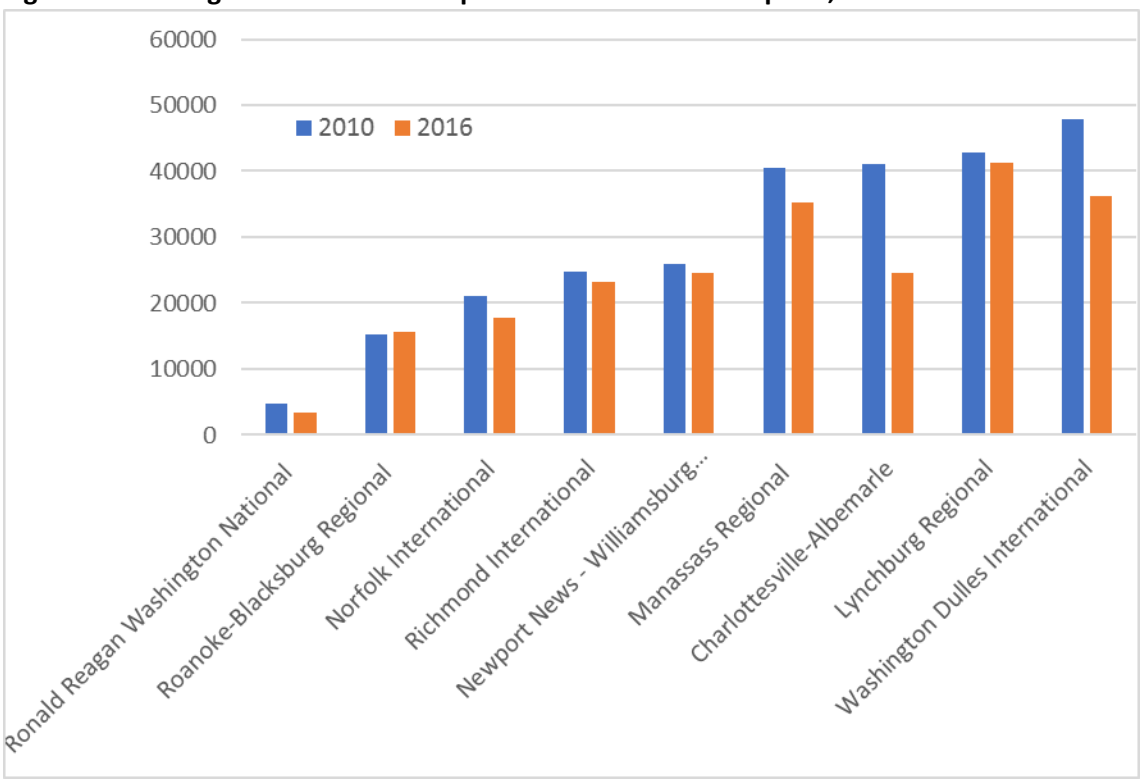
Aircraft Type	2010	2015	Change	% change
Piston - Total	155,419	141,141	(14,278)	-9.2%
Turboprop - Total	9,369	9,712	343	3.7%
Turbojet - Total	11,484	13,440	1,956	17.0%
Rotorcraft - Total	10,102	10,506	404	4.0%
All Aircraft - total	**223,370**	**210,030**	**(13,340)**	**-6.0%**

Source: FAA General Aviation and Part 135 Activity Survey

In Virginia, the GA community is also showing indications of some decline since 2010. Figure II-5 summarizes the change in the number of itinerant operations[10] at the airports in Virginia with air traffic control towers. (Because most airports do not have air traffic control towers, reliable data on GA operations are not available; those provided are usually based on counts by airport employees or tenants.) Of the airports with towers, only Roanoke-Blacksburg Regional experienced an increase in itinerant GA operations. In total, the number of itinerant GA operations at these airports decreased by more than 30,000 from 2010 through 2016 (-14 percent).

[10] Itinerant operations are any aircraft operation that is not a local operation (i.e., operating in the local traffic pattern, flying in local practice areas within 20 miles of the departure airport, or simulated approaches).

Figure II-5: Changes in Itinerant GA Operations at Towered Airports, 2010 - 2016



Data from the FAA on the number of active certificated private pilots in Virginia mirror the national trends. In Virginia, the number of individuals holding a private pilot's license dropped from 4,819 as of Dec. 2011 to 3,842 as of Dec. 2016 (-977, or -20 percent).[11]

Changes in Major Socio-Economic Factors

Socio-economic factors affect passenger and airline activity. Some of the most important include population, employment, and income. Table II-5 summarizes the changes in population and employment in the Commonwealth as a whole and in the major metropolitan statistical areas.

[11] FAA data on estimated active pilots and flight instructors available at https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics/

Table II-5: Changes in Major Socio-economic Variables

Metropolitan Statistical Area	Factor	2010	2016	Change	% Change
Charlottesville	Population	219,094	231,349	12,255	5.6%
	Employment	137,274	150,717	13,443	9.8%
	Avg. per capita income	$ 43,975	$ 52,795	$ 8,820	20.1%
Lynchburg	Population	253,054	260,232	7,178	2.8%
	Employment	131,651	135,633	3,982	3.0%
	Avg. per capita income	$ 32,829	$ 37,107	$ 4,278	13.0%
Richmond	Population	1,210,265	1,281,708	71,443	5.9%
	Employment	745,337	821,890	76,553	10.3%
	Avg. per capita income	$ 42,580	$ 50,460	$ 7,880	18.5%
Roanoke	Population	308,659	313,698	5,039	1.6%
	Employment	190,775	197,830	7,055	3.7%
	Avg. per capita income	$ 37,729	$ 43,405	$ 5,676	15.0%
Staunton-Waynesboro	Population	118,349	121,247	2,898	2.4%
	Employment	61,315	64,394	3,079	5.0%
	Avg. per capita income	$ 35,331	$ 40,000	$ 4,669	13.2%
Virginia Beach-Norfolk-Newport News	Population	1,679,972	1,726,907	46,935	2.8%
	Employment	990,802	1,028,584	37,782	3.8%
	Avg. per capita income	$ 40,627	$ 46,400	$ 5,773	14.2%
Washington, DC-Arlington-Alexandria	Population	5,666,536	6,131,977	465,441	8.2%
	Employment	3,876,726	4,180,748	304,022	7.8%
	Avg. per capita income	$ 58,148	$ 64,882	$ 6,734	11.6%
Total, Commonwealth of Virginia	**Population**	**8,025,773**	**8,411,808**	**386,035**	**4.8%**
	Employment	**4,747,510**	**5,059,067**	**311,557**	**6.6%**
	Avg. per capita income	**$ 45,340**	**$ 52,148**	**$ 6,808**	**15.0%**

Note: Population data are from the U.S. Bureau of the Census, American Factfinder, estimates for July 2016. Employment and per capita income data are from the Bureau of Economic Analysis and are for 2015, the latest available at the time of this report.

Population, Employment, and Income

A region's population greatly impacts an airports air service. The larger the population, the more commercial service a community will likely have. The population of the Commonwealth of Virginia has grown on average by 1.0 percent annually over the last 10 years, with a 2016 population approaching 8.5 million.

The Metro Washington Region (Washington-Arlington-Alexandria) is now home to more than six million residents. The region has experienced steady growth since 2010, posting annual growth figures of between one and two percent. With three airports (DCA, IAD, and BWI[12]) competing for air service, the growing population will often choose the airport it uses based on location, ticket prices, and drive times, but also the level of air service available. With modest population growth of eight percent since 2010, both of the northern Virginia airports will continue to work to capture existing market demand from the Washington/Baltimore region.

[12] Baltimore-Washington International Thurgood Marshall Airport (BWI), located in the State of Maryland, is outside of the scope of this study but does serve as a major airport serving the metropolitan Washington area.

After the area in northern Virginia outside of Washington, DC, the next largest population base is in the Tidewater area of Virginia Beach, Norfolk, and Newport News. Since 2010, that area grew by nearly 50,000.

Virginia's Capital Region, around Richmond, grew by nearly six percent between 2010 and 2016, and is approaching 1.3 million residents.

The Charlottesville area is now home to over 230,000 residents. The region has experienced steady population growth over the past five years, growth averaging 1.3 percent per year. This area has the second highest per capita income in the Commonwealth after northern Virginia.

The regions around Virginia's other airports have also seen increases in their population bases and expansions in employment and per capita income.

Changes in International Travel

Despite changes in currency exchange rates which likely discouraged some travel, the total volume of international travelers coming to Virginia increased between 2010 and 2016. Table II-6 summarizes changes in the amount of "origin-and-destination" traffic for each airport.[13] It shows the number of international travelers increased from just over 6 million in 2010 to almost 7.6 million in 2016, and that the overall percentage of travelers at Virginia's airports who were international also increased slightly, to 18 percent. Most of the increase in international traffic was at Washington Dulles International Airport, where the total rose from just under 4 million to 5.5 million. The airports serving Norfolk and Richmond also reported more international travelers.

Table II-6: Changes in Total Domestic and International Origin-and-Destination Travelers, 2010 vs. 2016 (000s)

	2010 O&D			2016 O&D		
Airport	Domestic	International	% Inter-national	Domestic	International	% Inter-national
Charlottesville Albemarle	345	36	10%	526	31	6%
Lynchburg Regional	173	14	8%	143	6	4%
Newport News - Williamsburg International	990	36	4%	372	18	5%
Norfolk International	2,981	277	9%	2,804	323	10%
Richmond International	2,950	244	8%	3,110	293	9%
Roanoke - Blacksburg Regional	534	61	10%	524	52	9%
Ronald Reagan Washington National	13,062	1,373	10%	18,494	1,361	7%
Shenandoah Valley Regional	21	2	8%	12	1	5%
Washington Dulles International	8,644	3,999	32%	7,847	5,508	41%
Total - All Airports	**29,700**	**6,042**	**17%**	**33,833**	**7,593**	**18%**

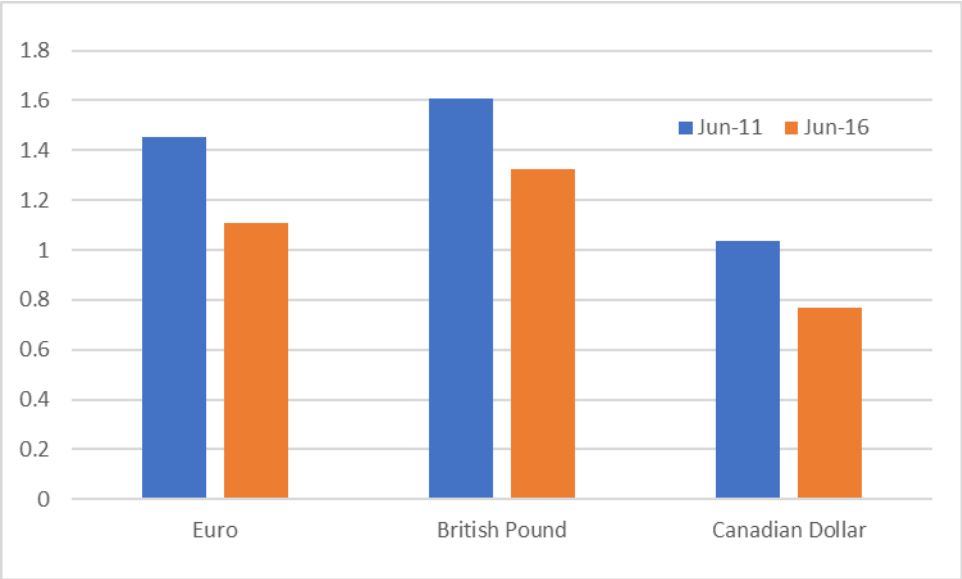
Source: U.S. DOT O&D data via the Diio online portal

Changes in the volume of international travel (especially discretionary leisure international travel) is sensitive to macroeconomic changes, especially those involving exchange rates. Since 2011, in general,

[13] "Origin-and-destination" metrics capture a traveler's initial point of departure and ultimate destination, regardless of any intermediary or connecting stops. For example, a traveler going from Richmond International Airport to London, UK via Washington Dulles is an international origin-and-destination passenger. In the industy's statistics, that traveler appears initially as a *domestic* enplaned passenger at Richmond International (the first flight was from RIC is to IAD) and an international enplanement at Washington Dulles. The statistics separately capture each segment and the entire trip. A different traveler going from RIC to Spokane, Washington and connecting over another U.S. airport would appear as a domestic origin-and-destination passenger.

the value of the U.S. dollar has strengthened significantly against major foreign currencies. This means U.S. travelers can better afford travel to foreign locations; each dollar buys more of foreign goods and services than previously. However, the inverse is true for travelers coming to the U.S. Travel from overseas locations to the U.S. becomes more expensive. This discourages the amount of travel as well as the amount of money that travelers spend when they visit. Figure II-6 illustrates the changes in exchange rates between the U.S. dollar and the Euro, British Pound, and Canadian dollar.

Figure II-6: Changes in Exchange Rates, June 2011 vs. June 2016
(US $1 bought with one unit of the foreign currency)



Source: www.x-rates.com

Between June 2011 and June 2016, the Euro fell by 24 percent against the U.S. dollar. This means, for example, that for travelers in the Eurozone, U.S. goods became more expensive by 24 percent. Canadians experienced a similar change in the value of their currency against the U.S. dollar. The British Pound fell by 18 percent. For many travelers (especially discretionary leisure travelers), the relative increase in costs would discourage travel to the U.S. or the total amount that foreign visitors could afford to spend when they visit.

Chapter III: Economic Impact of Virginia's Commercial Service Airports

The operations of commercial service airports are the greatest source of economic impact attributable to aviation operations in the Commonwealth. These airports are large centers of employment, not only as a direct result of the regularly scheduled flights of commercial airlines, but also because of the various governmental structures that allow passengers to fly in controlled airspace and in an environment made secure by physical screening. Concessionaires at airports provide food and drink for passengers (and airport employees). Ground transportation firms help move the traveling public to and from the airport.

Beyond these immediate activities on the airports, many firms in the supply chain benefit from business transactions that enable the airport and airlines' operations.

In addition, travelers who fly into Virginia via commercial airlines or by GA spend money on their personal and business journeys which supports the hospitality sector and other parts of the local, regional, and state economy.

This chapter describes the overall economic impact of Virginia's commercial service airports and the approach and methodology used to create those estimates.

Overview of Virginia's Commercial Service Airports

Nine commercial service airports serve residents and businesses in the Commonwealth. In 2016, over 26 million passengers enplaned at those airports, ranging from an average of more than 31,000 per day at Ronald Reagan Washington National Airport to 19 per day at Shenandoah Valley Regional Airport. Table III-1 summarizes the passenger traffic and commercial airline operations that drive economic activity at these airports.

Table III-1: Passenger and Airline Traffic at Virginia's Commercial Service Airports (2016)

Airport	Enplanements (000s)	Departures
Charlottesville Albemarle	295	6,824
Lynchburg Regional	75	1,965
Newport News-Williamsburg International	199	4,171
Norfolk International	1,600	23,469
Richmond International	1,792	25,143
Roanoke-Blacksburg Regional	302	6,785
Ronald Reagan Washington National	11,767	143,181
Shenandoah Valley Regional	7	810
Washington Dulles International	10,863	109,700
Total	**26,900**	**322,048**

Source: DOT T-100 data via the Diio mi online portal, Metropolitan Washington Airports Authority, Norfolk International Airport

Over 86 percent of the total passenger enplanements were to another U.S. destination. The remaining 14 percent went to international airports. Nearly all of those passengers departed from Washington Dulles International Airport. The only other airport in Virginia with nonstop operations to an

international destination in 2016 was Ronald Reagan Washington National, with year-round flights to Canada and seasonal operations to the Bahamas.

Each of the airports' 2016 operations are summarized briefly below. The two Washington-area airports are discussed separately because their operations are significantly larger in size and scope.

- Charlottesville Albemarle Airport (CHO) offers non-stop service to six hub airports. CHO is served by American Airlines, Delta Air Lines, and United Airlines along with their regional partners. On average, those carriers made about 19 departures each day. American carried the largest share of total passenger traffic, 63 percent.
- Lynchburg Regional Airport (LYH) offered an average of over five nonstop departures per day from American to Charlotte, NC, one of the airline's largest hubs.
- Newport News-Williamsburg International Airport (PHF) had nonstop service by American to its hubs in Charlotte and Philadelphia and from Delta to Atlanta. The airport offered an average of about 12 departures per day. American carried more than 60 percent of PHF's passengers.
- Norfolk International Airport (ORF) supported daily departures from American, Delta, Southwest, United and their regional airline partners. Passengers had regularly scheduled nonstop access to 17 destinations. In 2016, both American and Delta carried roughly equal shares of passenger traffic, with 33 percent each.
- Richmond International Airport (RIC) hosted an average of about 68 daily departures from American, Delta, JetBlue, Southwest, and United to 15 destinations. The airport also supported service from Allegiant Airlines to three Florida destinations. Delta carried a larger share of ROC's passengers than any other airline, with over 35 percent of total enplanements.
- Roanoke-Blacksburg Regional Airport (ROA) had service from American, Delta, and United, making an average of about 18 daily departures to six hub airports. The airport also was served by Allegiant, which operated weekly flights to two Florida destinations. American was the largest carrier, with about 40 percent of the airport's passenger traffic.
- Shenandoah Valley Regional Airport (SHD) received twice-daily departures on EAS-supported service to Washington Dulles International for most of 2016. In the late fall, that service was switched to another airline, which operated to Charlotte.

The two northern Virginia airports accounted for 84 percent of all passenger enplanements in the Commonwealth, including all of the nonstop traffic to international destinations.

- Ronald Reagan Washington National Airport was the largest airport in Virginia in 2016 in terms of total passenger traffic. Ten airlines – including one international airline, Air Canada – provide daily service to 90 destinations. With the exceptions of Air Canada's flights to Montreal and Toronto (and some seasonal service to the Bahamas and Bermuda), all of the destinations served are in the U.S. American operates a hub at the airport and carried the largest share of passenger traffic – nearly 50 percent. Southwest was the second largest carrier in terms of passengers carried (1.7 million, or 15 percent), slightly ahead of Delta (1.6 million passengers, or 14 percent). On average, airlines made 391 daily departures.
- Washington Dulles International Airport (IAD) is the premier international gateway in the region. In 2016, IAD had nonstop service to 53 international destinations.[14] This included service from

[14] In addition to the nonstop destinations, some other cities were served on flight continuations beyond the first international point of arrival. During the year, United operated a continuation flight to Singapore beyond Tokyo

28 international airlines to 32 destinations and service from United (which operates a hub at the airport) to 33 foreign destinations.[15] About one-third of all of Dulles' passenger traffic was on international flights. Foreign airlines carried a majority of those travelers. In addition to the international carriers and United, another nine U.S. airlines flew from Washington Dulles. In total, the U.S. airlines flew to 79 domestic destinations.

Table III-2 summarizes the service offerings from Virginia's commercial service airports, showing the market shares of the major airlines with service there, the total number of U.S. and international destinations that are served on a nonstop basis from each airport, and the average number of daily departures in August 2016.

Table III-2: Summary of Service Offerings at Virginia's Commercial Service Airports, 2016

Airport name	Number of Airlines *	Destinations Served **	
		Domestic	International
Charlottesville Albemarle	3	6	0
Lynchburg Regional	1	1	0
Norfolk International	4	17	0
Newport News-Williamsburg International	2	3	0
Richmond International	6	17	0
Roanoke-Blacksburg Regional	4	6	0
Shenandoah Valley Regional	1	1	0
Ronald Reagan Washington National	10	85	3
Washington Dulles International	37	76	51

Notes * Airlines providing at least 3 flights/week
** includes seasonal destinations
Source: Innovata Schedules via Diio, August 2016

Direct Economic Impacts of the Airports

This section discusses the direct economic impact of on-airport activities. Economic impacts associated with capital improvement are treated separately because the employment supported by major construction activities is significantly different from the employment required for regular airport operations.

Employment and Economic Activity Directly Related to Aviation and Airport Operations

On-airport employment covers a broad range of activities and functions, many of which are not usually recognized or seen by the traveling public. As noted in Chapter II, these jobs include airport management, airline operations, concessions (retail, restaurants/food service, other services, etc.), security, air traffic control, ground transportation, and many others. The number of employees performing these functions might be related to the total number of passengers at an airport (e.g., restaurant or food service employees) or more directly related to the number of aircraft operations (e.g., FAA's air traffic controllers).

and Avianca operated to La Paz beyond Bogota. South African's service to Johannesburg was beyond either Accra or Dakar, depending on the particular flight.

[15] In some cases, United and the international airlines flew to the same destination. For example, both United and KLM flew to Amsterdam, and both United and ANA flew to Tokyo. Delta also flew to Cancun from Washington Dulles in 2016.

Commercial service airports also host at least one fixed base operator (FBO). Employees of the FBO may provide services for both commercial airline operations (e.g., they might have the contract for fueling and performing basic maintenance on commercial aircraft) and GA operations. The FBOs might also be the point at the airport where special charter flights are handled, perhaps carrying a local university's sports teams. The FBOs might also subcontract some work (e.g., facility security) to other firms.

Cargo-related businesses and economic activity

Air cargo is an often overlooked but key contributor to economic activity at airports.[16] Virginia's commercial service airports receive shipments via the large U.S. integrated carriers (FedEx and UPS), dedicated cargo airlines, and via "belly space" on commercial passenger airlines. According to recent data from Airports Council International – North America, Washington Dulles International is the 22nd largest airport in the U.S. based on the tonnage of cargo handled.

With the exception of Shenandoah Valley Regional Airport, all of Virginia's airports have cargo shipments that move in the bellies of commercial airlines.[17] In 2016, the amounts shipped on commercial airlines ranged from 2,400 lbs. at Lynchburg Regional Airport to 21 million lbs. at Washington Dulles International Airport. Airlines carried more than 1 million lbs. of cargo at Washington Dulles, Ronald Reagan Washington National Airport, Richmond International Airport, and Norfolk International Airport.

A large portion of air cargo-related activity obviously occurs on airport property, because airports serve as "landlords" to this segment of the commercial air industry. On-airport cargo-related activities include the following:

- Airlines move air freight from one airport to another either in available cargo space of passenger aircraft or via dedicated all-cargo freighters. This can occur on regularly scheduled flights and by charter services. Some airlines also offer pickup and delivery services.
    - Integrated carriers, such as FedEx and UPS, provide door-to-door pickup and delivery services of packages (possibly including heavy cargo).
- Ground handlers load and unload aircraft. They might also handle freight storage, fueling, technical maintenance, deicing, crew support, and other services.
- Air cargo terminals process air cargo and mail that is transferred between air carriers and ground transportation. The terminals might be operated by public or private entities, including airports, air carriers, or third parties. Some terminals include handling facilities for live animals and refrigerated space needed to keep produce or other perishables fresh.

Summary: Economic Impact of Commercial Service Airports' On-airport Operations

Virginia's commercial service airports supported nearly 45,000 direct on-airport jobs in 2016, generating more than $3 billion in earnings (including sole proprietorships, producing an average of nearly $70,000), over $5 billion in domestic product and more than $10 billion in economic output. Table III-3 summaries the direct economic impact of on-airport operations at the airports.

[16] For a thorough discussion of the economic impact of the air cargo industry, see Transportation Research Board, Airports Cooperative Research Program, *Estimating the Economic Impact of Air Cargo Operations at Airports*, ACRP project 03-16 (2014), available at http://nap.edu/22235.

[17] Based on data reported by airlines to the U.S. Department of Transportation.

Table III-3: Summary of Direct Economic impacts at Virginia's Commercial Service Airports (2016)
(dollars in millions)

	Direct Impacts			
Airport	**Jobs**	**Wages**	**GDP**	**Output**
Charlottesville Albemarle	559	$41	$66	$122
Lynchburg Regional	618	$27	$36	$72
Newport News - Williamsburg International	629	$48	$86	$198
Norfolk International	2,777	$187	$295	$590
Richmond International	3,199	$195	$346	$652
Roanoke - Blacksburg Regional	908	$53	$110	$239
Ronald Reagan Washington National	16,184	$1,142	$1,934	$4,038
Shenandoah Valley Regional	183	$12	$18	$35
Washington Dulles International	19,850	$1,406	$2,248	$4,227
Total - All Commercial Service Airports	**44,908**	**$3,110**	**$5,139**	**$10,171**

Note that the total direct impacts of the two Northern Virginia commercial service airports shown in the table do not include any impacts that fall outside of Virginia. Thousands of direct employees at the two airports live outside of Virginia, so their impacts are not counted as accruing to the Commonwealth.

Indirect Economic Impacts of the Airports

Off-airport businesses and organizations are also dependent on the airport and airline industry. These are suppliers to the organizations and firms whose activities occur on airport property. For example, the firms that supply jet fuel to the on-airport fuelers exist in the region because of the airport and aircraft activity. Similarly, the wholesalers who supply the airport's restaurants with food and kitchen supplies owe some portion of their business and employment to the passengers who purchase food from the airport's concessionaries. In the case of public organizations such as the FAA or TSA, they might use their budgeted funds to purchase supplies from local, regional, or Virginia-based firms. These purchases represent business income to the respective supplier companies, which in turn supports additional jobs and payroll at those companies.

The air cargo sector includes a large percentage of business that occurs off-airport. These activities are included in the value chain of airport operation and may be considered to be part of the indirect economic impacts of air cargo and airport operations. They include:

- Air freight forwarders and "third party logistics providers" ("3PLs") act as intermediaries between the firms shipping the product or good and the transportation provider. They may negotiate with carriers to find available space and arrange pricing, handle the documentation services, arrange storage, consolidate small shipments into larger (less costly) shipments, and provide other services.
    - Some firms specialize only as consolidators, who work with or might function as a freight forwarder providing assembly points for cargo prior to its delivery to a carrier on the airport.
    - Air cargo truckers specialize in road transportation services for air freight shipments, typically requiring specialized roller-bed equipment.
- Container freight stations are typically located off-airport and handle the breakdown and redistribution of inbound international freight. They also provide space for short-term storage.

- Other stakeholders in the sector include a range of professional services, such as
    - Brokers, who buy capacity from airlines and sell it to small- and medium-sized forwarders.
    - Customs brokers, who assist importers and exporters in meeting federal requirements governing imports and exports.
    - General sales agents, who work for the airlines and sell air freight capacity in the belly of passenger aircraft or on dedicated freighters.
    - Others, such as specialty real estate service providers, who specialize in working with freight forwarders and others to locate and secure warehouse, office, and storage space to meet their unique needs.

All or some mixture of these stakeholders are found on or nearby Virginia's public use airports. This is especially true around Washington Dulles International, the primary airport in the Commonwealth for cargo handling.

These relationships are quantified in national, statewide, and regional economic data incorporated into input-output tables. The project team used the input-output tables in IMPLAN to track the total flow of sales and purchases through the Commonwealth and through each region around the airports to generate estimates of the indirect impacts of the commercial service airports' operations.[18] Table III-4 summarizes the total indirect economic impacts of the commercial service airports. It illustrates that commercial service airports' relationships with supplier industries added more than 22,000 additional jobs, generating earnings of $1.4 billion (an average of over $61,000), gross domestic product of more than $2 billion, and a total economic output of more than $3.6 billion.

Table III-4: Indirect Economic Impacts of Virginia's Commercial Service Airports (2016)
(dollars in millions)

	Indirect Impacts			
Airport	**Jobs**	**Wages**	**GDP**	**Output**
Charlottesville Albemarle	267	$17	$25	$44
Lynchburg Regional	219	$10	$15	$28
Newport News - Williamsburg International	416	$25	$40	$70
Norfolk International	1,382	$79	$125	$222
Richmond International	1,564	$96	$157	$271
Roanoke - Blacksburg Regional	579	$30	$47	$85
Ronald Reagan Washington National	8,492	$535	$818	$1,406
Shenandoah Valley Regional	84	$5	$7	$12
Washington Dulles International	9,409	$578	$884	$1,517
Total - All Commercial Service Airports	**22,410**	**$1,375**	**$2,118**	**$3,655**

As with the analysis of the direct impacts, the indirect impacts of the two Washington-area airports shown in the table do not include any impacts that fall outside of Virginia. To the extent that any suppliers or other indirect beneficiaries of the airports are located outside of Virginia, their impacts are not counted as accruing to the Commonwealth.

[18] Multipliers used are for the entire Commonwealth rather than specific regions.

Induced Economic Impacts of the Commercial Service Airports

Induced impacts are created when workers based at the airports and in the supplier industries spend their earnings in Virginia. This spending supports additional jobs within the Commonwealth at retail, service and other local establishments. For example, if an air traffic controller at Norfolk International Airport remodels his or her home, the expenses of that project support jobs and activity at hardware and home supply stores and with various contractors. Table III-5 summarizes the induced economic impacts of the commercial service airports. The induced impacts totaled over 14,000 jobs with earnings of $730 million (an average of over $50,000), total domestic product of more than $1.3 billion and total economic output of over $2.1 billion.

Table III-5: Induced Economic Impacts of Virginia's Commercial Service Airports (2016)
(dollars in millions)

	Induced Impacts			
Airport	**Jobs**	**Wages**	**GDP**	**Output**
Charlottesville Albemarle	263	$12	$22	$37
Lynchburg Regional	232	$9	$16	$29
Newport News - Williamsburg International	354	$16	$29	$50
Norfolk International	1,359	$60	$109	$190
Richmond International	1,955	$94	$170	$287
Roanoke - Blacksburg Regional	279	$13	$23	$39
Ronald Reagan Washington National	3,943	$208	$383	$614
Shenandoah Valley Regional	82	$3	$6	$11
Washington Dulles International	5,942	$314	$578	$925
Total - All Commercial Service Airports	**14,410**	**$730**	**$1,336**	**$2,182**

As with the analysis of the direct and indirect impacts, the induced impacts of the two Washington-area airports shown in the table do not include any impacts that fall outside of Virginia. To the extent that employees spend the earnings outside of Virginia, those impacts are not counted as accruing to the Commonwealth.

Impact of Capital Development at the Airports

The economic impact of capital development is commonly calculated separately from that of the other on-airport activities. This is done for two major reasons: major capital development at airports is often undertaken only occasionally and represents large efforts that may require multiple years to complete, and the nature of the development (heavily dependent on construction activity) is unlike the other activities underway on a regular basis at airports.

In 2016, Virginia's airports reported approximately $142 million in capital development. Most of that activity was at three airports: Development at Richmond International, Ronald Reagan Washington National, and Washington Dulles International accounted for $107 million of the total. Lynchburg Regional Airport began construction of a new air traffic control tower, with a total cost estimated at $3.3 million. At other airports, capital development expenses in 2016 were less than $500,000.

Capital development at the commercial service airports in 2016 supported over 1,500 direct, indirect, and induced jobs, paying nearly $90 million in total earnings (an average of over $59,000), generating almost $130 million in gross domestic product and nearly $230 million in economic activity. Table III-6 summarizes these economic impacts.

Table III-6: Total Impacts of Commercial Service Airports Capital Development Spending
(dollars in millions)

	Total Capital Improvement Impacts			
Airport	**Jobs**	**Wages**	**GDP**	**Output**
Charlottesville Albemarle	79	$4	$6	$11
Lynchburg Regional	6	$0	$0	$1
Newport News - Williamsburg International	70	$4	$5	$10
Norfolk International	179	$9	$13	$25
Richmond International	393	$21	$32	$58
Roanoke - Blacksburg Regional	64	$3	$5	$9
Ronald Reagan Washington National	377	$25	$34	$59
Shenandoah Valley Regional	4	$0	$0	$0
Washington Dulles International	350	$23	$32	$55
Total - All Commercial Service Airports	**1,521**	**$90**	**$128**	**$229**

These capital improvement totals are relatively modest. The Metropolitan Washington Airports Authority in 2017 kicked off a major expansion of Ronald Reagan Washington National Airport that will last for several years and cost nearly $1 billion. Had that redevelopment begun in 2015 or 2016, the total impact of capital spending shown above might easily have been two or three times greater.

Economic Impacts of Visitor Spending

Spending by visitors who arrive by aviation contributes to local and regional economic activity, especially but not exclusively the hospitality industry. Most – but not 100 percent – of the economic impact of passengers who move through airports is attributable to visitors to the region who spend money with ground transportation, hotels, restaurants, local retailers, and the entertainment industry.[19] This section reviews the estimates of the economic impact of visitor spending. It describes how the team distinguished "visitors" from all passengers who used the airport and how the team estimated the total number of annual visitors at each airport. It describes the methods used to estimate the average spending by those visitors while in Virginia and how those estimates compared to estimates of visitor spending produced by other researchers. In addition, the section describes how the team estimated the impact of visitors who traveled not on commercial airlines but on GA flights that landed and took off from the Commonwealth's commercial service airports. Finally, it discusses the total estimated economic impact flowing from those millions of visitors who spent money in Virginia.

Distinguishing Visitors from Other Travelers

Virginia's airports differ in the nature of their passenger traffic. At some airports, passenger traffic tends mostly to be local residents flying to other destinations for business or personal reasons. For example, the airport manager at Lynchburg Regional Airport said the bulk of the passengers there tends to originate from the local markets. At Norfolk International and Newport News-Williamsburg International airports, the markets are more balanced between inbound and outbound passengers. The

[19] A portion of the grand total of spending from passengers comes from passengers making connecting flights at an airport and may spend money at an airport's food service or retail concessionaires. Because only Ronald Reagan National Airport and Washington Dulles International Airport experience significant connecting passenger volumes, and because the amount spent by those travelers represents a small share of total spending by travelers, this study does not estimate that impact separately. Total spending at airport concessionaires is reflected in their employment levels and purchases from suppliers.

economies in Virginia's Tidewater region – and especially the activity driven by the Department of Defense facilities -- generate relatively balanced amounts of locally-originating outbound passenger traffic and outside-originating inbound traffic. By comparison, at Ronald Reagan Washington National Airport, a higher percentage of passenger traffic originates outside of the airport's catchment area.

Table III-7 summarizes the extent to which each airport's origin-and-destination passenger traffic originated at the Virginia airport as opposed to the other end of the trip. These estimates are based on analyses of the directionality of traffic and point-of-sale data for origin-and-destination passengers to Virginia's airports in 2016.

Table III-7: Point of Origin for Virginia's Origin-and-Destination Traffic

	Percentage of Traffic Originating	
Airport	Locally	Non-locally
Charlottesville Albemarle	58%	42%
Lynchburg Regional	59%	41%
Newport News - Williamsburg International	55%	45%
Norfolk International	55%	45%
Richmond International	59%	41%
Roanoke-Blacksburg Regional	58%	42%
Ronald Reagan Washington National	47%	53%
Shenandoah Valley Regional	54%	46%
Washington Dulles International	56%	44%

Source: Inter*VISTAS* analysis of directionality of travel data from DOT O&D data via Diio Mi (domestic travel) and Sabre MIDT Global Demand Data (international travel).

The table shows the total estimates for all travelers- both domestic and international. The team separately examined the directionality of travel for both sets of passengers. The distinction is important mostly for the large northern Virginia airports because they are the only two with nonstop service to foreign destinations. Table III-8 summarizes the differences in the percentage of domestic and international travelers at DCA and IAD who began their trips at those two airports. That analysis shows that domestic visitors represent a higher percentage of total enplanements (53.5 percent) at DCA than at IAD (44.6 percent), confirming the commonly-held belief that travelers flying to northern Virginia prefer to use the airport closer to downtown Washington. At the same time, likely in part because of the breadth of destinations served by nonstop flights available from IAD, local travelers prefer to make their international trips from that airport. A higher percentage of enplanements at IAD are travelers whose trips are originating there (56.5 percent). Certainly, some travelers leaving on flights to international destinations may make the first leg of their journey from DCA. However, unless those travelers are flying to a limited number of Canadian or island destinations (available only seasonally), they must connect over another gateway airport first. Similarly, travelers flying out of any other airport in Virginia have the same option; drive to IAD for a nonstop flight to one of the 52 foreign destinations served or connect over another airport.

Table III-8: Point of Origin for Domestic and International Travelers at the Northern Virginia Airports

Travel segment	Point of origin	DCA	IAD
Domestic	Local	46.5%	55.4%
	Non-Local	53.5%	44.6%
International	Local	54.5%	56.5%
	Non-Local	45.5%	43.5%
Total	Local	47.2%	55.9%
	Non-Local	52.8%	44.1%

Source: Inter*VISTAS* analysis of directionality of travel data from DOT O&D data via Diio Mi (domestic travel) and Sabre MIDT Global Demand Data (international travel).

Estimates of Total Visitors to Virginia

The data on the directionality of travel is critical for estimating the volume of travelers at an airport who are true visitors returning to their point of origin (or to another stop on their journey) instead of local-area residents flying from their home airports. (As noted earlier, passengers who are connecting at one of Virginia's airports from an incoming flight directly onto a subsequent outbound flight are by definition not "true visitors" to that connecting airport's area, although they may spend relatively small amounts of money at the airport on concessions.[20]) The data of the directionality of travel is applied to data on total enplanements to produce estimates of the total volume of visitors who flew from each of the airports.

These estimates separately take into account the number of enplanements flying to domestic and international destinations. As noted earlier, a large number of foreign airlines operated to international destinations in 2016 from Washington Dulles. To refine the estimates of the total number of international visitors, the project team examined data on international enplanements that all airlines operating to the U.S. must report to the U.S. Department of Transportation (DOT). Combined with other information on ticket sales, the team developed additional estimates on the number of visitors who flew from foreign points of origin on each carrier. Table III-9 summarizes the estimates of the total number of visitors to each airport (visitors who arrive on commercial flights only; those arriving on GA are analyzed separately). The estimated number of visitors takes into account the volume of passengers who make connections onto other flights at the airports. Over four million passengers (about 40 percent of all enplanements) connected at Washington Dulles, and about 1.5 million passengers (about 15 percent of all enplanements) connected at Reagan Washington National Airport. At the other airports, an average of only three percent of passengers connected to another flight.

[20] To clarify by way of example, a passenger whose trip originated in Charleston, South Carolina and connected at Ronald Reagan National Airport on his or her way to Albany, New York would not count as a visitor in Virginia by virtue of the stop at DCA. A second traveler whose trip originated in San Francisco who connected over Washington Dulles International Airport on his or her way to the destination of Norfolk would count not as a visitor at Washington Dulles but as a visitor in Norfolk. Neither traveler counts as a visitor at the airport where the connection occurs.

Table III-9: Total Estimated Visitors Departing from Each Virginia Airport, 2016 (in thousands)

Airport	Enplane-ments	Estimated Visitors
Charlottesville Albemarle	295	120
Lynchburg Regional	75	31
Newport News - Williamsburg International	199	88
Norfolk International	1,600	697
Richmond International	1,792	709
Roanoke-Blacksburg Regional	302	127
Ronald Reagan Washington National	11,767	5,295
Shenandoah Valley Regional	7	3
Washington Dulles International	10,863	2,871
Total	**26,900**	**9,941**

Source: Inter*VISTAS* analysis of data from airports, FAA, Diio (point of origin), and MIDT via Sabre Global Demand Data.

Estimating Average Amounts Spent by Visitors

Besides the number of visitors who use the airports, the other major variables are the average amounts spent each day by those visitors and the length of their visit in the area. Careful research is used to develop statistical estimates for each of those factors, differentiating the length of stay and the amounts visitors spend on different categories, mostly in the hospitality sector: hotels, restaurants, retail, local transportation and entertainment industries.

The project team developed and conducted in-terminal passenger intercept surveys at the Commonwealth's commercial service airports to produce statistically-reliable estimates of the spending and length of stay by non-resident visitors. The surveys determined whether the travelers were visitors, someone from the local area beginning a trip, or a connecting passenger. The surveys asked travelers the purpose of their trip (business, leisure, or both), how long they stayed in the area, the number in the traveling party, the total amount spent across different categories (lodging, food and beverages, ground transportation, entertainment, and retail), and their final destination (used to determine whether the visitor was domestic or international). Additional detail on the survey is available in Appendix I.

The surveys captured differences in spending patterns by different passenger types: domestic and international travelers, as well as leisure and business travelers. International visitors tend to stay longer and spend more than domestic visitors. The team did not survey travelers at three airports: Norfolk International (because it regularly conducts surveys of its passengers and those surveys met our statistical requirements), Richmond International (because airport policy prohibits any surveys of travelers on airport property); and Shenandoah Valley Regional Airport (because the new EAS service provider was experiencing operational difficulties, making service reliability and survey administration a challenge). Table III-10 below summarizes the number of surveys at each airport.

Table III-10: Sample Size by Airport

Airport	Sample Size
Charlottesville Albemarle	255
Lynchburg Regional	237
Newport News-Williamsburg International	248
Roanoke-Blacksburg Regional	272
Ronald Reagan Washington National	839
Washington Dulles International	760

Note: As discussed above, surveys were not conducted at Norfolk International, Richmond International, and Shenandoah Valley Regional airports.

The team conducted two waves of surveys at the airports to capture some evidence on differences in the seasonality of travel. The first was during early February 2017 during the slowest period of travel. The second wave was in April and May, during what is widely recognized as a "shoulder" season for travel – between the winter low season and the peak summer months. Time constraints imposed by the contract precluded the team's surveying during the peak summer months.

Table III-11 summarizes the results of the survey of visitor spending at each airport and indicates the associated average daily spending per visitor. The spending associated with visitors arriving via the Washington airports reflects both international and domestic travelers. The team recognizes that visitors from different points of origin have different spending patterns and accounted for this while developing the total visitor spending estimates.

Table III-11: Average Visitor Spending at Virginia's Airports (per person per day)

Airport	Avg. Per Person Daily Spend
Charlottesville Albemarle	$85
Lynchburg Regional	$89
Newport News - Williamsburg International	$77
Norfolk International	$171
Richmond International	$170
Roanoke-Blacksburg Regional	$100
Ronald Reagan Washington National	$201
Shenandoah Valley Regional	$86
Washington Dulles International	$173

Benchmarking Survey Estimates Against Other Research

The project team sought independent verification of its statistical estimates of average visitor spending. It contacted major travel and tourism organizations throughout the Commonwealth and the greater Washington, DC area, including firms and organizations that produce estimates of the impact of international visitors. The team also examined published data on visitor spending at other major U.S. metropolitan areas and global capitals. Without exception, the data from these other sources confirmed that the team's estimates are consistent with statistically-based surveys of visitor spending elsewhere. The key findings are:

- Virginia Tourism Corporation. The VTC, the state agency charged with promoting Virginia, produces estimates of the average amounts spent by out-of-state visitors to the

Commonwealth, including estimates that are specific to visitors who arrive by air. VTC data indicated that on average, visitors to Virginia who traveled there by air spent $443 per trip per person. (Average based on statistical median.)

- Capital Region USA. CRUSA is the official regional destination marketing organization promoting Washington, DC, Virginia and Maryland internationally, in partnership with Destination DC, the Virginia Tourism Corporation, the Maryland Office of Tourism Development and the Metropolitan Washington Airports Authority. CRUSA provided the project team with data it obtained from the National Travel and Tourism Office (NTTO), a part of the International Trade Administration in the U.S. Department of Commerce. NTTO produces annual estimates of the amount international travelers spend when they visit the U.S. According to these data, for example, on average, for trips to the Capital Region:
  - travelers from China spent $1,575 per person per trip, with an average length of stay of 15 days (slightly more than $100 per person per day);
  - travelers from France spent $465 per person per visit, with an average stay of 6 days (or less than $80 per person per day); and
  - travelers from Germany spent $445 per person per visit, with an average stay of 7 days (or less than $65 per person per day).
- Greater New York City. According to data from New York City & Company, the official destination marketing organization for the City of New York, the average international traveler spends about $1,600 on a 9-day stay (or about $175 per person per day).

Estimates of the average amount spent by international travelers in major global destinations also confirm that the team's estimates are reasonable. According to the Global Destination Cities Index by Mastercard, in 2016, the average amount spent by travelers per trip (in U.S. dollars) to Tokyo was about $1,150, to London was about $1,000, to Paris was about $715, and to Hong Kong was about $810.[21] Considering the average amounts spent per person and average length of stay in the greater Washington area, the team believes the results from Mastercard provide additional support for the reasonableness of the study's estimates.

The approach used to generate the statistical estimates of visitor spending, including information on the survey parameters and the resulting estimates, is described in greater detail in Appendix I.

Spending by GA Passengers at Commercial Service Airports

Visitor spending that stems from activity at commercial service airports is not limited to commercial operations. The commercial service airports also support large amounts of GA/business aviation activity as well.

The commercial service airports all report the total amount of GA operations on their airfields. Business and personal/recreational travelers can fly into any of the airports in Virginia except DCA, which requires a special security clearance for any GA operation.[22] Except for DCA, each of the commercial service airports has a relatively large number of GA aircraft based on there. (Reliever GA airports near each of

[21] Hedrick-Wong, Yuma and Desmond Choong, Global Destination Cities Index by Mastercard, 2016. Available at https://newsroom.mastercard.com/wp-content/uploads/2016/09/FINAL-Global-Destination-Cities-Index-Report.pdf

[22] The Transportation Security Administration restricts GA access to the airport and requires that any operators must secure permission to fly there via the DCA Access Standard Security Program (DASSP). DASSP was developed to ensure all DCA operators have been properly vetted and adhere to a higher level of security.

the commercial service airports provide close-in access to those metropolitan areas and help alleviate congestion with commercial airlines at the commercial service airports.) Table III-12 summarizes GA activity at each of the commercial service airports, showing the number of based aircraft[23] and total GA operations in 2016.

Table III-12: Summary of GA Activity at the Commercial Service Airports, 2016

Airport	Total GA Operations	Itinerant GA Operations	Based Aircraft
Charlottesville Albemarle	37,012	24,510	65
Lynchburg Regional	100,174	41,249	93
Newport News - Williamsburg International	49,162	24,577	141
Norfolk International	19,589	17,739	89
Richmond International	27,225	23,270	58
Roanoke-Blacksburg Regional	23,329	15,664	108
Ronald Reagan Washington National	3,363	3,363	0
Shenandoah Valley Regional	10,372	6,427	78
Washington Dulles International	36,256	36,256	58
Total	**306,482**	**193,055**	**690**

Source: DOAV (based aircraft), FAA Terminal Area Forecasts (total GA operations), FAA Opsnet (Itinerant GA operations).

Although the number of aircraft operations is recorded as part of the activities on the airport (and as part of the air traffic controllers' workload), the number of passengers on board those aircraft is not. Consequently, the team estimated the number of passengers on those GA flights who were visitors to each airport. The team developed information from each airport manager on GA traffic. In addition, the team surveyed the FBOs at all of the Commonwealth's commercial service airports to gather their perspectives on the extent to which their GA traffic was itinerant, the average number passengers on board those flights, and general spending patterns. The team combined this information with other data gathered at the GA airports to produce estimates of the number of GA visitors who use commercial service airports, their average length of stay, and average amounts spent during the stay. (See Chapter IV on the economic impact of GA airports and the visitors who use those facilities. Appendix I includes additional information on the survey of commercial service airport FBOs and the information the team developed.)

The estimated number of GA visitors and their spending were added to the overall estimates of total visitors who arrived by commercial airlines and their spending totals.

Total Estimated Impact of Visitor Spending at Commercial Service Airports

Table III-13 summarizes the total economic impact from the spending of visitors to Virginia who arrive via commercial air services. This combines the direct, indirect, and induced economic impacts that flow from visitor spending. The two metropolitan Washington airports were the sources of the greatest number of visitors to Virginia, so thus the impact of spending was greatest there. The estimated impact of visitor spending for travelers who used either of the Washington-area airports exceeded 35,000 jobs with wages of $1.4 billion, GDP of nearly $2.3 billion, and over $3.6 billion in total economic output. In

[23] "Based aircraft" are those permanently stored at one airport.

general, the impacts of visitor spending from the two MWAA airports account for roughly two-thirds of the total impacts of visitor spending attributable to Virginia's airports.

At the other airports in Virginia, visitor spending supported almost 22,000 jobs in the Commonwealth, with earnings approaching $670 million (representing an average of over $30,000 per job). Total domestic product from visitor spending exceeded $1 billion, and total economic activity from these visitors approached $2 billion.

Table III-13: Summary: Total Economic Impacts Associated with Visitor Spending at the Commercial Service Airports (dollars in millions)
Impact shown on Virginia only (excludes any impacts on DC or Maryland)

	Direct Impacts			
Airport	**Jobs**	**Wages**	**GDP**	**Output**
Charlottesville Albemarle	1,055	$31	$48	$87
Lynchburg Regional	698	$15	$24	$49
Newport News - Williamsburg International	1,023	$29	$46	$84
Norfolk International	9,227	$266	$429	$778
Richmond International	8,650	$285	$472	$820
Roanoke - Blacksburg Regional	1,217	$37	$60	$106
Ronald Reagan Washington National	19,752	$784	$1,264	$2,014
Shenandoah Valley Regional	73	$2	$3	$5
Washington Dulles International	15,598	$632	$1,017	$1,614
Total - All Commercial Service Airports	**57,293**	**$2,081**	**$3,364**	**$5,557**

The figures shown for the two large hub airports – Ronald Reagan Washington National and Washington Dulles International – represent only the impact on employment, earnings, and output for visitors who spent time and money in Virginia. Any impacts associated with time and money spent in the District of Columbia or Maryland are excluded. (See Methodology appendix for discussion of how these estimates were derived.) The study did not make any other similar assumptions about other airports where visitors might have flown into Virginia but spent time in a neighboring state.

Total Economic Impact at the Commercial Service Airports

Virginia's commercial service airports are major economic engines for the Commonwealth. Taken as a whole, the total economic impacts are impressive. The figures incorporate the impacts of on-airport operations (including capital improvements), the effects those operations exert on the supply chain, and the impacts that visitors to the Commonwealth create by their spending. The total amount of supported employment exceeds 140,000 jobs with wages in excess of $7 billion. Total GDP exceeds $12 billion, and total economic output approaches $22 billion. Table III-14 summaries the total economic impacts of these airports.

Table III-14: Consolidated Total Economic Impacts of Virginia's Commercial Service Airports
(dollars in millions)

	Consolidated Total Impacts			
Airport	**Jobs**	**Wages**	**GDP**	**Output**
Charlottesville Albemarle	2,223	$105	$166	$300
Lynchburg Regional	1,774	$61	$92	$179
Newport News - Williamsburg International	2,492	$121	$205	$411
Norfolk International	14,924	$602	$972	$1,804
Richmond International	15,761	$692	$1,178	$2,088
Roanoke - Blacksburg Regional	3,047	$136	$246	$479
Ronald Reagan Washington National	48,748	$2,694	$4,434	$8,131
Shenandoah Valley Regional	425	$22	$34	$63
Washington Dulles International	51,149	$2,954	$4,759	$8,338
Total - All Commercial Service Airports	**140,542**	**$7,386**	**$12,086**	**$21,793**

NOTE: Figures shown for the large hub airports do not include any impacts that occurred outside of Virginia.

Chapter IV: Economic Impact of GA Airports

In addition to the nine airports with scheduled commercial airline service, Virginia's system of public use airports includes 57 additional airports that serve general aviation. Those GA airports are spread around the state and offer an array of functions in the areas they served.

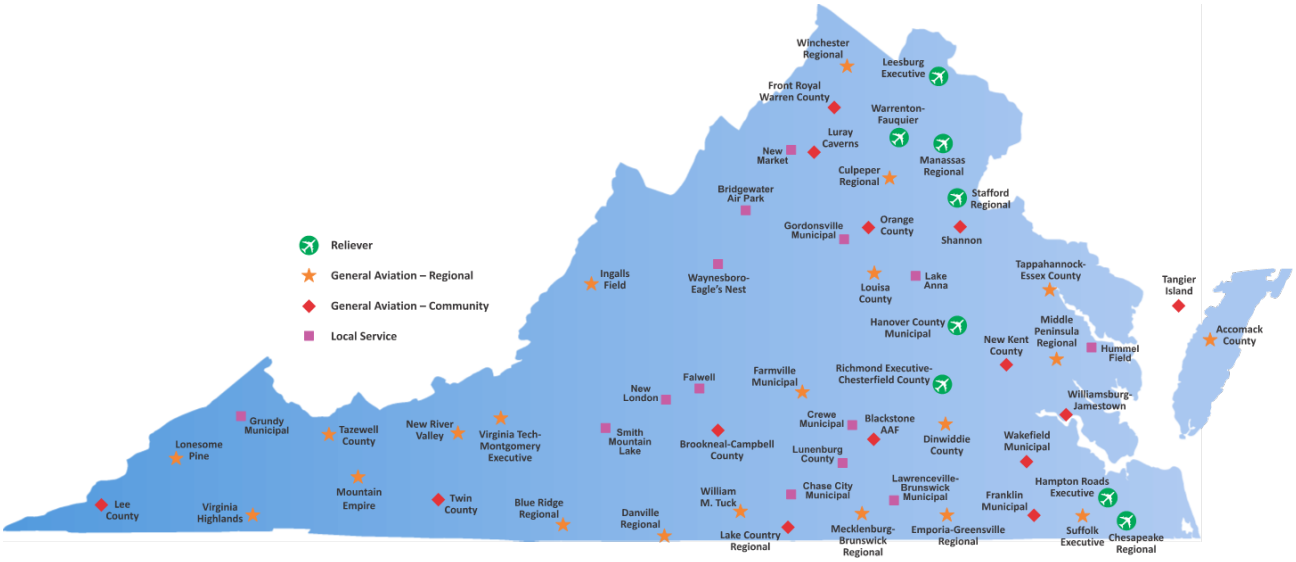
There is a common misconception that general aviation flights are dominated by corporate CEOs (and the rich and famous). In reality, there is a large body of compelling research that illustrates quite the opposite. For example, a recent Harris Interactive survey found that only 22 percent of passengers on business aircraft are top management; the balance is either mid-level management (50 percent) or technical, sales or service staff (20 percent). Further validating the value of general aviation airports, the survey also found that nearly 50 percent of flights are into airports with limited or no commercial service.

This chapter discusses the economic impact of the Commonwealth's GA airports. It describes differences in those airports in terms of their sizes and the functions and activities they supported. It then discusses the employment and economic effects associated with the airports. To help readers better understand all of the activities at these airports, the chapter includes several short case studies.

Overview of Virginia's GA Airports

Virginia's 57 public use GA airports serve every corner of the state, from the largest metropolitan areas to rural locations in the Blue Ridge Mountains and islands in the Chesapeake Bay. According to the 2015 Virginia Air Transportation System Plan Update, nearly 95 percent of Virginia's population in 2010 was within a 30-minute drive of any of the Commonwealth's public use airports.[24] Figure IV-1 shows the location of these airports.

Figure IV-1: Virginia's GA Airport System



[24] Virginia Air Transportation System Plan Update, Executive Summary, p. 6 (2015).

These airports vary significantly not only geographically but in terms of the nearby populations served, the number and type of aircraft based there, activity levels (takeoffs and landings), runway length, services offered, and other dimensions.

The Virginia Department of Aviation defines certain GA airports as "reliever" airports. These facilities provide access to areas served by commercial service where GA activity might cause congestion in the surrounding airspace or on the airfield. These airports are not diversionary sites for commercial airliners. Virginia has eight reliever airports:

- Chesapeake Regional Airport
- Richmond Executive-Chesterfield County Airport
- Hampton Roads Executive Airport
- Hanover County Municipal Airport
- Leesburg Executive Airport
- Manassas Regional Airport
- Stafford Regional Airport
- Warrenton-Fauquier Airport

In part because of their proximity to larger urban areas, these airports also tend to have more based aircraft and larger volumes of both "local" and "itinerant" aircraft operations.[25] On average, the reliever airports saw more than 100 flight operations each day in 2016. Table IV-1 summarizes the number of aircraft and activity levels at the reliever airports.

Table IV-1: Summary of Aircraft Activity at Virginia's Reliever Airports (2016)

Airport	Based Aircraft	Total Operations
Chesapeake Regional	119	37,361
Hampton Roads Executive	159	67,826
Hanover County Municipal	107	35,918
Leesburg Executive	239	117,989
Manassas Regional	406	87,312
Richmond Executive - Chesterfield County	123	61,780
Stafford Regional	68	23,659
Warrenton - Fauquier	166	46,181
Total	**1,387**	**478,026**

Source: DOAV (Based aircraft) and FAA Terminal Area Forecast model (operations)

The 49 other GA airports provide different levels of service to their regions and localities. Of the 49, the FAA has designated 31 as part of its "National Plan of Integrated Airport Systems" (NPIAS), which makes them eligible to receive federal funding for airport infrastructure development and improvements. The

[25] The FAA defines "local" operations as those operations performed by aircraft that remain in the local traffic pattern, execute simulated instrument approaches or low passes at the airport, and the operations to or from the airport and a designated practice area within a 20−mile radius of the tower. "Itinerant" operations are operations performed by an aircraft that lands at an airport, arriving from outside the airport area, or departs an airport and leaves the airport area.

FAA has not included the remaining 18 airports in the national airspace system.[26] On average, the 31 Virginia airports included in the NPIAS are larger in terms of the number of based aircraft than the 18 airports not included in the NPIAS (36 based aircraft vs. 24). However, some airports not included in the NPIAS have relatively large numbers of based aircraft (e.g., Shannon Airport, with 93 aircraft), and some airports included in the NPIAS have far fewer (e.g., Grundy Municipal Airport, with 7 based aircraft). Regardless, each of these airports serves important local needs and supports the local economy. Table IV-2 lists the 49 airports and the aircraft based there.

Table IV-2: Virginia's Non-Reliever GA Airports with Based Aircraft

Airports Included in the NPIAS	Based Aircraft
Accomack County	24
Blue Ridge	34
Brookneal/Campbell County	39
Culpeper Regional	127
Danville Regional	39
Dinwiddie County	66
Emporia-Greensville Regional	7
Farmville Regional	23
Franklin Municipal-John Beverly Rose	17
Front Royal-Warren County	61
Grundy Municipal	7
Ingalls Field	3
Lee County	10
Lonesome Pine	15
Louisa County/Freeman Field	52
Luray Caverns	25
Mecklenburg-Brunswick Regional	32
Middle Peninsula Regional	38
Mountain Empire	18
New Kent County	46
New River Valley	40
Orange County	36
Suffolk Executive	66
Tangier Island	0
Tappahannock-Essex County	31
Tazewell County	12
Twin County	19
Virginia Highlands	72
Virginia Tech/Montgomery Executive	43
William M Tuck	17
Winchester Regional	105
Total	**1,124**

Airports Not Included in the NPIAS	Based Aircraft
Allen C Perkinson Municipal / Blackstone	10
Bridgewater Air Park	91
Chase City Municipal	5
Crewe Municipal *	N/A
Eagle's Nest	36
Falwell	11
Gordonsville Municipal	17
Hummel Field	35
Lake Anna	3
Lake Country Regional	8
Lawrenceville - Brunswick Municipal	2
Lunenburg County Airport	2
New London Airport	44
New Market Airport	18
Shannon Airport	93
Smith Mountain Lake Airport	19
Wakefield Municipal	24
Williamsburg - Jamestown Airport	N/A
Total	**418**

Note: * Based aircraft data for 2016. N/A = not available or reported by the airport to the DOAV.

[26] For information on the criteria applied by the FAA to determine whether an airport may be included in the NPIAS, see Appendix C, National Plan of Integrated Airport Systems, 2017-2021, Report to the Congress. Available at https://www.faa.gov/airports/planning_capacity/npias/reports/media/NPIAS-Report-2017-2021-Appendix-C.pdf

The FAA generates estimates of the total volume of operations only at the airports included in the NPIAS. On average, these airports saw just under 50 operations each day, with a range of nearly 200 (Culpeper Regional Airport) to three (Tangier Island Airport). In addition to Culpeper Regional, three other airports also averaged over 100 operations daily: Dinwiddie County, Suffolk Executive, and Winchester Regional.

Functions Supported at Virginia's GA Airports

Virginia's airports are an integral part of the Commonwealth's transportation system, the larger U.S. air transportation system, and intrastate and interstate commerce. GA airports provide many functions in their local area. Each of these functions adds employment and economic activity:

- GA airports are vitally important for the Commonwealth' agricultural industry. Farmers rely on aviation for aerial operations to survey and monitor crops. Aviation also is important for the application of herbicides, pesticides, and fertilizers to crops. The use of aircraft allows treatment of large areas with mostly liquid products to control pests and disease, and to provide nutrients to crops.
- Throughout Virginia, emergency medical services also rely on GA airports to serve as their operating bases. Helicopter air ambulances are typically used to transport patients from the scene of an injury directly to hospitals or trauma centers. Air medical transport enables higher levels of care and supports a speedier response. Air medical flights also support vital health care needs by their ability to quickly move blood, other supplies, and medical staff. According to the Association of Air Medical Services, there are 17 locations in Virginia with air medical service bases. Of those, 10 are GA airports. (The other seven are Charlottesville Albemarle Airport and six helipads at hospitals.) In addition to pilots and mechanics, the medical crew on board advanced-medical-support units typically includes a specially-trained critical care nurse and paramedic. Other specialist caregivers or physicians may be added to the team as needed.[27]
- Virginia's GA airports are home to many flight schools. These schools offer flight instruction to beginners and experienced advanced pilots. Some specialize in teaching beginners to fly and others to operate more sophisticated aircraft so more experienced pilots can earn advanced certificates, including instrument ratings, multi-engine pilot, commercial pilot, airline transport pilots, and others.
- Business aviation. The FAA reports that throughout the U.S., about 11 percent of the total private flying is done by business employees flying themselves to meetings or other events. Most of this flying is done with piston or turboprop aircraft. Most of the pilots own or work for relatively small businesses and use the aircraft to accomplish missions that would otherwise take more time or would not be feasible because of a lack of commercial service. Another 12 percent of private flying is done in aircraft owned by a business and piloted by a professional, often (but not exclusively) in jets.[28] Many business flights operate to or from Virginia's GA airports.
- Recreation. Ballooning, skydiving, and personal recreational flying.
- Military. At Allen C. Perkinson Airport / Blackstone Army Airfield, the airport is co-owned by the Town of Blackstone and the U.S. Army. Most of the operations at the airport are military. As

[27] For additional information on air medical services, see http://aams.org/publications/air-med-101/

[28] U.S. Department of Transportation, Federal Aviation Administration, *General Aviation Airports: A National Asset,* May 2012, p 9.

another example, the Virginia Army National Guard has eight helicopters based at Richmond Executive Chesterfield County Airport from which it provides air ambulance services and serves as a key base for national disaster response operations.

- In addition, some critically important research is underway at one of Virginia's GA airports. At Leesburg Executive Airport, researchers test whether traditional air traffic control services can be handled via super-fast fiber networks, high definition cameras and remote sensing technology (called "remote tower services"). This test is funded by the State of Virginia and Saab Sensis, with the assistance of a commercial aviation services company that operates 97 air traffic control towers in the U.S. as part of the federal contract tower program. The FAA and other industry stakeholders also participate. At the Virginia Tech / Montgomery Executive Airport, researchers with the Virginia Tech Mid-Atlantic Aviation Partnership (MAAP) work with the FAA to understand how best to integrate unmanned aerial systems into the national airspace system.

In addition to the employment supported by these specific functions, each GA airport has some form of local management and maintenance staff (who are most commonly employed by the local or county governments that serve as the airport sponsor, as described in the Introduction). At some airports, those same employees may also sell fuel and handle the basic business functions of the airport. At most airports, a separate business called a fixed base operator (FBO) provides aeronautical services such as fueling, hangaring, tie-down and parking, aircraft rental, aircraft maintenance, and flight instruction.

Direct Economic Impacts of the GA Airports

In 2016, Virginia's GA airports supported over 2,100 total direct on-airport jobs. These include jobs with airport management and maintenance, FBOs on airport properties, and any other firms engaged in aviation-related work at the airports. Unlike the commercial service airports, the GA airports generally do not have federal government employees (e.g., FAA air traffic controllers or TSA security screeners) at these airports.

Those direct jobs generated more than $190 million in total direct earnings (an average of $90,000 – the figure includes not just wages but also income to sole proprietorships). The total economic output associated with the direct impacts approaches $600 million. Table IV-3 summarizes the direct economic impacts at the GA airports.

Table IV-3: Summary of Direct On-Airport Economic Impacts at Virginia's GA Airports
(dollars in thousands)

	Direct Impacts (dollars in thousands)			
Airport	Jobs	Wages	GDP	Output
Accomack County	7	$685	$830	$1,410
Blackstone AAF	74	$4,247	$5,998	$14,938
Blue Ridge Regional	20	$1,643	$1,799	$2,954
Bridgewater Air Park	272	$23,587	$48,586	$92,992
Brookneal-Campbell County	1	$26	$34	$116
Chase City Municipal	1	$128	$139	$222
Chesapeake Regional	50	$2,299	$2,718	$4,786
Crewe Municipal	1	$77	$96	$179
Culpeper Regional	28	$1,230	$1,576	$3,091
Danville Regional	17	$603	$972	$2,412
Dinwiddie County	36	$2,682	$4,570	$6,732
Emporia-Greensville Regional	5	$299	$352	$765
Falwell	3	$88	$111	$358
Farmville Municipal	3	$178	$232	$480
Franklin Municipal	5	$617	$754	$1,170
Front Royal-Warren County	21	$859	$1,037	$2,504
Gordonsville Municipal	11	$1,379	$1,517	$2,430
Grundy Municipal	1	$34	$42	$124
Hampton Roads Executive	110	$6,629	$10,460	$25,756
Hanover County Municipal	48	$1,501	$2,288	$3,899
Hummel Field	4	$140	$172	$369
Ingalls Field	1	$13	$15	$97
Lake Anna	2	$1,154	$1,184	$1,356
Lake Country Regional	1	$249	$256	$340
Lawrenceville-Brunswick Municipal	1	$131	$140	$223
Lee County	1	$49	$62	$145
Leesburg Executive	249	$36,706	$43,391	$70,878
Lonesome Pine	4	$212	$266	$596
Louisa County	9	$5,333	$5,634	$7,183
Lunenburg County	3	$201	$238	$420
Luray Caverns	2	$92	$113	$278
Manassas Regional	547	$66,347	$104,365	$245,344
Mecklenburg-Brunswick Regional	7	$757	$821	$1,401
Middle Peninsula Regional	50	$2,290	$2,778	$6,811
Mountain Empire	3	$161	$202	$450
New Kent County	8	$347	$420	$839
New London	1	$29	$37	$119
New Market	20	$494	$544	$1,128
New River Valley	14	$628	$788	$1,666

Table IV-3 (continued)

Airport	Direct Impacts (dollars in thousands) Jobs	Wages	GDP	Output
Orange County	54	$1,861	$2,218	$3,552
Richmond Executive - Chesterfield County	101	$6,702	$12,176	$27,935
Shannon	36	$1,323	$1,546	$3,163
Smith Mountain Lake	8	$456	$698	$1,297
Stafford Regional	68	$3,226	$4,170	$9,452
Suffolk Executive	24	$1,331	$1,693	$3,211
Tangier Island	1	$98	$119	$201
Tappahannock-Essex County	28	$3,421	$3,626	$5,949
Tazewell County	3	$111	$146	$394
Twin County	5	$288	$527	$943
Virginia Highlands	26	$1,841	$2,234	$3,144
Virginia Tech-Montgomery Executive	24	$1,441	$1,882	$3,866
Wakefield Municipal	2	$140	$165	$331
Warrenton-Fauquier	23	$983	$1,215	$2,714
Waynesboro-Eagle's Nest	1	$70	$87	$169
William M. Tuck	2	$206	$240	$406
Williamsburg-Jamestown	16	$502	$570	$1,125
Winchester Regional	44	$2,741	$4,808	$8,685
Total	**2,107**	**$190,867**	**$283,655**	**$583,499**

Note: Figures may not sum to totals due to rounding.

Multiplier Impacts of Virginia's GA Airports

In addition to the direct economic impacts of on-airport activity, Virginia's GA airports create additional indirect and induced economic impacts on the local and regional economies. These are sometimes referred to as "multiplier" impacts.

Indirect impacts are those that occur because of business-to-business transactions and are generated when one organization or firm (e.g., an on-airport FBO) purchase goods and services from other Virginia companies. For example, if an FBO buys provisions from other Virginia-based vendors, those purchases represent revenue to the vendors. In turn, the vendor purchases other products from another company further up the supply chain. Those transactions support employment in the supply chain (i.e., generating additional economic activity). This cycle continues and these successive rounds of business-to-business spending are the indirect impacts.

The induced impacts are those that flow from the transactions above, where employees of on-airport firms and organizations as well as those in supply chain firms spend the incomes earned at their jobs in the local and regional economies. Workers' spending supports the housing, retail and service sectors in the local, regional, and Virginia-wide economy. In addition, spending in those sectors (e.g., at restaurants or in local hardware stores) supports employment and additional economic activity in those sectors. These successive rounds of spending and job creation are the induced impacts.

The total number of indirect and induced jobs supported by the Commonwealth's GA airports was nearly 2,300, with total earnings (including sole proprietorships) of just over $125 million. Total gross

domestic product from these airports exceeded $200 million, and total economic output was nearly $350 million. Table IV-4 summarizes the combined indirect and induced impacts associated with the GA airports.

Table IV-4: Combined Indirect and Induced On-Airport Impacts at Virginia's GA Airports (dollars in thousands)

	Multiplier Impacts ($000s)			
Airport	Jobs	Wages	GDP	Output
Accomack County	7	$238	$389	$738
Blackstone AAF	84	$4,002	$7,036	$12,143
Blue Ridge Regional	16	$612	$1,051	$1,950
Bridgewater Air Park	359	$16,828	$28,493	$50,422
Brookneal-Campbell County	1	$40	$61	$110
Chase City Municipal	1	$57	$92	$166
Chesapeake Regional	32	$1,542	$2,497	$4,348
Crewe Municipal	1	$51	$82	$150
Culpeper Regional	19	$832	$1,343	$2,472
Danville Regional	15	$632	$969	$1,766
Dinwiddie County	36	$1,681	$2,953	$5,165
Emporia-Greensville Regional	5	$203	$324	$585
Falwell	3	$122	$188	$336
Farmville Municipal	3	$140	$219	$406
Franklin Municipal	6	$296	$495	$864
Front Royal-Warren County	16	$725	$1,157	$2,065
Gordonsville Municipal	15	$745	$1,199	$2,073
Grundy Municipal	1	$23	$34	$65
Hampton Roads Executive	121	$6,247	$10,261	$17,862
Hanover County Municipal	23	$1,219	$2,132	$3,570
Hummel Field	3	$105	$171	$318
Ingalls Field	1	$27	$42	$76
Lake Anna	6	$242	$424	$782
Lake Country Regional	2	$83	$140	$253
Lawrenceville-Brunswick Municipal	1	$54	$90	$162
Lee County	1	$25	$38	$70
Leesburg Executive	278	$17,195	$28,290	$45,177
Lonesome Pine	2	$110	$169	$302
Louisa County	29	$1,267	$2,320	$4,026
Lunenburg County	3	$108	$176	$319
Luray Caverns	2	$72	$115	$201
Manassas Regional	679	$46,438	$74,439	$118,983
Mecklenburg-Brunswick Regional	9	$371	$600	$1,091
Middle Peninsula Regional	47	$2,087	$3,298	$6,074
Mountain Empire	3	$109	$169	$320
New Kent County	6	$308	$501	$834
New London	1	$43	$66	$121
New Market	8	$336	$583	$1,026
New River Valley	11	$475	$792	$1,387

Table IV-4 (continued)

Airport	Multiplier Impacts ($000s) Jobs	Wages	GDP	Output
Orange County	18	$795	$1,464	$2,560
Richmond Executive - Chesterfield County	136	$7,545	$12,817	$21,968
Shannon	17	$758	$1,364	$2,433
Smith Mountain Lake	7	$308	$517	$947
Stafford Regional	58	$2,647	$4,386	$7,897
Suffolk Executive	21	$1,022	$1,657	$2,899
Tangier Island	1	$34	$56	$105
Tappahannock-Essex County	38	$1,426	$2,384	$4,500
Tazewell County	2	$97	$148	$283
Twin County	4	$142	$232	$431
Virginia Highlands	15	$642	$1,025	$1,837
Virginia Tech-Montgomery Executive	24	$1,082	$1,776	$3,127
Wakefield Municipal	2	$96	$153	$271
Warrenton-Fauquier	16	$771	$1,252	$2,222
Waynesboro-Eagle's Nest	1	$54	$85	$153
William M. Tuck	2	$111	$171	$304
Williamsburg-Jamestown	7	$327	$564	$996
Winchester Regional	50	$2,312	$3,721	$6,615
Total	**2,274**	**$125,860**	**$207,171**	**$348,327**

Note: Figures may not sum to totals due to rounding.

Impacts of Visitor Spending at GA airports

Although most people associate only the commercial service airports with generating visitors to an area, the GA airports also are a significant source of visitor traffic in Virginia. Reports from managers at several of the Commonwealth's airports indicate those airports contribute to the local economies as key points of arrival for NASCAR races, high-end resorts, university sporting and cultural activities, horse racing, business functions, and other events. (See the case studies at the end of this chapter for examples.) In addition to airports that might host aircraft arrivals for special events, other GA airports host visitors who arrive by private aircraft for personal or business reasons.

Estimating the impact of spending by visitors who arrive in Virginia by GA is far more challenging than making similar estimates at the commercial service airports. Researchers confront more difficulties in analyzing data on these passengers – mostly because the data do not exist in any readily-available form. The counts of GA flight activity are unavailable at some airports. No organization collects data on the number of people on board those aircraft. The very nature of business aviation, which places a premium on anonymity, makes it difficult to gather data on their movements.

Estimating the Number of Visitors at GA Airports

The team used a combination of methods and data to develop approximations of the number of travelers who used the GA airports. The team began by examining data on operations at those airports available from the FAA. As noted previously, because many GA airports do not have air traffic control towers, there are often no official counts of aircraft operations. For airports included in the National Plan for Integrated Airport Systems (NPIAS), the FAA creates annual estimates of operations. Of

Virginia's 57 GA airports, 39 are included. For the NPIAS airports, the team started with the FAA's estimates of total GA operations.

The remaining 18 airports in Virginia's system are not included in the NPIAS, so there are no FAA-generated estimates of aircraft operations. To develop estimates for these airports, the team analyzed airports similarly classified by the DOAV and were home to similar numbers (and types) of based aircraft. The team inferred that airports with similar characteristics would have comparable numbers of operations.

Separately, the team surveyed all of the GA airport managers, asking them to report on various operational metrics and features of their airports. The survey asked airport managers to identify nearby special events or attractions that regularly attract GA traffic, such as resorts, NASCAR races, and university sporting events. The surveys also asked airport managers to estimate the amount of their itinerant GA traffic, the average number of people on board (including aircrew), the average length of stay for visitors (even if not overnight), and other matters relevant to their potential spending.

Estimating Spending by GA Visitors

Many of Virginia's airports see a significant number of itinerant operations. With some of those flights, pilots and visitors might only stop for fuel or to take a break from flying. A sizeable percentage, however, will spend the entire day – and possibly a night or more – in the area for personal or business reasons. In those cases, the activity at the airport supports additional economic activity in the local economies, most directly in the hospitality industry. (The impact of business aviation – possibly including major business deals – is impossible to measure but can clearly have broad and significant impacts on the local and regional economies.)

The project team gathered data from Virginia's GA airport managers on the spending patterns of visitors flying into their airports. Those data provided rough approximations of the number of travelers and general spending patterns. Those surveys also determined if the airport was near special events (e.g., NASCAR races) or attractions (e.g., high end resorts) that brought in unusual numbers of flights or different types of aircraft that would suggest high spending patterns (e.g., business jets as opposed to single-engine propeller-driven aircraft).

The project team conducted a confidential, voluntary survey of visitors to GA airports of different sizes to develop information on the purpose of visits, total spending and length of stay. These surveys were available for a month in the late spring. At the end of the survey, the airport managers or FBOs returned the surveys to the project team for analysis.

These data were combined and analyzed on an airport-by-airport basis to develop estimates of total visitors and estimated visitor spending. The team also analyzed these data with other information from the Virginia Tourism Corporation on the average amounts spent be travelers who visit Virginia via airports to ensure broad comparability.

Table IV-5 summarizes the estimates of the total (direct, indirect, and induced) economic impact of the GA airports attributable to visitor spending. The number of jobs attributable to visitor spending at the GA airports were more than 1,700, with total earnings (including sole proprietorships) of about $45 million, total gross domestic product of nearly $70 million and total economic output of nearly $130 million.

Table IV-5: Visitor Spending Impacts at Virginia's GA Airports (dollars in thousands)

Airport	Visitor Spending Impacts			
	Jobs	Wages	GDP	Output
Accomack County	32	$681	$1,031	$2,050
Blackstone AAF	0	$15	$24	$45
Blue Ridge Regional	76	$1,495	$2,222	$4,819
Bridgewater Air Park	10	$234	$358	$701
Brookneal-Campbell County	2	$42	$69	$143
Chase City Municipal	4	$101	$143	$263
Chesapeake Regional	45	$1,189	$1,846	$3,438
Crewe Municipal	0	$12	$18	$41
Culpeper Regional	112	$2,172	$3,350	$7,350
Danville Regional	22	$478	$705	$1,460
Dinwiddie County	79	$1,993	$3,063	$5,996
Emporia-Greensville Regional	4	$93	$133	$276
Falwell	4	$70	$114	$239
Farmville Municipal	25	$520	$803	$1,670
Franklin Municipal	8	$240	$352	$624
Front Royal-Warren County	30	$664	$978	$2,007
Gordonsville Municipal	5	$117	$175	$341
Grundy Municipal	2	$20	$29	$80
Hampton Roads Executive	218	$5,849	$9,124	$16,926
Hanover County Municipal	40	$1,296	$2,069	$3,563
Hummel Field	2	$46	$73	$155
Ingalls Field	32	$767	$1,134	$2,682
Lake Anna -	0	$5	$6	$10
Lake Country Regional	2	$79	$112	$198
Lawrenceville-Brunswick Municipal	1	$36	$50	$92
Lee County	11	$313	$414	$798
Leesburg Executive	59	$2,328	$3,402	$5,427
Lonesome Pine	41	$535	$814	$2,129
Louisa County	22	$1,165	$1,505	$2,325
Lunenburg County	0	$5	$7	$13
Luray Caverns	22	$550	$827	$1,595
Manassas Regional	125	$4,652	$6,814	$11,164
Mecklenburg-Brunswick Regional	10	$304	$426	$779
Middle Peninsula Regional	44	$879	$1,385	$2,945
Mountain Empire	23	$485	$691	$1,481
New Kent County	32	$1,131	$1,803	$2,977
New London	15	$301	$487	$1,031
New Market	9	$215	$324	$646
New River Valley	10	$253	$405	$731

Table IV-5 (continued)

Airport	Visitor Spending Impacts ($000s)			
	Jobs	Wages	GDP	Output
Orange County	26	$462	$744	$1,655
Richmond Executive - Chesterfield County	28	$935	$1,489	$2,548
Shannon	16	$444	$678	$1,258
Smith Mountain Lake	8	$151	$221	$508
Stafford Regional	77	$2,103	$3,214	$5,960
Suffolk Executive	6	$169	$245	$445
Tangier Island	2	$37	$56	$112
Tappahannock-Essex County	3	$58	$88	$182
Tazewell County	4	$119	$158	$302
Twin County	26	$392	$579	$1,397
Virginia Highlands	46	$665	$977	$2,481
Virginia Tech-Montgomery Executive	46	$1,214	$1,944	$3,523
Wakefield Municipal	27	$761	$1,156	$2,117
Warrenton-Fauquier	91	$2,548	$3,869	$7,116
Waynesboro-Eagle's Nest	4	$110	$169	$321
William M. Tuck	13	$405	$534	$979
Williamsburg-Jamestown	50	$1,209	$1,836	$3,594
Winchester Regional	84	$1,803	$2,701	$5,660
Total	**1,736**	**$44,918**	**$67,943**	**$129,367**

Note: Figures may not sum to totals due to rounding.

Total Economic Impact of the GA Airports

Virginia's GA airports made significant contributions to the Commonwealth's economy. Combined, the economic impact of Virginia's GA airports included more than 6,100 jobs, with earnings (including sole proprietorships) of roughly $360 million, total gross domestic product of nearly $560 million, and total economic output of nearly $1.1 billion. Table IV-6 shows the total consolidated (operations and visitors spending) economic impact of the GA airports.

Table IV-6: Consolidated Total Economic Impact of Virginia's GA Airports (dollars in thousands)

	Total Consolidated Impacts			
Airport	**Jobs**	**Wages**	**GDP**	**Output**
Accomack County	45	$1,603	$2,249	$4,198
Blackstone AAF	159	$8,264	$13,058	$27,125
Blue Ridge Regional	112	$3,751	$5,072	$9,723
Bridgewater Air Park	641	$40,650	$77,437	$144,115
Brookneal-Campbell County	4	$108	$164	$369
Chase City Municipal	6	$286	$374	$652
Chesapeake Regional	126	$5,030	$7,061	$12,572
Crewe Municipal	3	$139	$196	$369
Culpeper Regional	160	$4,234	$6,269	$12,913
Danville Regional	54	$1,713	$2,646	$5,639
Dinwiddie County	151	$6,357	$10,585	$17,893
Emporia-Greensville Regional	14	$595	$808	$1,625
Falwell	9	$280	$413	$934
Farmville Municipal	31	$838	$1,255	$2,556
Franklin Municipal	19	$1,153	$1,601	$2,657
Front Royal-Warren County	67	$2,249	$3,172	$6,575
Gordonsville Municipal	31	$2,241	$2,891	$4,844
Grundy Municipal	3	$77	$105	$270
Hampton Roads Executive	449	$18,725	$29,845	$60,543
Hanover County Municipal	111	$4,016	$6,489	$11,032
Hummel Field	9	$291	$416	$842
Ingalls Field	34	$807	$1,190	$2,855
Lake Anna	8	$1,402	$1,615	$2,147
Lake Country Regional	5	$411	$508	$791
Lawrenceville-Brunswick Municipal	3	$220	$279	$477
Lee County	13	$387	$514	$1,012
Leesburg Executive	586	$56,229	$75,083	$121,482
Lonesome Pine	47	$858	$1,248	$3,027
Louisa County	59	$7,765	$9,458	$13,534
Lunenburg County	6	$314	$421	$752
Luray Caverns	26	$714	$1,054	$2,074
Manassas Regional	1,351	$117,438	$185,618	$375,492
Mecklenburg-Brunswick Regional	26	$1,432	$1,846	$3,271
Middle Peninsula Regional	141	$5,255	$7,461	$15,831
Mountain Empire	29	$755	$1,063	$2,252
New Kent County	46	$1,787	$2,725	$4,650
New London	17	$373	$590	$1,271
New Market	37	$1,045	$1,451	$2,799
New River Valley	34	$1,356	$1,985	$3,784

Table IV-6 (continued)

Airport	Total Consolidated Impacts ($000s)			
	Jobs	Wages	GDP	Output
Orange County	98	$3,118	$4,426	$7,767
Richmond Executive - Chesterfield Co	266	$15,181	$26,482	$52,450
Shannon	69	$2,526	$3,588	$6,854
Smith Mountain Lake	23	$915	$1,436	$2,752
Stafford Regional	203	$7,977	$11,769	$23,310
Suffolk Executive	51	$2,521	$3,595	$6,555
Tangier Island	4	$169	$230	$419
Tappahannock-Essex County	69	$4,905	$6,098	$10,631
Tazewell County	10	$327	$452	$978
Twin County	34	$823	$1,338	$2,771
Virginia Highlands	87	$3,148	$4,237	$7,463
Virginia Tech-Montgomery Executive	94	$3,737	$5,602	$10,516
Wakefield Municipal	31	$998	$1,475	$2,719
Warrenton-Fauquier	131	$4,302	$6,336	$12,052
Waynesboro-Eagle's Nest	7	$234	$341	$644
William M. Tuck	18	$722	$945	$1,690
Williamsburg-Jamestown	73	$2,039	$2,969	$5,716
Winchester Regional	179	$6,855	$11,230	$20,960
Total	**6,117**	**$361,645**	**$558,769**	**$1,061,193**

Note: Figures may not sum to totals due to rounding.

Case Studies: Virginia's GA Airports Contribute to Regional Economy

The project team conducted case studies of three Commonwealth airports to more clearly outline how GA airports provide critical economic impacts to Virginia and their local communities. While these and all other airports have unique operating and economic profiles, they can be considered illustrative.

The Private Community Airport with a Long History and Bright Future

Within the historic Fredericksburg Civil War battlefield, Shannon Airport is one of only a limited number of private airports in Virginia. Sidney Lawrence Shannon Jr., son of local aviation enthusiast and businessman Sidney Shannon, founded Shannon Airport in October 1950. The elder Shannon was the first person in the area to own an airplane and started the original Shannon Airport nearby in the 1920s. He learned to fly at Hoover field, now the site of the Pentagon. The senior Shannon was also a principal investor in a small airline that delivered mail at night using open cockpit aircraft: Eastern Airlines.

Sidney Shannon Jr. enhanced the airfield in 1976 by opening the Shannon Air Museum on the site. Among other aviation artifacts, the museum has 13 vintage aircraft from his father's era. On his death in 1981, the museum and its collection moved to the Virginia Aviation Museum near the Richmond Airport.

The younger Shannon's death brought hard times to the airport, and a bank took ownership in 1992. While a former Shannon employee eventually acquired the airport, physical conditions deterioration continued.

In 1984, a local businessman and aviation enthusiast began taking flying lessons at Shannon. Over the years, Luke Curtis grew his business and continued to fly. Beginning in 2004, he merged his interests and embraced business aviation with Shannon Airport as his base. A decade later, Curtis purchased the airport with a pledge to continue the Shannon family legacy, which continues.

As unique as he is as an airport owner, Curtis is the prototypical user of a general aviation airport in Virginia. His company owns a Cirrus SR22 aircraft, a single engine, four-seat aircraft with a range of approximately 1,100 miles. His 110-employee company is based locally, but also operates a facility in Florida.

Vital Statistics

Name: Shannon Airport

Location: Fredericksburg

Airport Identifier: KEZF

Year founded: 1950

Airport Area: 62 acres

Main Runway Length: 3,000 ft.

Second Runway: Grass

Based Aircraft: 107

Key tenants: PHI, JLS Flight School, The Plane Doctor, AC/DC Flying Machines

The aircraft provides efficient transport between these two regional facilities but is also essential to his business sales. In 2016, he had two key meetings in Albany and Rochester, New York. By using general aviation, he could leave home at 10 a.m. for a noon meeting in Albany. Following a short flight, he conducted business in Rochester at 3pm and was home for dinner. This trip would not have been possible using scheduled airline services. Curtis credits his company's use of general aviation as a major contributor to the growth of its business. The company has doubled in size since Curtis has used the aircraft.

In a typical year, he logs approximately 150 hours of flying time for business. With 107 aircraft based at Shannon, he is not alone. Owners of these aircraft are a mix of other business people and recreational pilots, leveraging the airport's location and facilities. Shannon is home to aircraft belonging to many former airline and military pilots whose love for flying did not end with retirement.

Since buying Shannon Airport, Curtis has invested significantly to modernize the airfield and its facilities. The terminal building housing the FBO has been completely renovated to offer pilots and passengers modern technology and amenities more common in larger airports. Aircraft ramp and hangar parking are available. Full and self-service piston and jet fuel are sold on the airfield, as are most aircraft handling services. Two aircraft maintenance companies operate at Shannon, able to meet the technical and engineering needs of aircraft that regularly use the airport.

The retro-designed Robin's Nest restaurant is a favorite spot for both pilots and locals for meals amidst a bustling general aviation airport environment. A pilot shop was recently added to give pilots quick and easy access to supplies and parts while at Shannon.

Shannon is also home to one of five PHI Air Medical bases in the region in addition to its role as a base for business and leisure aircraft. For 12 years, PHI Air Medical has provided air ambulance services and outreach education to Fredericksburg and local healthcare systems. At its Shannon base, PHI employs four nurses, four pilots, four paramedics and a dedicated mechanic. In a typical month, PHI will operate 40-50 missions from Shannon, half of them emergency response calls. Hospital to hospital transfers comprises the other 50 percent. The range and speed of the PHI helicopter from Shannon, as an alternative to ground transport on rural roads or congested highways, provides an essential medical service.

JLS Aviation has provided flight training at Shannon since 2007. JLS has five aircraft and five flight instructors and typically trains 40-60 pilots during the peak summer months. JLS consumes almost 50 percent of the capacity of one of Shannon's two maintenance providers. The presence of such high-quality maintenance is a key reason the school is located at the airfield. Flight training accounts for the vast majority of JLS's business, but they are looking to expand in new directions including aerial photography and the training of drone pilots.

While the unique grass runway gets little use in this modern area of flight, it could well be a prime advantage for future military training exercises. Shannon's location, history and restaurant all support Mr. Curtis' goal to make Shannon the nation's best "$100 hamburger" destination, a term used to define leisure pilots' flights to enjoy a day in the skies and stop for lunch. Plans for a Bed and Breakfast on the airfield are being considered, taking advantage of a home on the property. And more generally, Shannon and other similar airports are well-positioned to offer more local businesses the chance to travel more efficiently as commercial service airports become increasingly congested. The trend shift from twin-engine propeller driven aircraft to high performance single engines certainly supports increased use of shorter runway airfields.

Curtis is "all in" at Shannon. His company recently bought an adjacent property for expansion. Although Shannon Airport is private, Curtis considers the community airport is a valued part of the Commonwealth's aviation system. Shannon is a prime example of how a small airport makes a meaningful economic contribution to the local and state economies.

The Capital City Reliever to a Commercial Service Airport

In 2011, the Chesterfield County Airport was renamed Richmond Executive Chesterfield County Airport to reflect its important role as the primary reliever for the capital city's commercial service airport. However, its core role of serving the general aviation needs of Chesterfield County remains.

Since 1991, Dominion Aviation has been the exclusive FBO at the airport and employs 68 people. Dominion offers customers a full range of options including aircraft maintenance, charter sales and flight training. For customers who have an aircraft based at Richmond Executive Chesterfield County, Dominion offers aircraft management services covering all aspects of operating and maintaining the aircraft for owners and operators. Dominion provides aircraft services such as parking, hangars, fueling, maintenance and a range of "concierge" like services such as catering, reservations and transport for visitors to the Richmond area.

Dominion's 20 maintenance workers undergird its technical and engineering capabilities to make Richmond Executive Chesterfield County one of the region's top sources for quality aircraft maintenance for both fixed wing airplanes and helicopters. Its sales group represents several aircraft brands, including Cessna, Cirrus, Diamond and Hawker, all typical general aviation workhorse aircraft models.

Some of the 12 aircraft Dominion manages on their owners' behalf are available for charter. Some of these aircraft now form part of the Netjets network, the world's largest fractional jet ownership company.

In addition to traditional FBO services, the airport is home to a range of public safety organizations for Chesterfield County and beyond.

Vital Statistics

Name: Richmond Executive Chesterfield County Airport

Location: Richmond

Airport Identifier: KFCI

Year founded: 1973

Airport Area: 556 acres

Main Runway Length: 5,500 ft.

Based Aircraft: 133

Key tenants: Dominion Aviation, Virginia Army National Guard, Virginia State Police, Civil Air Patrol, Government Agencies

The Virginia Army National Guard has eight helicopters based at Richmond Executive Chesterfield County Airport to provide air ambulance services, and the unit constitutes a key base of operations for national disaster response. Guard members also act as first responders for river rescue calls for the fire department adjacent to the airport.

The Civil Air Patrol's 30-person staff at Richmond Executive Chesterfield County makes it the organization's largest in Virginia. CAP offers a joint focus on education and emergency response. On a typical day, the Civil Air Patrol will have one or two fixed- or rotorary-wing aircraft at the airport ready to undertake any mission, including search and rescue, disaster relief, humanitarian services, counterdrug enforcement or other requested assistance to the Air Force.

Richmond Executive Chesterfield County Airport is also home to one of three Virginia State Police aviation unit. The others are at Lynchburg and Abingdon. Two helicopters and one fixed-wing aircraft at the Richmond-area airport are used for search and rescue and air-based police pursuits. With its proximity to the capital, Richmond Executive Chesterfield County-based police aircraft also support the Governor's official transport requirements. Since 1984, Medflight One (the fully equipped publicly

funded helicopter air ambulance) has served the people of Chesterfield County and its environs with county paramedics and flight nurses from Virginia Commonwealth University. The service averages 2.5 medical response calls each day. As a hub for the police unit, maintenance for all their aircraft is at Richmond Executive.

The airfield is also home to aviation bases and aircraft operated by a wide range of other government agencies and departments.

Richmond Executive Chesterfield County has 117 hangars - seven large (community) or 110 smaller (t-hangars). Short-term visitors have ample ramp parking near the hangars or in front of the restaurant. In addition to serving visiting pilots, the restaurant is a local favorite for employees in the adjacent business park as well as local residents.

Richmond Executive Chesterfield County Airport has specialized key offerings including an aircraft firefighting unit. Such capabilities are required for larger, commercial service airports, but it is rare for an airfield of this size. The airport has a military fuel contract, making it one of the smallest airports in the nation that the military and Department of Defense (DoD) can use for refueling stops. The airport must meet the safety and operational standards dictated by the DoD to qualify for this designation. Fuel sales are an important part of general aviation airports' income. Dominion Aviation and airport management regularly reach out to the military to remind them that DoD credit cards can be used at Richmond Executive Chesterfield County.

Looking ahead, there is the soon-to-begin runway extension, increasing the landing area from 5,500 to 6,300 feet by 2022. This 800-foot addition will open the airport to larger classes of general aviation and military aircraft and make it a more suitable official reliever airport to Richmond International. This major renovation is scheduled to be completed by 2022. Land with direct access to taxiways and the parking ramp is available for development. Plots with full utility access are being actively marketed to the aviation community and should increase use at the airfield when leased. Airport management is also exploring how to use its footprint for solar power generation and capture. This creative use of otherwise unusable real estate (due to height limitations near the runways) would earn revenue for the airport and provide power to the local grid.

The Uncommonly "Big" Small Rural Airport

While NASCAR fans immediately associate Martinsville with the Speedway, the city is also home to Blue Ridge Regional Airport. Twice a year, these two local linchpins work as one to bring NASCAR to Southwestern Virginia.

More importantly for the city and region, Blue Ridge provides critical air transport infrastructure, supporting local, regional and national businesses and creating much needed economic impact. The City of Martinsville and two surrounding counties form the Airport Authority that owns and operates the airfield. The Authority also operates the FBO, providing a range of aircraft and pilot related services such as fuel, ground services, aircraft maintenance, catering, aircraft hangar/ramp parking, pilot lounge/briefing and a range of concierge services.

Vital Statistics

Name: Blue Ridge Regional Airport

Location: Martinsville

Airport Identifier: KMTV

Year founded: 1964

Airport Area: 365 acres

Main Runway Length: 5,002 ft.

Based Aircraft: 34

Key tenants: Air Methods/Aire Care

Aircraft maintenance is a priority at Blue Ridge. With three full-time mechanics, the airport provides full service maintenance for based aircraft as well as those based at other general aviation airports in the region. Certified to maintain a range of aircraft from small pistons to light jets, pilots would need to travel to Greensboro, NC to get equivalent maintenance capabilities as that offered at Blue Ridge.

In late 2016, AireCare marked its fifth year of air ambulance helicopter service based at Blue Ridge. AireCare has a staff of 18 -- four pilots, two mechanics and twelve EMTs -- based at the airport to provide emergency scene response and hospital-to-hospital transfers for the region. AireCare aircraft based at other airports frequently fly to Blue Ridge for maintenance and crew training. AireCare credits the airport's rural location and modern instrument landing system as essential elements in its decision to base at Blue Ridge. An average month for AireCare involves about 30 missions that often begin or end at hospitals in Winston-Salem, NC or Roanoke.

Based aircraft occupy approximately 90 percent of available hangar parking at Blue Ridge. These aircraft range from small, recreational aircraft to medium size business jets.

One of these jets is owned by a local company that embraced general aviation at Blue Ridge in 1991. According to the company's chief pilot, the enterprise started cautiously with a small piston aircraft and gradually upgraded to more sophisticated aircraft as their business grew. Their two-aircraft fleet has a mid-size piston-powered aircraft and a light jet used on average once a week for executive meetings, conferences and sales calls. The company, with 650 employees in central and southwestern Virginia could not operate in another location and views general aviation at Blue Ridge as essential. The chief pilot recounted a trip to Orlando that took just over two hours in the light jet. The same trip would have required 16 hours using a commercial airline, making the trip impossible in the available time. The chief pilot said that the owner has in the past refused to sell the company for the sole reason that he wanted to protect local jobs. Blue Ridge specifically, and Commonwealth general aviation airports in general, host companies that view the use of business aircraft as vital corporate assets.

Blue Ridge serves as the primary GA airport for the luxury, 12,000-acre resort Primland, located 30 minutes away in Meadows of Dan, Virginia. This four-season resort that employs 300 staff during the peak months and increasingly relies on Blue Ridge as an air gateway for its corporate retreat, sales incentive meeting and family outing customers. Primland guests often arrive in larger classes of aircraft than are typical at Virginia general aviation airports, making the larger runway at Blue Ridge essential to meet their needs. Larger aircraft drive more revenue for the airport, including aircraft handling fees and fuel sales. Primland considers the exemplary customer service at Blue Ridge as an extension of their stay at the resort.

Blue Ridge actively promotes its community involvement, evident by their use of social media. Airport representatives often speak to local groups promoting the airport's economic role for the city and region. Aviation-themed summer camps are periodically offered and senior groups are also frequently invited. School tours are the most popular events and range from pre-school to high school age levels. Tours are modelled appropriately to the age group visiting, but typically include the differences between general aviation and commercial service airports, how Blue Ridge benefits the community, types of jobs within the aviation field and airport operations. Such exposure is great for the students as well for the future of general aviation. Simply Suzanne's Café, located in the general aviation terminal, serves as a mingling place for locals and airport guests. The café provides catering for both groups of customers, and is often used by the community as a unique venue for private parties.

Finally, returning to NASCAR, these events are inevitably peak days at Blue Ridge; October 2016 was no exception. On race day alone, the hangars and parking areas accommodated visiting aircraft that outnumbered those based at the airport. Seven helicopters and 43 fixed-wing aircraft brought race teams, owners, sponsors, drivers (and their families) and a wide range of fans from across the country. Blue Ridge also hosted experimental aircraft and vintage warbirds used during the race flyover, operated by the Bandit Flying Team. As most of these aircraft refueled before their post-race departure, peak days drive significant economic impact both to Blue Ridge and Commonwealth.

A major pavement resurfacing project will begin at Blue Ridge in the spring of 2017. The airport is also actively marketing an additional parcel of land that will offer a tenant direct airport and road access. Looking even further ahead, the airport and county own significant real estate adjacent to the current airport property that could easily be used for substantial growth and expansion.

Chapter V: Other Economic Impacts of Virginia's Airports

Commercial and general aviation are truly economic accelerators. Some economic development might have eventually occurred, but civil and commercial aviation enables the activities to occur earlier and faster by opening up opportunities for stakeholders to meet, buyers and sellers to transact business, and markets to develop. This chapter briefly describes two of the principal means by which aviation contributes to a vigorous statewide and regional economy.

Economic Development Requires Connectivity

High quality transportation – of all modes -- is a prerequisite for sustained economic growth and for maintaining economic competitiveness. *International* competitiveness is driven by productivity growth which is underpinned by trade, foreign investment and innovative activity, all of which are facilitated by connectivity via commercial aviation.

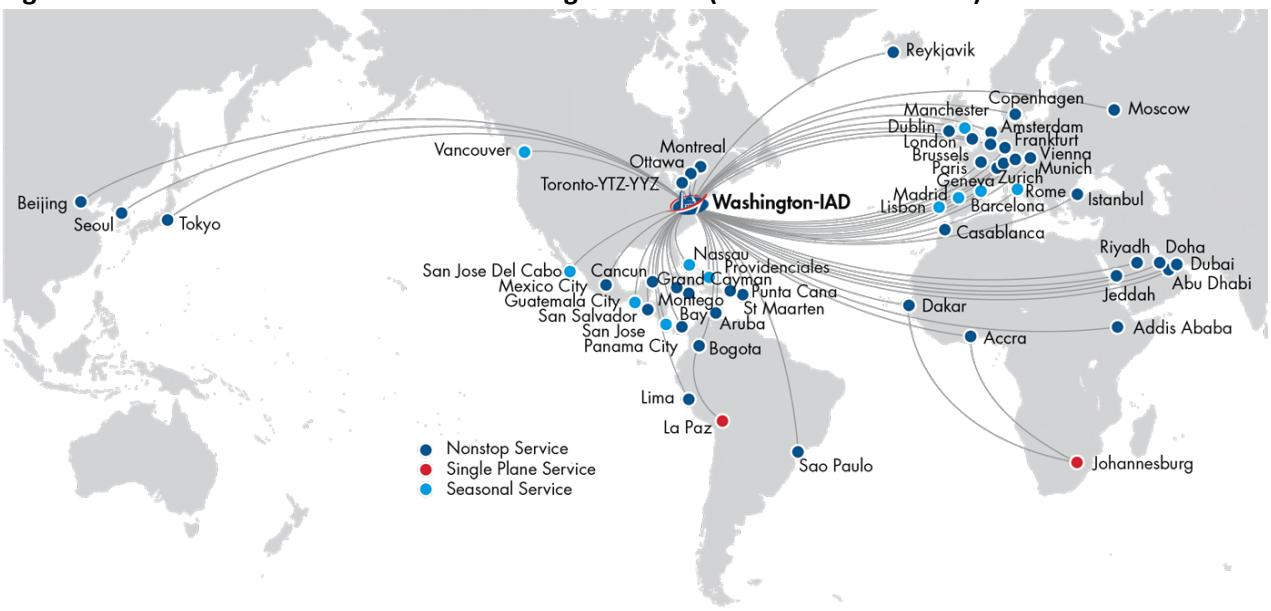
"Connectivity" generally means the ability to reach a wide range of places in a short amount of time. Connectivity creates efficiencies that make firms more productive, which in turn attracts more high-flying international businesses that have their choice of locations and starts a virtuous cycle of economic growth.

As noted in Chapter II, Virginia's airports have excellent connectivity to the domestic economy, led by the two Washington-area airports. At Ronald Reagan National Airport in December 2016, 10 carriers were making over 370 daily flights to 81 destinations (including three Canadian cities and Nassau, The Bahamas). From Washington Dulles International, 10 carriers were making 236 daily departures to 73 destinations. Between the two airports, passengers had nonstop connectivity to every major business center in North America.

Virginia is also well connected with nonstop service to major international markets. As of December 2016, Washington Dulles International Airport had service from 30 international airlines (including United, which operates a hub at the airport) to 49 foreign destinations. Figure V-1 illustrates the breadth of the international service available from the airport. Of the top 50 origin-and-destination markets of Washington-area travelers, Dulles had nonstop service to 39.[29]

[29] Since then, one of those markets – Delhi, India – is now served, as Air India initiated service in early 2017. United Airlines has indicated that it plans to launch service to another of those "top 50 destinations" -- Edinburgh, Scotland -- in early 2018.

Figure V-1: International Service from Washington Dulles (as of December 2016)



Source: Inter*VISTAS*, based on Innovata Schedules, November 4, 2016 update.

Air connectivity increases with the number of destinations served and the frequency of flights along these routes. This in turn will make a location more attractive to foreign investment and increase the potential for business efficiency, and ultimately generates a virtuous cycle of connectivity and economic growth. Connectivity is generated by an airport's ability to attract passengers and the extent of the number of routes served on a nonstop basis to major domestic and international business locations. A country or region that has continental and intercontinental linkages only to a limited number of destinations will be a less desirable place to do business. Travel costs for staff and for goods will be higher due to the need to purchase multiple flight legs to move people and goods. On the other hand, a community with direct access to a broad range of markets, especially the fastest growing markets, will be a lower cost place to do business. It will also enhance customer servicing and goods and support staff can easily and quickly get to a range of destinations.

Hub airports like Washington Dulles International and to a lesser extent, Ronald Reagan Washington National are thus major contributors to economic development. The key benefit of a hub airport is that it can sustain a far wider network at a higher frequency of service than would be possible at a point-to-point airport. Greater volumes of connecting passengers make nonstop routes to many destinations financially sustainable for hubbing airlines to operate.

Overview of Virginia's Economy

According to the U.S. Bureau of Economic Analysis, Virginia's 2016 current-dollar GDP was $493 billion and ranked 12th in the United States. The Commonwealth's economy is heavily dependent on white-collar industries and the public sector – not surprising considering its proximity to Washington, DC and it large military presence.

In 2016, the largest industry in Virginia was finance, insurance, real estate, rental, and leasing. This industry accounted for almost 20 percent of Virginia GDP. The second largest industry was professional and business services, which accounted for nearly 19 percent of Virginia GDP. Government – local,

state, and federal – also accounted for 19 percent of the economy. Table V-1 summarizes the Commonwealth's economy in terms of the contributions to GDP by different economic sectors.

Table V-1: Overview of Virginia's Economic Structure (dollars in millions)

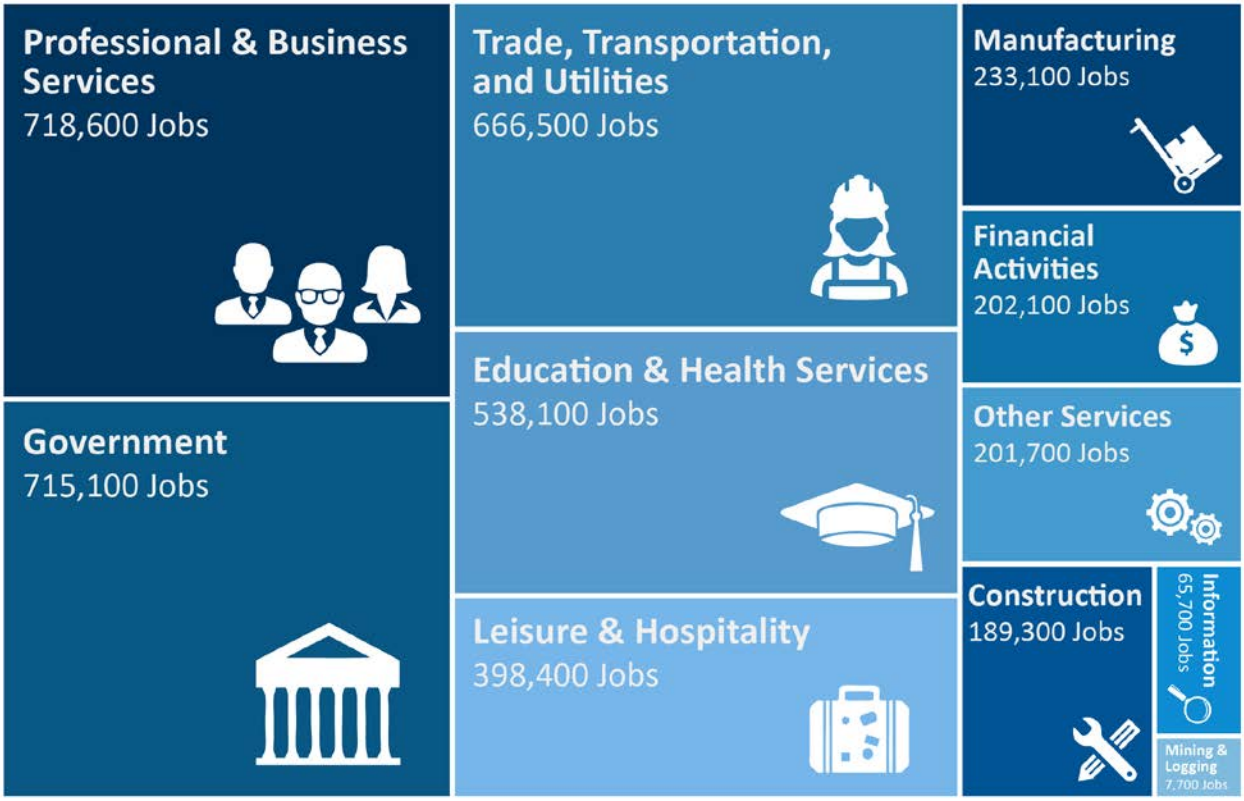
Sector and industry	GDP	%
Private industries	$ 400,200	
Finance, insurance, real estate, rental, and leasing	$ 98,018	20%
Professional and business services	$ 90,656	18%
Manufacturing	$ 42,778	9%
Educational services, health care, and social assistance	$ 34,956	7%
Retail trade	$ 26,047	5%
Construction	$ 21,021	4%
Wholesale trade	$ 20,372	4%
Arts, entertainment, recreation, accommodation, and food services	$ 15,935	3%
Information	$ 15,346	3%
Other services (except public administration)	$ 12,962	3%
Transportation and warehousing	$ 12,589	3%
Utilities	$ 6,089	1%
Mining, quarrying, and oil and gas extraction	$ 1,838	0%
Agriculture, forestry, fishing, and hunting	$ 1,594	0%
Government	$ 92,732	19%
All industry total	**$492,932**	**100%**

Source: BEA

Over 4 million people were employed in the Commonwealth, with average earnings of over $60,000.[30] Although companies in the finance, insurance, real estate, rental, and leasing sector made the largest contribution to the Commonwealth's GDP, companies providing professional and business services (along with different levels of government) were the largest employers (see Figure V-2). In 2016, Virginia had a per capita personal income of $53,723. This ranked 11th in the United States and was 108 percent of the national average, $49,571.

[30] Earnings include employer-provided supplemental contributions for pensions, insurance, and government social insurance. If the value of those supplements is subtracted, the average wage and salaries of employees was $55,663. Employment estimates are for the civilian workforce from the U.S. Bureau of Labor Statistics for December 2016, seasonally adjusted.

Figure V-2: Employment by Industry Sector in Virginia, 2016



Source: U.S. Bureau of Labor Statistics

Commercial Aviation Supports Virginia Business

Commercial aviation is inextricably entwined with Virginia's economy. Airlines and airports purchase goods and services from other sectors of the economy in order to operate. Similarly, other sectors of the economy depend on commercial aviation to transact their business. Were it not for the availability of commercial air transport in Virginia, those businesses would be forced to rely on aviation elsewhere, perhaps to the point of relocating. In that sense, the availability of commercial and general aviation is a prerequisite for some of this business to occur; the business is dependent on aviation.

The project team examined the interrelationships of commercial aviation and businesses in Virginia to quantify the extent to which the two are co-dependent. Economic input-output tables trace the flow of funds between sectors and allow for these relationships to be quantified. Purchases by airlines and airports have already been captured as "indirect impacts" and discussed at length in earlier chapters. Those purchases are upstream inputs or supplies to the industry. Purchases of airline and airport services by other sectors, however, have not been recorded. According to these data (which originate in the U.S. Bureau of Economic Analysis), households and businesses in Virginia made $5.6 billion in payments to commercial aviation in 2016. Excluding payments by households (which are essentially travel by individuals), businesses spent $4.2 billion on aviation-related matters. Table V-2 summarizes those results.

Table V-2: Purchases of Air Transport Services by Economic Sector in Virginia (dollars in millions)

Sector		Value
Domestic Trade	$	1,558
Foreign Trade	$	1,236
Households	$	1,425
Government	$	467
Wholesale trade	$	46
Computer systems design services	$	46
Data processing, hosting, and related services	$	37
Capital	$	37
Management consulting services	$	34
Nondepository credit intermediation and related activities	$	30
Other computer related services, including facilities management	$	27
Architectural, engineering, and related services	$	26
Other financial investment activities	$	25
Truck transportation	$	24
Ship building and repairing	$	18
Real estate	$	17
Monetary authorities and depository credit intermediation	$	16
Employment services	$	15
Insurance agencies, brokerages, and related activities	$	15
Offices of physicians	$	14
All other	$	499
TOTAL	**$**	**5,612**
Net of household purchases of air transport:	**$**	**4,188**

Source: IMPLAN

Domestic and foreign trade rely on transportation in general and aviation in particular for their business. (See discussion in Chapter III concerning the direct and indirect impacts of air cargo operations on airports.) Tables V-3 and V-4 highlight the major categories of exports and imports that occurred by air from and to Virginia in 2016, separately revealing the total tonnage shipped and the value of the commodities. For example, Virginia businesses exported over 5,500 metric tons of computer/high-tech machinery in 2016 with declared values of over $700 million. The most valuable commodities exported were electric machinery, worth nearly $1.3 billion. In total in 2016, Virginia exported nearly 37 million metric tons of commodities by air, with a value of just under $4 billion.

As shown in Table V-4, Virginia businesses also imported large amounts of computer/high-tech machinery. In 2016, Virginia imported over 9,000 metric tons of those products, worth over $1 billion. In total, Virginia companies imported over 39 million metric tons of commodities by air, with a value of more than $4 billion.

Table V-3: Top Categories of Virginia Exports by Air from Virginia, 2016 (dollars in millions)

Commodity	Exports (MTs)
Computer/High-Tech Machinery	5,527
Electric Machinery	4,264
Pharmaceutical Products	3,169
Wadding/Felt/Yarn/Twine/Ropes	3,125
Plastic Articles	3,042
Optical, Medical, or Surgical Instruments	1,780
Essential Oils, Cosmetics	1,318
Iron and Steel	1,208
Paper Articles	1,146
Manmade Fibers & Woven Fabrics	746

Commodity	Exports Value
Electric Machinery	$ 1,277
Computer/High-Tech Machinery	$ 711
Optical, Medical, or Surgical Instruments	$ 519
Aircraft and Spacecraft Parts	$ 456
Pharmaceutical Products	$ 225
Special Classification Provisions	$ 147
Chemical Products	$ 85
Wadding/Felt/Yarn/Twine/Ropes	$ 71
Arms And Ammunition	$ 58
Plastic Articles	$ 57

Note: MT = metric ton

Source: WISERTrade State database

Table V-4: Top Categories of Virginia Imports by Air into Virginia, 2016 (dollars in millions)

Commodity	Imports (MTs)
Computer/High-Tech Machinery	9,226
Electric Machinery	6,087
Optical, Medical, or Surgical Instruments	2,603
Non-Railway Vehicles & Parts	2,466
Plastic Articles	1,870
Special Classification Provisions	1,433
Non-Knit Apparel Articles	1,362
Iron and Steel Products	1,008
Knit Apparel Articles	1,072
Rubber Articles	1,032

Commodity	Imports Value
Electric Machinery	$ 1,252
Computer/High-Tech Machinery	$ 1,038
Special Classification Provisions	$ 539
Optical, Medical, or Surgical Instruments	$ 461
Pharmaceutical Products	$ 154
Aircraft and Spacecraft Parts	$ 102
Non-Railway Vehicles & Parts	$ 86
Chemical Products	$ 68
Arms And Ammunition	$ 47
Plastic Articles	$ 36

Note: MT = metric ton

Source: WISERTrade State database

Not all of those exports and imports move through Washington Dulles International Airport.[31] According to data from MWAA, for example, of all of the exports from Virginia that moved to Europe, Washington Dulles captured about 28 percent of the total tonnage. Of the exports from Virginia that moved to Asia and Oceania, Washington Dulles captured 11 percent of the total tonnage. Nearly half – 47 percent – moved instead via John F. Kennedy International Airport in New York.

Because air cargo markets are highly price competitive, some of Virginia's air cargo exports and imports move through other gateways. Conversely, cargo from other regions will move overseas through Washington Dulles. The balance shifts frequently and depends on changes in the amount of cargo offered for export or import to Virginia vs. available capacity. Further, Washington Dulles also serves cargo originating from and destined to DC and Maryland (along with West Virginia and other nearby states). Further complicating the numbers are that significant volumes of exports and imports depart on

[31] Washington Dulles International Airport's cargo and freight operations capture traffic from a wide geographic area, including the six nearby states – Virginia, Maryland, North Carolina, Ohio, Pennsylvania, and South Carolina.

cargo aircraft from Washington Dulles to integrator carriers' major sort hubs (e.g., FedEx's Memphis hub or UPS' facility in Louisville) before going overseas. Nevertheless, Washington Dulles acts as the facilitating gateway for this cargo even if formal customs documentation lists another airport.

Catalytic or Wider Economic Benefits of Aviation

Traditional economic impact analyses do not capture every benefit that flows from commercial aviation. These are the "catalytic" or "wider" economic benefits, which link transport impacts to the functioning of the economy less directly. Air transport helps boost productivity, improve international competitiveness, and reduce market imperfections.

Connectivity generates wider economic benefits for businesses through the efficiency of direct linkages and also by providing an environment that benefits businesses. In an international business world, air transport provides access to an international labor force, as well as customers, suppliers and knowledge-sharing around the world. These "catalytic" and 'spillover' effects, increase the efficiency and productivity of businesses, as well as attracting inward investment and high-profile businesses to the Commonwealth.

Global connectivity is particularly important for those sectors characterized by internationalized, high-value products and services, dependent on mobile workforces and face-to-face relations. These include high-tech sectors, pharmaceuticals and financial and business services. which place significant value on face-to-face relations, rapid delivery of high value goods, and supporting a mobile workforce

Air connectivity increases with the number of destinations served and the frequency of flights along these routes. This in turn will make a location more attractive to foreign investment and increase the potential for business efficiency and ultimately generates a virtuous cycle of connectivity and economic growth

Virginia's economy is able to leverage the easy and immediate international connectivity afforded by Washington Dulles International Airport. Many foreign-owned firms have operations in Virginia, especially in close proximity to the airport. According to the U.S. Bureau of Economic Affairs, 837 firms with assets of more than $20 million operated affiliates in the Commonwealth.

Table V-5: Affiliates of Foreign Firms in Virginia

Region	Country	Number of Affiliates
Europe	France	69
	Germany	82
	Netherlands	32
	Switzerland	47
	United Kingdom	116
	Other	142
Asia	Japan	125
	Other	73
N. America	Canada	73
All Other		78
Total		**837**

Source: BEA (data for 2015)

These firms employ over 180,000 individuals. Nearly 50,000 of them work in manufacturing, and more than 30,000 work in professional, scientific, and technical services; information, finance, insurance, and real estate.

Air Connectivity and Economic Growth in Virginia

The project team applied a measure of connectivity developed for the International Air Transport Association (IATA) to quantify the non-tourism wider economic benefits of air transportation in Virginia.[32] The IATA connectivity index measures the scope of access between an individual airport, region or country, and the global economy. The index measures the number and size (passenger air traffic) of destinations served, the frequency of service to each, and the number of onward connections available from those destinations. The index recognizes that connections to major gateways provide greater global connectivity than connections to the same number of spoke ends. For example, direct service to 40 small regional destinations does not have the same importance as direct connections to 40 major global markets.

The IATA index is calculated from airline schedule data for passenger services for both domestic and international services. The connectivity index measures the number of frequencies and available seats to a destination. It then weights the number of available seats by the size of the destination airport (the number of passengers handled each year). The weighting reflects both the size and economic importance of the destination and the potential for convenient onward connections.

The project team analyzed the relationship between air connectivity and economic growth using data on the IATA connectivity index and GDP per capita related to the commercial service airports in Virginia between 2011 and 2016. This is referred to as panel data, as it incorporates both time series variation (changes over time) and cross-sectional variation (changes between airports).

[32] Inter*VISTAS* Consulting Inc., "Measuring the Economic Rate of Return on Investment in Aviation", December 2006. This study is one of the few that are based on global data and provides a parameter that specifically addresses productivity rather than other aspects of aviation economic impacts such as airport activity or tourism.

Wider Economic Benefits on Productivity, Trade and Investment

To quantify the wider economic benefits related to productivity, trade and investment, the project team analyzed the changes in air connectivity at airports in Virginia since 2011. The analysis estimates the GDP per capita (and from that, GDP) that stems from the growth in connectivity.

The IATA study found that a one percent increase in a nation's air connectivity increased the nation's productivity (measured in terms of GDP per hour or GDP per worker) each year by 0.0068 percent. While the outcome from the parameter is expressed in terms of GDP per hour or worker, it captures the aggregate net effect of a range of catalytic impacts including trade, investment, business location, etc., which manifest themselves as greater GDP per worker.[33] For example, greater trade allows businesses to benefit from economies of scale as they sell to a larger market. Investment decisions (expanding operations, developing new operations, introducing new technologies) will also have the effect of improving the value-added produced by each worker.

The result of the analysis is an estimate of the amount of GDP foregone if commercial air connectivity in Virginia had not changed over the last five years. Arguably, this is a conservative approach to estimating the wider economic benefits, as it does not consider connectivity changes prior to 2011.

For example, between 2011 and 2016, Richmond International Airport's connectivity index increased by about three percent. Applying the catalytic parameter, this suggests the contribution to per capita GDP growth was 0.0068 x 3 percent = 0.02 percent.[34] This percentage was applied to the GDP per capita for the Richmond Metropolitan Statistical Area (MSA) of $55,631 in 2011 (inflated to 2016 prices) and multiplied by the same MSA's population of 1.27 million:

$55,631 x 0.02 percent x 1.27 million = $14 million

Similar calculations were performed for each of the eight other commercial service airports. The GDP attributable to the wider economic benefits of commercial air transportation in Virginia/DC is the result of incremental economic activity supported and stimulated by air connectivity – greater trade, new investment and higher productivity. This stimulates spending by businesses and individuals in the economy, due to wealth creation, and can be translated into employment impacts.

The estimated non-tourism wider economic benefit impacts of commercial aviation in Virginia/DC are in Table V-6. It is estimated that nearly 2,500 jobs are associated with the non-tourism wider economic benefits of commercial air transportation in the area. The non-tourism wider economic benefits generated approximately $270 million in GDP. This is approximately 0.04 percent of the total combined GDP of Virginia and DC in 2016.[35]

[33] The original analysis that produced the connectivity parameter did not include any variables related to trade or business location. Therefore, air connectivity's contribution to these effects is captured by the coefficient on GDP per hour.

[34] Rounded from 0.0203%.

[35] Based on data from the U.S. Bureau of Economic Analysis as of May 2017, the combined real GDP of Virginia and the District of Columbia was $609 billion in 2016.

Table V-6: Non-Tourism Wider Economic Benefits of Virginia Commercial Aviation (2016)
(dollars in millions)

Impact	Jobs	GDP
Wider Economic Benefits	2,500	$270

Conclusion

Virginia's commercial service airports contribute to substantial economic activity in the Commonwealth beyond employment with airlines and at airports. Commercial aviation supports Virginia's businesses by facilitating and encouraging trade. Over 800 foreign-owned firms, employing more than 180,000 individuals, are in Virginia in part because of the economic opportunities available and in part because of the ease of access via international air service. Virginia's businesses rely on aviation to support a significant number of their operations. With $4.2 billion in spending in 2016, Virginia businesses imported and exported more than $8 billion in goods by air in 2016, much of it through Washington Dulles. Finally, improvements in connectivity to major domestic and international business centers have increased GDP growth in Virginia by an additional $270 million since 2011.

Chapter VI: Tax Impacts of Virginia's Public Use Airports

For local governments and the Commonwealth, another important part of the economic impact of airports is the significant volume of tax revenue they generate. Direct employment in the industry provides millions of dollars of tax revenue to public treasuries, and there are myriad other taxes levied locally and by the state that also add to the coffers.

Table VI-1 summarizes the federal, state, and local tax revenues generated through the operations of Virginia's commercial service airports. The taxes shown for the two Washington-area airports include those paid only by employees who live in Virginia. Many employees at those airports live in Maryland, the District of Columbia, or other states such as West Virginia. Taxes paid to those jurisdictions are not included. The taxes are summarized into major groupings:

- Social Insurance taxes. This includes both the amounts contributed by employees and employers to Social Security;
- Federal income taxes, those paid to the Federal government on personal income;
- Other federal taxes, including all federal excise and customs duties levied on alcohol, tobacco, telephones or such items as rents and royalties, special assessments, fines, settlements, and donations;
- State income taxes paid to the Commonwealth on personal income; and
- Other state and local taxes, including estimated tax receipts paid by employees for such items as property taxes, retail sales taxes, gas taxes, motor vehicle licenses, gasoline, alcohol, tobacco and other consumables.

The direct operations of these airports (exclusive of employment and wages attributable to indirect and induced economic impacts) approached $500 million in federal tax revenues and nearly $515 million in Virginia and local taxes. (The estimate is based on taxes linked to employment associated with airport operations; individual employees might pay additional taxes and fees depending upon their personal circumstances. The estimate excludes any consideration of corporate or business taxes that might be payable to any level of government.) The largest components of the state/local taxes are those associated with retail sales and property taxes. Property taxes fund local government operations. Virginia taxes both real estate and personal property (e.g., autos, boats, trailers).

Table VI-1: Tax Revenues Attributable to Direct Employment at the Commercial Service Airports (dollars in thousands)

Airport	Federal Taxes				State/Local Taxes			
	Social Insurance	Personal Income Tax	Other Taxes/Fees	**Total Federal**	Social Insurance	Personal Income Tax	Other State & Local Taxes/Fees	**Total State & Local**
Charlottesville - Albemarle	$ 3,646	$ 3,171	$ 1,258	$ 8,075	$ 124	$ 881	$ 8,787	$ 9,791
Lynchburg Regional	$ 3,022	$ 1,909	$ 449	$ 5,380	$ 34	$ 542	$ 2,615	$ 3,191
Newport News-Williamsburg International	$ 5,027	$ 3,214	$ 1,186	$ 9,428	$ 57	$ 909	$ 8,369	$ 9,334
Norfolk International	$ 20,178	$ 12,801	$ 4,559	$ 37,539	$ 241	$ 3,627	$ 33,829	$ 37,697
Richmond International	$ 22,089	$ 15,534	$ 10,358	$ 47,981	$ 455	$ 5,958	$ 53,600	$ 60,013
Roanoke-Blacksburg Regional	$ 6,448	$ 2,249	$ 3,182	$ 11,879	$ 72	$ 639	$ 18,539	$ 19,250
Ronald Reagan Washington National *(Virginia only)*	$ 73,504	$ 58,191	$ 17,851	$ 149,546	$ 700	$ 15,453	$ 190,180	$ 206,332
Shenandoah Valley Regional	$ 1,224	$ 844	$ 390	$ 2,457	$ 20	$ 241	$ 1,641	$ 1,901
Washington Dulles International *(Virginia only)*	$ 115,998	$ 91,461	$ 15,459	$ 222,918	$ 1,154	$ 25,087	$ 140,337	$ 166,577
Total Commercial Service Airports	**$ 251,135**	**$ 189,375**	**$ 54,693**	**$ 495,203**	**$ 2,855**	**$ 53,336**	**$ 457,896**	**$ 514,087**

Source: InterVISTAS analysis of data from IMPLAN tax module

The GA airports also contribute significant amounts of federal, Virginia, and local taxes. Table VI-2 summarizes the same taxes attributable to direct employment at those facilities. The ongoing direct operations of these airports (exclusive of employment and wages attributable to indirect and induced economic impacts) exceeded $36 million in federal tax revenues and $22 million in Virginia and local taxes.

Table VI-2: Tax Revenues Attributable to Direct Employment at the GA Airports (dollars in thousands)

Airport	Federal Taxes				State/Local Taxes			
	Social Insurance	Personal Income Tax	Other Taxes/Fees	**Total Federal**	Social Insurance	Personal Income Tax	Other State & Local Taxes/Fees	**Total State & Local**
Accomack Country	$ 67	$ 53	$ 2	$ 122	$ 1	$ 15	$ 13	$ 28
Blackstone Allen C Perkinson	$ 514	$ 290	$ 14	$ 818	$ 21	$ 84	$ 105	$ 210
Blue Ridge Regional	$ 153	$ 122	$ 3	$ 278	$ 2	$ 35	$ 19	$ 56
Bridgewater Air Park	$ 2,410	$ 1,711	$ 1,637	$ 5,758	$ 39	$ 487	$ 6,523	$ 7,049
Brookneal-Campbell County	$ 3	$ 2	$ 0	$ 4	$ 0	$ 0	$ 2	$ 2
Chase City	$ 9	$ 9	$ 0	$ 19	$ 0	$ 3	$ 2	$ 5
Chesapeake Regional	$ 234	$ 167	$ 6	$ 407	$ 3	$ 47	$ 45	$ 95
Crewe Municipal	$ 9	$ 5	$ 0	$ 14	$ 0	$ 2	$ 2	$ 4
Culpeper Regional	$ 102	$ 106	$ 8	$ 216	$ 1	$ 29	$ 56	$ 87
Danville Regional	$ 81	$ 41	$ 25	$ 147	$ 1	$ 12	$ 125	$ 138
Dinwiddie County	$ 226	$ 219	$ 29	$ 474	$ 3	$ 62	$ 171	$ 236
Emporia-Greensville	$ 24	$ 20	$ 2	$ 46	$ 1	$ 6	$ 9	$ 15
Falwell	$ 9	$ 6	$ 1	$ 15	$ 0	$ 2	$ 5	$ 7
Farmville Regional	$ 22	$ 11	$ 1	$ 34	$ 1	$ 3	$ 5	$ 9
Franklin Municipal	$ 62	$ 50	$ 1	$ 114	$ 1	$ 14	$ 9	$ 24
Front Royal - Warren County	$ 81	$ 61	$ 5	$ 147	$ 1	$ 17	$ 32	$ 50
Gordonsville Municipal	$ 89	$ 116	$ 3	$ 208	$ 2	$ 32	$ 20	$ 54
Grundy Municipal	$ 3	$ 2	$ 0	$ 6	$ 0	$ 1	$ 2	$ 3
Hampton Roads	$ 706	$ 512	$ 238	$ 1,455	$ 9	$ 145	$ 1,734	$ 1,887
Hanover County Municipal	$ 152	$ 121	$ 37	$ 310	$ 2	$ 34	$ 122	$ 159
Hummel Field	$ 17	$ 11	$ 1	$ 29	$ 0	$ 3	$ 4	$ 8
Ingalls Field	$ 1	$ 1	$ 0	$ 2	$ -	$ 0	$ 2	$ 2
Lake Anna	$ 60	$ 103	$ 1	$ 164	$ 0	$ 29	$ 3	$ 33
Lake Country Regional	$ 13	$ 19	$ 0	$ 32	$ 0	$ 5	$ 2	$ 7
Lawrenceville-Brunswick Municipal	$ 8	$ 10	$ 0	$ 18	$ 0	$ 3	$ 2	$ 5
Lee County	$ 5	$ 3	$ 0	$ 9	$ 0	$ 1	$ 2	$ 3
Leesburg Executive	$ 2,569	$ 3,342	$ 203	$ 6,115	$ 17	$ 915	$ 1,881	$ 2,812

Table VI-2 (continued)

Airport	Federal Taxes				State/Local Taxes			
	Social Insurance	Personal Income Tax	Other Taxes/Fees	**Total Federal**	Social Insurance	Personal Income Tax	Other State & Local Taxes/Fees	**Total State & Local**
Lonesome Pine	$ 23	$ 12	$ 1	$ 36	$ 1	$ 3	$ 7	$ 11
Louisa County	$ 239	$ 446	$ 52	$ 737	$ 0	$ 127	$ 218	$ 345
Lunenburg County	$ 21	$ 14	$ 1	$ 35	$ 0	$ 4	$ 4	$ 8
Luray Caverns	$ 9	$ 6	$ 1	$ 16	$ 0	$ 2	$ 3	$ 5
Manassas Regional	$ 6,326	$ 5,779	$ 377	$ 12,483	$ 61	$ 1,585	$ 3,564	$ 5,210
Mecklenburg-Brunswick Regional	$ 50	$ 55	$ 2	$ 107	$ 0	$ 16	$ 12	$ 29
Middle Peninsula Regional	$ 228	$ 181	$ 11	$ 420	$ 5	$ 52	$ 91	$ 148
Mountain Empire	$ 18	$ 11	$ 1	$ 31	$ 0	$ 3	$ 5	$ 9
New Kent County	$ 37	$ 23	$ 3	$ 63	$ 1	$ 6	$ 7	$ 14
New London	$ 3	$ 2	$ 0	$ 5	$ 0	$ 1	$ 2	$ 2
New Market	$ 45	$ 36	$ 3	$ 84	$ 1	$ 10	$ 12	$ 23
New River Valley	$ 73	$ 38	$ 3	$ 114	$ 2	$ 11	$ 19	$ 32
Orange County	$ 209	$ 138	$ 7	$ 354	$ 4	$ 39	$ 53	$ 96
Richmond Executive Chesterfield County	$ 780	$ 510	$ 715	$ 2,005	$ 13	$ 142	$ 2,266	$ 2,422
Shannon	$ 141	$ 103	$ 5	$ 248	$ 2	$ 28	$ 45	$ 76
Smith Mountain Lake	$ 32	$ 35	$ 10	$ 77	$ 0	$ 10	$ 58	$ 68
Stafford Regional	$ 350	$ 250	$ 13	$ 613	$ 6	$ 69	$ 119	$ 194
Suffolk Executive	$ 151	$ 107	$ 4	$ 263	$ 2	$ 30	$ 33	$ 66
Tangier Island	$ 10	$ 8	$ 0	$ 17	$ 0	$ 2	$ 2	$ 4
Tappahannock-Essex County	$ 198	$ 260	$ 7	$ 465	$ 2	$ 75	$ 51	$ 128
Tazewell County	$ 14	$ 8	$ 1	$ 23	$ 0	$ 2	$ 5	$ 8
Twin County	$ 31	$ 18	$ 6	$ 55	$ 1	$ 5	$ 31	$ 37
Virginia Highlands	$ 231	$ 141	$ 4	$ 375	$ 4	$ 40	$ 19	$ 62
Virginia Tech	$ 160	$ 84	$ 6	$ 250	$ 7	$ 24	$ 44	$ 74
Wakefield Municipal	$ 9	$ 12	$ 1	$ 21	$ 0	$ 3	$ 3	$ 7

Table VI-2 (continued)

Airport	Federal Taxes				State/Local Taxes			
	Social Insurance	Personal Income Tax	Other Taxes/Fees	**Total Federal**	Social Insurance	Personal Income Tax	Other State & Local Taxes/Fees	**Total State & Local**
Warrenton-Fauquier	$ 103	$ 80	$ 4	$ 187	$ 2	$ 22	$ 34	$ 58
Waynesboro Eagles Nest	$ 8	$ 5	$ 0	$ 13	$ 0	$ 1	$ 2	$ 3
William M Tuck	$ 18	$ 15	$ 1	$ 34	$ 0	$ 4	$ 3	$ 8
Williamsburg-Jamestown	$ 54	$ 38	$ 3	$ 95	$ 1	$ 11	$ 20	$ 31
Winchester Regional	$ 249	$ 211	$ 25	$ 485	$ 3	$ 60	$ 172	$ 234
Total	**$ 17,447**	**$ 15,740**	**$ 3,485**	**$ 36,672**	**$ 225**	**$ 4,375**	**$ 17,798**	**$ 22,399**

Source: InterVISTAS analysis of data from IMPLAN tax module. Restricted to taxes generated from direct employment only.

As noted earlier, visitors who travel to these areas also support additional employment in the Commonwealth, with a large proportion in the accommodations and food service industries. Table VI-3 summarizes the contributions to federal, state, and local tax revenues from direct employment in those sectors supported by visitor spending, where the visitors arrived using the commercial service airports. (Note the figures shown for the two Washington, DC-area airports are limited to the taxes from spending by visitors within the Commonwealth; the effects of spending by visitors using those airports in the District of Columbia, Maryland, or elsewhere are not included.) Table VI-4 summarizes the comparable contributions to federal, state, and local tax revenues from visitors who used the GA airports.

Table VI-3: Estimated Tax Revenues: Impact of Employment from Visitors Using Commercial Service Airports (dollars in thousands)

Airport	Federal Taxes				State/Local Taxes			
	Social Insurance	Personal Income Tax	Other Fed. Taxes/Fees	**Total Federal**	Social Insurance	Personal Income Tax	Other State & Local Taxes/Fees	**Total State & Local**
Charlottesville Albermarle	$ 1,939	$ 1,273	$ 404	$ 3,616	$ 77	$ 354	$ 2,823	$ 3,254
Lynchburg Regional	$ 934	$ 519	$ 222	$ 1,675	$ 11	$ 147	$ 1,293	$ 1,451
Newport News - Williamsburg International	$ 1,790	$ 1,150	$ 381	$ 3,321	$ 20	$ 325	$ 2,687	$ 3,032
Norfolk International	$ 16,286	$ 10,664	$ 3,734	$ 30,684	$ 192	$ 3,021	$ 27,707	$ 30,920
Richmond International	$ 17,184	$ 12,000	$ 6,890	$ 36,074	$ 271	$ 3,355	$ 22,898	$ 26,524
Roanoke - Blacksburg Regional	$ 2,786	$ 991	$ 669	$ 4,446	$ 31	$ 282	$ 3,897	$ 4,210
Ronald Reagan Washington National *(Virginia only)*	$ 53,114	$ 42,606	$ 7,893	$ 103,613	$ 523	$ 11,686	$ 71,652	$ 83,861
Shenandoah Valley Regional	$ 119	$ 74	$ 34	$ 227	$ 2	$ 21	$ 141	$ 164
Washington Dulles International *(Virginia only)*	$ 42,563	$ 34,353	$ 6,860	$ 83,776	$ 418	$ 9,423	$ 62,278	$ 72,119
Total Commercial Service Airports	**$ 136,715**	**$ 103,630**	**$ 27,087**	**$ 267,432**	**$ 1,545**	**$ 28,614**	**$ 195,376**	**$ 225,535**

Source: Inter*VISTAS* analysis of data from IMPLAN tax module

Table VI-4: Estimated Tax Revenues: Impact of Employment from Visitors Using GA Airports (dollars in thousands)

Airport	Federal Taxes				State/Local Taxes			
	Social Insurance	Personal Income Tax	Other Fed. Taxes/Fees	**Total Federal**	Social Insurance	Personal Income Tax	Other State & Local Taxes/Fees	**Total State & Local**
Accomack Country	$52	$38	$8	$98	$1	$11	$55	$67
Blackstone Allen C Perkinson	$1	$1	$0	$2	$0	$0	$1	$1
Blue Ridge Regional	$98	$66	$20	$184	$1	$19	$117	$138
Bridgewater Air Park	$14	$9	$3	$27	$0	$3	$14	$17
Brookneal-Campbell County	$3	$1	$1	$4	$0	$0	$3	$4
Chase City	$7	$5	$1	$13	$0	$1	$6	$7
Chesapeake Regional	$69	$48	$10	$127	$1	$14	$70	$85
Crewe Municipal	$1	$0	$0	$1	$0	$0	$1	$1
Culpeper Regional	$131	$88	$23	$241	$2	$25	$161	$188
Danville Regional	$73	$37	$23	$133	$1	$10	$113	$124
Dinwiddie County	$109	$82	$19	$211	$2	$23	$115	$140
Emporia-Greensville	$4	$4	$1	$10	$0	$1	$7	$8
Falwell	$5	$2	$1	$7	$0	$1	$5	$6
Farmville Regional	$34	$18	$6	$58	$1	$5	$38	$44
Franklin Municipal	$14	$13	$2	$29	$0	$4	$13	$17
Front Royal - Warren County	$36	$28	$7	$71	$1	$8	$45	$53
Gordonsville Municipal	$6	$5	$1	$12	$0	$1	$7	$8
Grundy Municipal	$1	$1	$0	$2	$0	$0	$3	$3
Hampton Roads	$339	$254	$47	$639	$4	$72	$343	$419
Hanover County Municipal	$78	$55	$16	$150	$1	$15	$54	$71
Hummel Field	$3	$2	$0	$6	$0	$1	$3	$4
Ingalls Field	$44	$33	$12	$89	$1	$9	$63	$73
Lake Anna	$0	$0	$0	$1	$0	$0	$0	$0
Lake Country Regional	$5	$4	$1	$10	$0	$1	$4	$5
Lawrenceville-Brunswick Municipal	$2	$2	$0	$4	$0	$0	$2	$3
Lee County	$18	$15	$4	$36	$0	$4	$21	$26
Leesburg Executive	$143	$133	$11	$287	$1	$36	$102	$140

Table VI-4 (continued)

Airport	Federal Taxes				State/Local Taxes			
	Social Insurance	Personal Income Tax	Other Fed. Taxes/Fees	**Total Federal**	Social Insurance	Personal Income Tax	Other State & Local Taxes/Fees	**Total State & Local**
Lonesome Pine	$34	$17	$10	$60	$1	$5	$65	$71
Louisa County	$64	$74	$10	$147	$1	$21	$41	$63
Lunenburg County	$0	$0	$0	$1	$0	$0	$0	$0
Luray Caverns	$34	$24	$9	$67	$1	$7	$33	$40
Manassas Regional	$278	$254	$23	$555	$3	$70	$214	$286
Mecklenburg-Brunswick Regional	$19	$15	$3	$37	$0	$4	$18	$22
Middle Peninsula Regional	$59	$35	$8	$102	$1	$10	$69	$80
Mountain Empire	$16	$10	$1	$27	$0	$3	$4	$7
New Kent County	$75	$43	$17	$135	$1	$12	$45	$58
New London	$19	$10	$4	$33	$0	$3	$22	$25
New Market	$11	$9	$3	$23	$0	$2	$12	$15
New River Valley	$20	$10	$2	$32	$1	$3	$17	$20
Orange County	$27	$15	$5	$48	$1	$4	$38	$43
Richmond Executive Chesterfield County	$57	$39	$12	$109	$1	$11	$39	$51
Shannon	$27	$22	$3	$52	$0	$6	$27	$34
Smith Mountain Lake	$8	$6	$2	$16	$0	$2	$11	$13
Stafford Regional	$129	$104	$15	$247	$2	$29	$130	$161
Suffolk Executive	$9	$9	$1	$19	$0	$2	$9	$12
Tangier Island	$3	$2	$0	$5	$0	$1	$3	$4
Tappahannock-Essex County	$4	$2	$1	$7	$0	$1	$4	$5
Tazewell County	$7	$6	$1	$15	$0	$2	$7	$9
Twin County	$28	$16	$7	$51	$1	$5	$39	$45
Virginia Highlands	$42	$26	$13	$81	$1	$7	$65	$73
Virginia Tech	$84	$47	$11	$142	$4	$13	$82	$98
Wakefield Municipal	$35	$41	$9	$85	$1	$12	$47	$59

Table VI-4 (continued)

Airport	Federal Taxes				State/Local Taxes			
	Social Insurance	Personal Income Tax	Other Fed. Taxes/Fees	**Total Federal**	Social Insurance	Personal Income Tax	Other State & Local Taxes/Fees	**Total State & Local**
Warrenton-Fauquier	$163	$130	$17	$310	$3	$36	$152	$190
Waynesboro Eagles Nest	$7	$5	$1	$13	$0	$1	$7	$8
William M Tuck	$20	$21	$4	$45	$0	$6	$22	$28
Williamsburg-Jamestown	$65	$52	$11	$129	$1	$15	$75	$90
Winchester Regional	$91	$71	$17	$179	$1	$20	$119	$140
Total	**$2,724**	**$2,057**	**$440**	**$5,221**	**$43**	**$577**	**$2,782**	**$3,402**

Source: InterVISTAS analysis of data from IMPLAN tax module. Totals may not sum due to rounding.

In addition, the activities of the visitors contribute other tax revenues to the Commonwealth and local governments. Visitor spending contributes incremental tax revenues via hotel occupancy taxes, sales taxes paid on retail spending, and other consumption-related taxes. Table VI-5 summarizes these additional revenues to the Commonwealth and to local governments from visitors who arrived at commercial service airports. In total, visitors who arrived via the commercial service airports paid nearly $250 million in taxes to Virginia and local governments in 2016. Table VI-6 summarizes the same information for visitors who arrived via GA airports.

Table VI-5: Summary of Estimated Tax Revenues from Visitor Spending Activities – Commercial Service Airports (dollars in thousands)

Airport	Local Taxes	State Taxes	Total
Charlottesville Albemarle	$2,010	$1,411	$3,420
Lynchburg Regional	$735	$601	$1,335
Newport News - Williamsburg Internationa	$2,402	$1,395	$3,797
Norfolk International	$26,177	$13,378	$39,556
Richmond International	$20,298	$10,950	$31,249
Roanoke-Blacksburg Regional	$3,588	$1,648	$5,236
Ronald Reagan Washington National	$49,538	$33,374	$82,912
Shenandoah Valley Regional	$81	$72	$154
Washington Dulles International	$42,196	$34,832	$77,028
Total	**$147,025**	**$97,662**	**$244,687**

Source: InterVISTAS analysis

Table VI-6: Summary of Estimated Tax Revenues from Visitor Spending Activities – GA Airports (dollars in thousands)

Airport	Local Taxes	State Taxes	Total
Accomack County	$12	$29	$40
Blackstone AAF	$0	$1	$1
Blue Ridge Regional	$55	$59	$114
Bridgewater Air Park	$8	$8	$16
Brookneal-Campbell County	$2	$2	$3
Chase City Municipal	$1	$3	$4
Chesapeake Regional	$53	$44	$97
Crewe Municipal	$0	$0	$1
Culpeper County	$50	$80	$131
Danville Regional	$18	$18	$36
Dinwiddie County Airport	$40	$61	$101
Emporia-Greensville Regional	$2	$4	$6
Falwell	$3	$3	$5
Farmville Regional	$5	$19	$24
Franklin Municipal	$10	$8	$19

Table VI-6 (continued)

Airport	Local Taxes	State Taxes	Total
Front Royal-Warren County	$17	$24	$41
Gordonsville Municipal	$4	$4	$7
Grundy Municipal	$1	$1	$2
Hampton Roads Executive	$257	$217	$474
Hanover County Municipal	$33	$37	$70
Hummel Field	$1	$2	$3
Ingalls Field	$31	$33	$64
Lake Anna	$0	$0	$0
Lake Country Regional	$1	$2	$3
Lawrenceville-Brunswick Municipal	$1	$1	$2
Lee County	$3	$11	$14
Leesburg Executive	$38	$76	$115
Lonesome Pine	$10	$29	$39
Louisa County	$25	$29	$54
Lunenburg County	$0	$0	$0
Luray Caverns	$14	$19	$33
Manassas Regional	$63	$154	$216
Mecklenburg-Brunswick Regional	$4	$10	$13
Middle Peninsula Regional	$28	$33	$61
Mountain Empire	$13	$21	$34
New Kent County	$40	$34	$74
New London	$11	$11	$22
New Market	$6	$7	$13
New River Valley	$4	$9	$13
Orange County	$9	$18	$27
Richmond Executive Chesterfield County	$25	$27	$52
Shannon	$10	$16	$26
Smith Mountain Lake	$5	$6	$11
Stafford Regional	$47	$77	$124
Suffolk Executive	$7	$6	$12
Tangier Island	$1	$2	$2
Tappahannock-Essex County	$1	$2	$3
Tazewell County	$1	$4	$5
Twin County	$18	$21	$38
Virginia Highlands	$19	$31	$51
Virginia Tech	$22	$44	$66
Wakefield Municipal	$26	$28	$54
Warrenton-Fauquier	$47	$95	$142
Waynesboro/Eagle's Nest	$4	$4	$8
William M. Tuck	$12	$12	$24
Williamsburg-Jamestown	$53	$45	$98
Winchester Regional	$59	$61	$120
Total	**$1,231**	**$1,598**	**$2,829**

Source: Inter*VISTAS* analysis. Totals may not sum due to rounding.

Chapter VII: Summary of Economic Impact of Virginia's Public Use Airports

As described throughout this report, the Commonwealth of Virginia's 66 public-use airports play a vital role in the state and regional economies by creating jobs and contributing to overall economic development. In addition, these airports serve as gateways to the nation's air transportation system and connect the Commonwealth to the global economy.

Virginia is home to a significant amount of public aviation activity. In 2016:

- Each day, more than 4,000 aircraft took off from and landed at Virginia airports.
- More than 72,000 people boarded commercial aircraft in Virginia every day.
- Each day, approximately 23,000 visitors arrived in the state on commercial airline or general aviation aircraft.

This activity generates economic impacts in the local communities and regions throughout the Commonwealth, which is summarized briefly here.

Economic Impact of Airport Operations

The economic impact of airport operations includes the direct, indirect, and induced impacts associated with airport, airline, and GA operations. On-airport tenants and businesses create jobs and purchase goods and supplies from other Virginia businesses which create and support additional jobs in other sectors of the state's economy. Examples of on-airport tenants and businesses include airlines, air ambulance operators, aircraft sales and management companies, airport management, corporate flight departments, FBOs, ground transportation operators, local and state government agencies, rental car agencies, retail concessions, TSA agents, air traffic controllers, and others. Economic activity at the airports also drive employment off airport properties with supplier industries (e.g., food wholesalers that sell to aircraft caterers or to on-airport concessionaires). And when these employees spend their wages, that in turn drives additional local and regional economic activity.

Table VII-1: Total Impacts from Airport Operations (dollars in millions)

	Total Airport-Related Impacts		
Airport	Jobs	Wages	Output
Commercial Service - Large & Medium Hub	64,550	$4,240	$12,840
Commercial Service - Small & Non-Hub	18,700	$1,070	$3,400
General Aviation	4,380	$310	$940
Total	**87,630**	**$5,620**	**$17,180**

Figures may not total due to rounding.
The large and medium hub airports are Ronald Reagan Washington National and Washington Dulles International airports.
The small and non-hub airports are Charlottesville Albemarle, Lynchburg Regional Newport News – Williamsburg International, Norfolk International, Richmond International, Roanoke – Blacksburg Regional, and Shenandoah Valley Regional airports.

Economic Impact of Visitor Spending

Virginia's airports are conduits for bringing millions of visitors to the Commonwealth. In 2016, over 10 million visitors came to the Commonwealth through its airports and spent an estimated $3.6 billion. These visitors include travelers who arrived at any Virginia airport on general aviation. Visitor spending supported nearly 60,000 total jobs in the Commonwealth, generating over $2 billion in earnings and nearly $6 billion in total economic activity.

Table VII-2: Total Impacts from Visitor Spending (dollars in millions)

	Total Visitor Impacts		
Airport	**Jobs**	**Wages**	**Output**
Commercial Service - Large & Medium Hub	35,350	$1,420	$3,630
Commercial Service - Small & Non-Hub	21,940	$660	$1,930
General Aviation	1,740	$50	$130
Total	**59,030**	**$2,130**	**$5,690**

Figures may not total due to rounding.
The large and medium hub airports are Ronald Reagan Washington National and Washington Dulles International airports.
The small and non-hub airports are Charlottesville Albemarle, Lynchburg Regional Newport News – Williamsburg International, Norfolk International, Richmond International, Roanoke – Blacksburg Regional, and Shenandoah Valley Regional airports.

Consolidated Impact of Virginia's Public Use Airports

Counting both the impacts of airport operations and related visitor spending, In 2016, through aviation-related services, the system supported 146,660 jobs, provided over $7.7 billion in earnings, and generated almost $23 billion in economic activity while meeting the air travel needs of Virginia residents, businesses and visitors. This represents 3.6 percent of all jobs in Virginia.

Table VII-3: Total Impacts from Visitor Spending (dollars in millions)

	Total Consolidated Impacts		
Airport	**Jobs**	**Wages**	**Output**
Commercial Service - Large & Medium Hub	99,900	$5,650	$16,470
Commercial Service - Small & Non-Hub	40,640	$1,730	$5,330
General Aviation	6,120	$370	$1,070
Total	**146,660**	**$7,750**	**$22,870**

Figures may not total due to rounding.
The large and medium hub airports are Ronald Reagan Washington National and Washington Dulles International airports.
The small and non-hub airports are Charlottesville Albemarle, Lynchburg Regional Newport News – Williamsburg International, Norfolk International, Richmond International, Roanoke – Blacksburg Regional, and Shenandoah Valley Regional airports.

Tax Impacts from Airports

Direct employment at Virginia's airports generates significant tax revenues for federal, Virginia, and local governments. Totals surpassed $530 million in federal tax revenues and $535 million in Virginia and local taxes.

Table VII-4: Total Tax Impacts from Virginia's Airports (dollars in thousands)

	Federal Taxes				State/Local Taxes			
Airport Classification	Social Insurance	Personal Income Tax	Other Fed. Taxes/Fees	Total Federal Taxes	Social Insurance	Personal Income Tax	Other Taxes/Fees	Total State & Local Taxes
Commercial Service - Large & Medium Hub	$190,000	$150,000	$33,000	$372,000	$2,000	$41,000	$331,000	$373,000
Commercial Service - Small & Non-Hub	$61,000	$40,000	$22,000	$123,000	$1,000	$12,000	$127,000	$141,000
General Aviation	$17,000	$16,000	$3,000	$37,000	$225	$4,000	$18,000	$22,000
Total	**$268,000**	**$206,000**	**$58,000**	**$532,000**	**$3,225**	**$57,000**	**$476,000**	**$536,000**

Figures may not total due to rounding.
The large and medium hub airports are Ronald Reagan Washington National and Washington Dulles International airports.
The small and non-hub airports are Charlottesville Albemarle, Lynchburg Regional Newport News – Williamsburg International, Norfolk International, Richmond International, Roanoke – Blacksburg Regional, and Shenandoah Valley Regional airports.

The employment impacts from visitor spending added another $270 million in federal taxes and $230 million in taxes to Virginia and local governments. In addition, the direct spending by visitors added nearly another $250 million in retail sales and hotel occupancy taxes.

Chapter VIII: Changes in Economic Impact from 2010 to 2016

In general, the changes in economic impact at Virginia's airports are consistent with expectations driven by changes in passenger activity, airline service, and GA activity. For most of Virginia's airports, the economic impacts increased since the earlier report (which documented the economic impact as of 2010). Comparisons of the direct, indirect, induced, and total economic impacts of airport operations and visitor spending are straightforward. Both studies used similar methodologies.

However, comparisons with the results attributable to the Washington-area airport were complicated by different methodologies and timeframes. The results in the prior Virginia study were from a different consulting firm, using a different methodology. The project team believes the impacts of on-airport operations can be reasonably compared, but not those associated with visitor spending. MWAA also commissioned another economic impact study (completed in 2012). The results relating to airport operations can be compared with this study's results, but not those associated with visitor spending because of vastly different methodologies.

Table VIII-1 summarizes the changes in the total (direct, indirect, plus induced) economic impacts of Virginia's commercial service airports, excluding the impacts of visitor spending. The figures include the impacts of capital development at the airports during each period. The total employment supported by Virginia's commercial service airports increased by 30,000 between 2010 and 2016, with increases in total wages of over $2.6 billion. Total economic output associated with the airports rose by nearly $7 billion. Changes in GDP cannot be compared because the earlier study did not include that information.

Table VIII-2 summarizes the changes in the visitor spending impacts at all airports except the MWAA airports. (Again, comparisons are not valid because of the differences in methodologies.) At most of Virginia's airports, visitor spending impacts rose after 2010. Visitor spending impacts at the non-MWAA airports increased employment by more than 800 jobs, added $29 million in wages and an increase of about $28 million in total economic output.

Virginia's GA airports also contributed more to the Commonwealth's economy in 2016 than in 2010. Although total (direct, indirect, plus induced) employment dropped at 20 of the 57 airports, those losses were more than offset by increases at 34 other airports. (At three airports, there was no change in total employment.) Total employment supported by GA airports rose by more than 950 jobs, with an accompanying increase in total wages of about $150 million and $330 million in total economic output. Table VIII-3 summarizes the changes in the total economic impacts of Virginia's GA airports, excluding the impacts of visitor spending.

Table VIII-1: Summary of 2016 Results vs. 2010 Results, Commercial Service Airports (*Impacts of visitor spending excluded*)
(dollars in millions)

	2016 Total Results				2010 Total Results				Change			
Airport	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output
Charlottesville Albermarle	1,168	$74	$119	$214	363	$15	N/A	$51	805	$59	N/A	$162
Lynchburg Regional	1,075	$46	$68	$130	389	$16	N/A	$67	686	$30	N/A	$63
Newport News - Williamsburg International	1,468	$92	$159	$327	984	$41	N/A	$152	484	$51	N/A	$175
Norfolk International	5,697	$335	$543	$1,026	2,852	$109	N/A	$394	2,845	$226	N/A	$632
Richmond International	7,111	$407	$705	$1,269	2,304	$99	N/A	$323	4,807	$308	N/A	$946
Roanoke - Blacksburg Regional	1,831	$99	$186	$373	995	$30	N/A	$104	836	$69	N/A	$269
Ronald Reagan Washington National	28,995	$1,910	$3,169	$6,117	18,863	$983	N/A	$2,533	10,132	$926	N/A	$3,584
Shenandoah Valley Regional	353	$20	$31	$58	157	$4	N/A	$19	196	$15	N/A	$39
Washington Dulles International	35,551	$2,322	$3,741	$6,724	26,012	$1,403	N/A	$5,718	9,539	$919	N/A	$1,006
Total All Airports	**83,249**	**$5,305**	**$8,722**	**$16,237**	**52,919**	**$2,701**	**N/A**	**$9,360**	**30,330**	**$2,604**	**N/A**	**$6,877**

Note: N/A = Not available. The 2010 study did not publish information on GDP, so comparisons are unavailable.
Figures may not sum to total due to rounding.

Table VIII-2: Summary of 2016 Results vs. 2010 Results, Commercial Service Airports, *Impacts of Visitor Spending Only* (MWAA Airports excluded) (dollars in millions)

	2016 Total Results				2010 Total Results				Change			
Airport	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output
Charlottesville Albermarle	1,055	$31	$48	$87	904	$26	N/A	$77	151	$5	N/A	$10
Lynchburg Regional	698	$15	$24	$49	522	$14	N/A	$42	176	$1	N/A	$7
Newport News - Williamsburg International	1,023	$29	$46	$84	2,398	$73	N/A	$222	(1,375)	($44)	N/A	($138)
Norfolk International	9,227	$266	$429	$778	7,417	$232	N/A	$681	1,810	$34	N/A	$97
Richmond International	8,650	$285	$472	$820	8,606	$251	N/A	$760	44	$34	N/A	$60
Roanoke Regional	1,217	$37	$60	$106	1,194	$38	N/A	$112	23	($1)	N/A	($6)
Shenandoah Valley Regional	73	$2	$3	$5	95	$2	N/A	$7	(22)	$0	N/A	($2)
Subtotal	**21,942**	**$665**	**$1,082**	**$1,929**	**21,136**	**$636**	**N/A**	**$1,901**	**806**	**$29**	**N/A**	**$28**

Note: N/A = Not available. The 2010 study did not publish information on GDP, so comparisons are unavailable.
Figures may not sum to total due to rounding.

Table VIII-3: Summary of 2016 Results vs. 2010 Results, GA Airports (*Impacts of visitor spending excluded*)

(dollars in thousands)

	Total Consolidated Impacts 2016				Total Consolidated Impacts 2010				Change			
Airport	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output
Accomack County	45	$1,603	$2,249	$4,198	32	$710	N/A	$2,370	13	$893	N/A	$1,828
Blackstone AAF	159	$8,264	$13,058	$27,125	15	$200	N/A	$670	144	$8,064	N/A	$26,455
Blue Ridge Regional	112	$3,751	$5,072	$9,723	59	$1,310	N/A	$5,200	53	$2,441	N/A	$4,523
Bridgewater Air Park	641	$40,650	$77,437	$144,115	565	$18,430	N/A	$85,140	76	$22,220	N/A	$58,975
Brookneal-Campbell County	4	$108	$164	$369	4	$160	N/A	$640	0	($52)	N/A	($271)
Chase City Municipal	6	$286	$374	$652	3	$80	N/A	$450	3	$206	N/A	$202
Chesapeake Regional	126	$5,030	$7,061	$12,572	182	$6,310	N/A	$21,670	(56)	($1,280)	N/A	($9,098)
Crewe Municipal	3	$139	$196	$369	4	$140	N/A	$440	(1)	$0	N/A	($71)
Culpeper Regional	160	$4,234	$6,269	$12,913	108	$3,100	N/A	$9,740	52	$1,134	N/A	$3,173
Danville Regional	54	$1,713	$2,646	$5,639	72	$1,910	N/A	$6,840	(18)	($197)	N/A	($1,201)
Dinwiddie County	151	$6,357	$10,585	$17,893	75	$2,990	N/A	$10,340	76	$3,367	N/A	$7,553
Emporia-Greensville Regional	14	$595	$808	$1,625	16	$380	N/A	$1,290	(2)	$215	N/A	$335
Falwell	9	$280	$413	$934	53	$2,060	N/A	$9,110	(44)	($1,780)	N/A	($8,176)
Farmville Municipal	31	$838	$1,255	$2,556	44	$1,160	N/A	$3,610	(13)	($322)	N/A	($1,054)
Franklin Municipal	19	$1,153	$1,601	$2,657	19	$590	N/A	$2,470	(0)	$563	N/A	$187
Front Royal-Warren County	67	$2,249	$3,172	$6,575	45	$1,160	N/A	$4,590	22	$1,089	N/A	$1,985
Gordonsville Municipal	31	$2,241	$2,891	$4,844	11	$360	N/A	$1,120	20	$1,881	N/A	$3,724
Grundy Municipal	3	$77	$105	$270	4	$130	N/A	$530	(1)	($53)	N/A	($260)
Hampton Roads Executive	449	$18,725	$29,845	$60,543	237	$8,810	N/A	$29,400	212	$9,915	N/A	$31,143
Hanover County Municipal	111	$4,016	$6,489	$11,032	191	$8,380	N/A	$29,370	(80)	($4,364)	N/A	($18,338)
Hummel Field	9	$291	$416	$842	23	$1,690	N/A	$5,650	(14)	($1,399)	N/A	($4,808)
Ingalls Field	34	$807	$1,190	$2,855	10	$290	N/A	$930	24	$517	N/A	$1,925
Lake Anna	8	$1,402	$1,615	$2,147	2	$80	N/A	$250	6	$1,322	N/A	$1,897
Lake Country Regional	5	$411	$508	$791	4	$110	N/A	$550	0	$301	N/A	$241
Lawrenceville-Brunswick Municipal	3	$220	$279	$477	5	$50	N/A	$230	(2)	$170	N/A	$247
Lee County	13	$387	$514	$1,012	7	$190	N/A	$720	6	$197	N/A	$292
Leesburg Executive	586	$56,229	$75,083	$121,482	634	$32,740	N/A	$78,060	(48)	$23,489	N/A	$43,422
Lonesome Pine	47	$858	$1,248	$3,027	26	$700	N/A	$2,240	21	$158	N/A	$787
Louisa County	59	$7,765	$9,458	$13,534	50	$1,490	N/A	$4,750	9	$6,275	N/A	$8,784
Lunenburg County	6	$314	$421	$752	2	$80	N/A	$470	4	$234	N/A	$282
Luray Caverns	26	$714	$1,054	$2,074	23	$390	N/A	$1,430	3	$324	N/A	$644

Table VIII-3 (continued)

Airport	Total Consolidated Impacts 2016				Total Consolidated Impacts 2010				Change			
	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output
Manassas Regional	1351	$117,438	$185,618	$375,492	1056	$69,880	N/A	$234,610	295	$47,558	N/A	$140,882
Mecklenburg-Brunswick Regional	26	$1,432	$1,846	$3,271	34	$630	N/A	$2,720	(8)	$802	N/A	$551
Middle Peninsula Regional	141	$5,255	$7,461	$15,831	93	$2,080	N/A	$7,030	48	$3,175	N/A	$8,801
Mountain Empire	29	$755	$1,063	$2,252	31	$650	N/A	$2,890	(2)	$105	N/A	($638)
New Kent County	46	$1,787	$2,725	$4,650	36	$1,140	N/A	$3,890	10	$647	N/A	$760
New London	17	$373	$590	$1,271	15	$480	N/A	$1,800	2	($107)	N/A	($529)
New Market	37	$1,045	$1,451	$2,799	17	$650	N/A	$2,620	20	$395	N/A	$179
New River Valley	34	$1,356	$1,985	$3,784	67	$1,690	N/A	$5,930	(33)	($334)	N/A	($2,146)
Orange County	98	$3,118	$4,426	$7,767	104	$1,850	N/A	$5,710	(6)	$1,268	N/A	$2,057
Richmond Executive Chesterfield County	266	$15,181	$26,482	$52,450	239	$7,910	N/A	$27,810	27	$7,271	N/A	$24,640
Shannon	69	$2,526	$3,588	$6,854	83	$3,040	N/A	$11,830	(14)	($514)	N/A	($4,976)
Smith Mountain Lake	23	$915	$1,436	$2,752	5	$160	N/A	$600	18	$755	N/A	$2,152
Stafford Regional	203	$7,977	$11,769	$23,310	107	$4,440	N/A	$18,410	96	$3,537	N/A	$4,900
Suffolk Executive	51	$2,521	$3,595	$6,555	136	$4,410	N/A	$15,310	(85)	($1,889)	N/A	($8,755)
Tangier Island	4	$169	$230	$419	11	$210	N/A	$650	0	$0	N/A	($231)
Tappahannock-Essex County	69	$4,905	$6,098	$10,631	17	$450	N/A	$1,530	52	$4,455	N/A	$9,101
Tazewell County	10	$327	$452	$978	12	$260	N/A	$1,040	(2)	$67	N/A	($62)
Twin County	34	$823	$1,338	$2,771	14	$400	N/A	$1,350	20	$423	N/A	$1,421
Virginia Highlands	87	$3,148	$4,237	$7,463	70	$2,210	N/A	$7,570	17	$938	N/A	($107)
Virginia Tech-Montgomery Executive	94	$3,737	$5,602	$10,516	70	$1,980	N/A	$9,400	24	$1,757	N/A	$1,116
Wakefield Municipal	31	$998	$1,475	$2,719	17	$390	N/A	$1,530	14	$608	N/A	$1,189
Warrenton-Fauquier	131	$4,302	$6,336	$12,052	131	$4,340	N/A	$14,360	(0)	($38)	N/A	($2,308)
Waynesboro-Eagle's Nest	7	$234	$341	$644	13	$330	N/A	$1,120	(6)	($96)	N/A	($476)
William M. Tuck	18	$722	$945	$1,690	22	$460	N/A	$1,580	(4)	$262	N/A	$110
Williamsburg-Jamestown	73	$2,039	$2,969	$5,716	62	$1,290	N/A	$4,090	11	$749	N/A	$1,626
Winchester Regional	179	$6,855	$11,230	$20,960	168	$5,890	N/A	$22,540	11	$965	N/A	($1,580)
Total General Aviation	**6117**	**$361,645**	**$558,769**	**$1,061,193**	**5155**	**$213,400**	**N/A**	**$728,190**	**962**	**$148,245**	**N/A**	**$333,003**

Note: N/A = Not available. The 2010 study did not publish information on GDP, so comparisons are unavailable. Totals may not sum due to rounding.

Table VIII-4: Consolidated Total 2016 Results vs. 2010 Results, GA Airports (Impacts of Visitor Spending *Included*)

(dollars in thousands)

	Total Consolidated Impacts 2016				Total Consolidated Impacts 2010				Change			
Airport	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output
Accomack County	45	$1,603	$2,249	$4,198	32	$710	N/A	$2,370	13	$893	N/A	$1,828
Blackstone AAF	159	$8,264	$13,058	$27,125	15	$200	N/A	$670	144	$8,064	N/A	$26,455
Blue Ridge Regional	112	$3,751	$5,072	$9,723	59	$1,310	N/A	$5,200	53	$2,441	N/A	$4,523
Bridgewater Air Park	641	$40,650	$77,437	$144,115	565	$18,430	N/A	$85,140	76	$22,220	N/A	$58,975
Brookneal-Campbell County	4	$108	$164	$369	4	$160	N/A	$640	0	($52)	N/A	($271)
Chase City Municipal	6	$286	$374	$652	3	$80	N/A	$450	3	$206	N/A	$202
Chesapeake Regional	126	$5,030	$7,061	$12,572	182	$6,310	N/A	$21,670	(56)	($1,280)	N/A	($9,098)
Crewe Municipal	3	$139	$196	$369	4	$140	N/A	$440	(1)	$0	N/A	($71)
Culpeper Regional	160	$4,234	$6,269	$12,913	108	$3,100	N/A	$9,740	52	$1,134	N/A	$3,173
Danville Regional	54	$1,713	$2,646	$5,639	72	$1,910	N/A	$6,840	(18)	($197)	N/A	($1,201)
Dinwiddie County	151	$6,357	$10,585	$17,893	75	$2,990	N/A	$10,340	76	$3,367	N/A	$7,553
Emporia-Greensville Regional	14	$595	$808	$1,625	16	$380	N/A	$1,290	(2)	$215	N/A	$335
Falwell	9	$280	$413	$934	53	$2,060	N/A	$9,110	(44)	($1,780)	N/A	($8,176)
Farmville Municipal	31	$838	$1,255	$2,556	44	$1,160	N/A	$3,610	(13)	($322)	N/A	($1,054)
Franklin Municipal	19	$1,153	$1,601	$2,657	19	$590	N/A	$2,470	0	$563	N/A	$187
Front Royal-Warren County	67	$2,249	$3,172	$6,575	45	$1,160	N/A	$4,590	22	$1,089	N/A	$1,985
Gordonsville Municipal	31	$2,241	$2,891	$4,844	11	$360	N/A	$1,120	20	$1,881	N/A	$3,724
Grundy Municipal	3	$77	$105	$270	4	$130	N/A	$530	(1)	($53)	N/A	($260)
Hampton Roads Executive	449	$18,725	$29,845	$60,543	237	$8,810	N/A	$29,400	212	$9,915	N/A	$31,143
Hanover County Municipal	111	$4,016	$6,489	$11,032	191	$8,380	N/A	$29,370	(80)	($4,364)	N/A	($18,338)
Hummel Field	9	$291	$416	$842	23	$1,690	N/A	$5,650	(14)	($1,399)	N/A	($4,808)
Ingalls Field	34	$807	$1,190	$2,855	10	$290	N/A	$930	24	$517	N/A	$1,925
Lake Anna	8	$1,402	$1,615	$2,147	2	$80	N/A	$250	6	$1,322	N/A	$1,897
Lake Country Regional	5	$411	$508	$791	4	$110	N/A	$550	1	$301	N/A	$241
Lawrenceville-Brunswick Municipal	3	$220	$279	$477	5	$50	N/A	$230	(2)	$170	N/A	$247
Lee County	13	$387	$514	$1,012	7	$190	N/A	$720	6	$197	N/A	$292
Leesburg Executive	586	$56,229	$75,083	$121,482	634	$32,740	N/A	$78,060	(48)	$23,489	N/A	$43,422
Lonesome Pine	47	$858	$1,248	$3,027	26	$700	N/A	$2,240	21	$158	N/A	$787
Louisa County	59	$7,765	$9,458	$13,534	50	$1,490	N/A	$4,750	9	$6,275	N/A	$8,784
Lunenburg County	6	$314	$421	$752	2	$80	N/A	$470	4	$234	N/A	$282
Luray Caverns	26	$714	$1,054	$2,074	23	$390	N/A	$1,430	3	$324	N/A	$644

Table VIII-4 (continued):

Airport	Total Consolidated Impacts 2016				Total Consolidated Impacts 2010				Change			
	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output	Jobs	Wages	GDP	Output
Manassas Regional	1,351	$117,438	$185,618	$375,492	1,056	$69,880	N/A	$234,610	295	$47,558	N/A	$140,882
Mecklenburg-Brunswick Regional	26	$1,432	$1,846	$3,271	34	$630	N/A	$2,720	(8)	$802	N/A	$551
Middle Peninsula Regional	141	$5,255	$7,461	$15,831	93	$2,080	N/A	$7,030	48	$3,175	N/A	$8,801
Mountain Empire	29	$755	$1,063	$2,252	31	$650	N/A	$2,890	(2)	$105	N/A	($638)
New Kent County	46	$1,787	$2,725	$4,650	36	$1,140	N/A	$3,890	10	$647	N/A	$760
New London	17	$373	$590	$1,271	15	$480	N/A	$1,800	2	($107)	N/A	($529)
New Market	37	$1,045	$1,451	$2,799	17	$650	N/A	$2,620	20	$395	N/A	$179
New River Valley	34	$1,356	$1,985	$3,784	67	$1,690	N/A	$5,930	(33)	($334)	N/A	($2,146)
Orange County	98	$3,118	$4,426	$7,767	104	$1,850	N/A	$5,710	(6)	$1,268	N/A	$2,057
Richmond Executive Chesterfield County	266	$15,181	$26,482	$52,450	239	$7,910	N/A	$27,810	27	$7,271	N/A	$24,640
Shannon	69	$2,526	$3,588	$6,854	83	$3,040	N/A	$11,830	(14)	($514)	N/A	($4,976)
Smith Mountain Lake	23	$915	$1,436	$2,752	5	$160	N/A	$600	18	$755	N/A	$2,152
Stafford Regional	203	$7,977	$11,769	$23,310	107	$4,440	N/A	$18,410	96	$3,537	N/A	$4,900
Suffolk Executive	51	$2,521	$3,595	$6,555	136	$4,410	N/A	$15,310	(85)	($1,889)	N/A	($8,755)
Tangier Island	4	$169	$230	$419	4	$210	N/A	$650	0	$0	N/A	($231)
Tappahannock-Essex County	69	$4,905	$6,098	$10,631	17	$450	N/A	$1,530	52	$4,455	N/A	$9,101
Tazewell County	10	$327	$452	$978	12	$260	N/A	$1,040	(2)	$67	N/A	($62)
Twin County	34	$823	$1,338	$2,771	14	$400	N/A	$1,350	20	$423	N/A	$1,421
Virginia Highlands	87	$3,148	$4,237	$7,463	70	$2,210	N/A	$7,570	17	$938	N/A	($107)
Virginia Tech-Montgomery Executive	94	$3,737	$5,602	$10,516	70	$1,980	N/A	$9,400	24	$1,757	N/A	$1,116
Wakefield Municipal	31	$998	$1,475	$2,719	17	$390	N/A	$1,530	14	$608	N/A	$1,189
Warrenton-Fauquier	131	$4,302	$6,336	$12,052	131	$4,340	N/A	$14,360	0	($38)	N/A	($2,308)
Waynesboro-Eagle's Nest	7	$234	$341	$644	13	$330	N/A	$1,120	(6)	($96)	N/A	($476)
William M. Tuck	18	$722	$945	$1,690	22	$460	N/A	$1,580	(4)	$262	N/A	$110
Williamsburg-Jamestown	73	$2,039	$2,969	$5,716	62	$1,290	N/A	$4,090	11	$749	N/A	$1,626
Winchester Regional	179	$6,855	$11,230	$20,960	168	$5,890	N/A	$22,540	11	$965	N/A	($1,580)
Total General Aviation	**6,117**	**$361,645**	**$558,769**	**$1,061,193**	**5,155**	**$213,400**	**N/A**	**$728,190**	**962**	**$148,245**	**N/A**	**$333,003**

Note: N/A = Not available. The 2010 study did not publish information on GDP, so comparisons are unavailable. Totals may not sum due to rounding.

Appendix I: Approach and Methodology

This appendix provides a detailed description of the approach and methodology applied to each of the major project components.

The timeframe for the analysis of the economic impact of Virginia's public use airports was calendar year 2016. The project began in the fall of 2016 and was completed in late 2017. The data obtained on employment, earnings, airline activities, and all airport activities was for 2016.

Background Research on Airport Operations and Passenger Traffic

The project team reviewed the prior studies of the economic impact of Virginia's public use airports to gain perspective on the differences among those facilities, in terms of their size, complexity, roles, and functions. The team reviewed other studies of Virginia's airports available from the DOAV (e.g., the previous economic impact study, the 2015 Virginia Commercial Air Service Strategic Review). The team then gathered significant amounts of data on passenger and aircraft activity at all of Virginia's public use airports. This included data reported by the airports to the FAA on their runways, terminals, sponsorships, based aircraft, budgets, and capital improvement expenditures.

Analyses of changes in operations and passenger enplanements generally relied on data from the U.S. Department of Transportation's various databases, such as the Origin-and-Destination survey data (DB1B) reported by airlines and the T-100 segment and market data, as reported via the Diio-Mi online portal. Norfolk International Airport and the Metropolitan Washington Airports Authority asked that the project team use their passenger enplanement data instead, believing those data to be a more accurate representation of passenger activity at those facilities. For Norfolk, the difference between the DOT T-100 data and the airport authorities' data was less than 1 percent. For the two northern Virginia airports, the airport authority's figures were 3 percent higher than the Diio-reported DOT data.

Commercial Service Airports

The team focused on various measures of activity at the commercial service airports reported to the DOT and/or the FAA by both airports and airlines. In particular, the team examined changes in passenger traffic, aircraft operations, available capacity, nonstop destinations served, average seats per departure, market shares of airlines operating at the airports, entry and exit of airlines, and other common measures of airport and airline activity. These measures are critical to better understand the relationship between the airports, airlines, employment, capital development, and visitor spending.

To support the elements of the project concerning the economic impact of visitor spending in areas around the airports, the team examined each airport's "origin-and-destination" (O&D) passenger traffic. This is distinct from total passengers at an airport in that it separates any passenger traffic that connect onto another flight at an airport. (Of all the airports in Virginia, by far most connecting traffic occurs at either Ronald Reagan Washington National Airport or Washington Dulles International Airport. The former serves as an operational hub for American Airlines, and the latter is an operational hub for United Airlines.) Further, the team analyzed data on the point of sale for the O&D traffic. Doing so enabled estimates of the volume of traffic originating outside of Virginia compared to travel that originates at one of the Commonwealth's airports. For example, in examining the total Charlottesville-

Chicago market, the analysis would distinguish passengers whose trip originated in Chicago, who would thus be counted as "true visitors" to Charlottesville.

General Aviation Airports

The team obtained data on the number and type of GA aircraft based at each airport from the DOAV and confirmed with each airport that the data was accurate. The team obtained information on the number and length of runways and the availability of services from local fixed base operators (FBOs) from the FAA; and other web-based content providers such as AirNav.com. This information was confirmed by the airports and/or the DOAV.

Quantifying Direct Employment at Airports

The largest sources of economic impact in Virginia's aviation system are the commercial service airports. The team met with the managers, directors, and/or CEOs and key staff members of each of the commercial service airports to ensure they understood the scope and scale of the project, as well as the importance of their participation.

The project team relied on two methods to estimate the direct employment at the airports –the number of individuals employed at the airports. Those individuals may have been employed by a variety of companies or organizations. These include but were not limited to:

- airport management (which often is part of the local municipal or county government, but may also be part of quasi-governmental airport authorities or private companies);
- airlines;
- other government agencies (including the Federal Aviation Administration's air traffic controllers, the Transportation Security Administration, Customs and Border Protection, or local law enforcement);
- FBOs;
- maintenance, repair, and overhaul (MRO) firms;
- concessionaires;
- rental car companies and other ground transportation operators;
- flight schools; and
- air ambulance operators.

The project team sent surveys to each company or organization identified by airport management as operating on their properties. The surveys were designed to gather data on employment (measured in jobs) and total wages. Additional information was collected on full-time versus part-time, and permanent versus seasonal jobs to gain a better understanding of employment at the airports.[36] The survey also solicited information on whether firms contract out certain functions or services to guard against undercounting or double counting. To identify potential impacts related to air cargo at the airports, the survey included questions of the airports' tenants on their business operations related to air cargo movements. Depending on the type of information sought, the project team sent different

[36] All employment figures in the analysis and report are measured in jobs or headcount.

surveys to different types of airport tenants. (A copy of the surveys sent to airport tenants and airlines can be found in Appendix III.)

To supplement the data obtained via the employment and wage surveys, the project team asked each airport for a list of the tenants and the number of employees with authorization to work on airport property. The team reconciled the data obtained from the surveys with the data from the airports.

The team used different methods to encourage organizations to respond to the survey. All the surveys were included cover letters from the DOAV and the local airport management, explaining the project and requesting the tenants' cooperation. After the surveys were emailed to the points of contact for each organization, the project team re-sent surveys to those who had not responded within a short period. The project team also called each company and organization, often multiple times, to ask them to participate in the project by responding to the survey. The emphasis on the follow-up calls was on obtaining survey responses from the largest organizations on airports' properties, as identified by the data on badged employees. In addition, the project team regularly told each commercial service airport which tenants had not responded. Airports managements then made separate and independent requests to the tenants that they respond. In addition, the DOAV also encouraged airport managers to request tenants participate. The overall goal was to maximize the total number of responses obtained for each airport. Table A-I.1 summarizes the number of surveys sent to tenants at each airport and the response rates.

Table A-I.1: Employment Survey Response Rate by Airport

Airport	Total Surveys Sent	Response Rate
Charlottesville - Albemarle	17	47%
Lynchburg Regional	16	69%
Newport News-Williamsburg International	13	69%
Norfolk International	74	74%
Richmond International	54	74%
Roanoke - Blacksburg Regional	23	74%
Ronald Reagan Washington National	85	79%
Shenandoah Valley Regional	9	56%
Washington Dulles International	108	57%
Total - All Commercial Service Airports	**399**	**69%**

Using the direct employment figures from the surveys as inputs, the *direct* wage, GDP and economic output impacts were also estimated using economic multipliers from the IMPLAN Model. The IMPLAN Model is an industry-recognized non-proprietary economic model, which is used to identify interrelationships in a regional economy and estimate the impacts of changes on that economy. The ratios and multipliers for each of the airport's respective catchment areas were used in this study.[37] (A table summarizing the counties and cities included in each airport catchment area is provided in Appendix VI.)

[37] For IAD and DCA, all direct impacts were assigned to the Commonwealth of Virginia rather than employees' place of residence, as the two airports are located in the Commonwealth of Virginia.

Surveys of Employment at GA Airports

In comparison to the size, scope, and complexity of most of the commercial service airports, most GA facilities in Virginia are more modest operations, with fewer tenants and less flight activity. This is not always the case; some reliever airports in Virginia support very large numbers of aircraft operations, sometimes more than some of the smaller commercial service airports. The team sent simplified surveys to all the GA airports. They sought basic information from airport management on the numbers of employees, their total wages, the number and type of based aircraft, and the names of the tenants, including FBOs or MROs, but not names of individuals who might rent a hangar for their personal aircraft. The team contacted the identified tenants and surveyed them.

The team made repeated efforts to obtain responses from all airports. Follow-up requests to complete the surveys were sent multiple times, and non-responding airports were called to ask them to return the surveys. In addition, the DOAV also asked GA airport directors to encourage tenants to participate in the study. In some cases, DOAV personnel reached out directly to some larger tenants and asked them to submit responses to the surveys. Eventually, the study team secured responses from 54 of the 57 GA airports. Those that did not respond were among the smallest in the state and had experienced changes in personnel who had been responsible for the airport.

Table A-I.2: Responses from GA Airports to Employment Survey

	Count	% of Total
Respondents *	54	95%
Non-Respondents	3	5%
TOTAL	**57**	**100%**

* Note: One airport had separately contracted with a local university to produce an independent economic impact study. It did not respond to this study's survey, but is counted among the responding airport because the same basic information was produced and made available to the study team.

The project team estimated employment at the non-responding airports using a variety of methods. In general, the team benchmarked the non-responding airports against others that had responded, controlling for the number and type of based aircraft, total estimated or reported operations, and the presence of an FBO and other on-airport facilities (e.g., a café).

Inferring Employment

In instances in which firm or organizations would not respond to repeated requests for their participation, the project team estimated direct employment at both commercial service and GA airports, employment by making professional inferences based on other indicators. The team examined all other available sources of information, such as the number of employees given badges to work on the airport's property, previous survey responses or public information such as annual reports. The team also considered using information on similar firms that did respond to the survey. For example, if the team received survey responses from 20 of 25 freight forwarders. Because other information was not available on the remaining five firms, the team examined the average employment from the responding firms. The employment estimate applied was the mean total employment of the responding firms excluding the highest and lowest employers to avoid the mean being skewed by outliers.

There may be firms that were not surveyed simply because they were not known to exist. The project team did not include an estimate of employment for such non-surveyed firms because there was no basis for an assessment. In any event, the team believes most of these would be very small in terms of missed employment.

Estimating Indirect Economic Impacts of Airports

Indirect economic impacts are those that result from the direct impacts. For an airport, indirect impacts encompass the economic activities of off-site firms that serve airport users. Indirect employment includes the portion of employment in supplier industries dependent on sales to the air transport sector. An example would be food wholesalers supplying food for catering on flights.

While the direct employment and earnings impacts of airport were based on survey information, the approach is not practical for estimating indirect and induced economic impacts. While it might be possible to conduct a survey of businesses impacted indirectly, the survey would need to cover thousands of companies. The team relied on economic input-output tables to generate estimates of the indirect aviation-related economic activity associated with the public use airports. The input-output tables are derived from national and regional economic data that quantify the relationships between industrial sectors, including those between supplier industries and final producers. They show the commodity inputs used by each industry to produce its output, the commodities produced by each industry.[38] In other words, for airlines and airports, they document the relationship between the final demand for air service (by passengers or shippers) upon users (airports and airlines) and the suppliers (e.g., aircraft manufacturers, fuel wholesalers). Changes in the level of air services demanded and consumed (e.g., increases or decreases in airline passenger traffic and aircraft arrivals and departures) lead to changes in the amount of inputs (supplies) required. Each industry that produces goods and services generates demands for other goods and services and so on. *Multipliers* describe these iterations.

The multipliers and ratios used in this study were based on the 2015 Input-Output multipliers maintained by IMPLAN. These were the most current I-O multipliers available at the time of the study. The economic ratios and multipliers have been updated to reflect current price levels, but no structural changes have been assumed. As the indirect impacts of an airport extend beyond an airport's catchment area, IMPLAN's Multi-Regional Input-Output (MRIO) analysis is used to determine the total impacts of each airport in the Commonwealth of Virginia. First, the MRIO analysis estimates the economic impacts within the airport's catchment area. Then, it estimates the indirect and induced impacts occurring in cities and counties occurring outside of the catchment area but within the Commonwealth of Virginia. Summed together, the estimates capture the impacts of each airport across the Commonwealth of Virginia (i.e., statewide impacts).[39]

These impacts need to be distinguished from those in which air travel is an *input* to the production of a final good or service. For example, in foreign trade, a portion of that industry may be dependent upon

[38] Readers interested in more background on the national input-output tables are encouraged to review U.S. Department of Commerce, Bureau of Economic Analysis, *Concepts and Methods of the U.S. Input-Output Accounts*, Sept. 2006, updated April 2009. https://www.bea.gov/papers/pdf/IOmanual_092906.pdf

[39] For IAD and DCA, only the indirect impacts occurring within the Commonwealth of Virginia are included in this study.

air services. Ground – whether by rail or by truck -- and sea transport may or may not be substitutes. In these cases, airlines and airports are inputs to the production of the final good, so the role that aviation plays in the production of those goods and services are recognized separately.

Off-airport aviation-related economic activity

The team analyzed information from a business and economics database identifying companies in the vicinity of each airport that were related to the transportation and aviation industries. The team developed a list of potential firms for each airport that might be related to the industry. The team then asked airport management to identify those that had actual business relationships to the airport. In general, airport management often had little or no knowledge of the listed firms. Where the airport management knew the firm, the project team surveyed those firms to develop estimates of the extent to which their business was related to the airport and its operations. In addition, the team coordinated its research and preliminary findings with the Aerospace Industries Association to ensure identification of companies involved in non-defense aerospace manufacturing in Virginia.

Cargo-related businesses and economic activity

A large portion of air cargo-related activity takes place on airport property, because airports are "landlords" to this segment of the commercial air industry. [40] However, another large portion occurs off-airport. These activities are included in the value chain of airport operation and may be considered part of the indirect economic impacts of air cargo and airport operations. They include the following:

- Airlines move air freight from one airport to another using available cargo space on passenger aircraft ("belly space") or on dedicated all-cargo freighters. This takes place on regularly scheduled flights and on charter services. Some airlines also offer pickup and delivery services.
    - "Integrated" carriers like FedEx and UPS provide door-to-door pickup and delivery services for packages, sometimes including heavy cargo. These companies operate integrated aircraft and ground transportation services.
- Ground handlers load and unload aircraft. They may also handle freight storage, fueling, technical maintenance, deicing, crew support, and other services.
- Air cargo terminals process air cargo and mail transferred between air carriers and ground transportation. The terminals may be operated by public or private entities, including airports, air carriers, or third parties. Some terminals include refrigerated space needed to keep produce or other perishables fresh.
- Air freight forwarders and "third party logistics providers" ("3PLs") are intermediaries between the firms shipping the product or good and the transportation provider. They may negotiate with carriers to find available space and arrange pricing, handle the documentation services, arrange storage, consolidate small shipments into larger (less costly) shipments, and provide other services.

[40] For a thorough discussion of the economic impact of the air cargo industry, see Transportation Research Board, Airports Cooperative Research Program, *Estimating the Economic Impact of Air Cargo Operations at Airports*, ACRP project 03-16 (2014), available at http://nap.edu/22235.

    - Some firms specialize as consolidators, working with a freight forwarder providing assembly points for cargo prior to its delivery to a carrier on the airport.
- Air cargo truckers specialize in road transportation services for air freight shipments, typically requiring specialized roller-bed equipment.
- Container freight stations are typically located off-airport and handle the breakdown and redistribution of inbound international freight. They also provide space for short-term storage.
- Other stakeholders in the sector include a range of professional services, such as
    - Brokers, who buy capacity from airlines and sell it to small- and medium-sized forwarders.
    - Customs brokers, who assist importers and exporters in meeting federal requirements governing imports and exports.
    - General sales agents, who work for the airlines and sell air freight capacity in the belly of passenger aircraft or on dedicated freighters.
    - Others, such as specialty real estate service providers, who specialize in working with freight forwarders and others to locate and secure warehouse, office, and storage space to meet their unique needs.

All or some mixture of these stakeholders are found at or nearby Virginia's public use airports, especially around Washington Dulles International, the Commonwealth's primary airport for cargo handling.

The project team worked closely with the head of cargo operations at MWAA to identify all the firms in this segment of the industry. That official reviewed a list of firms the team had identified using various business databases to indicate whether the firm was engaged in the broad economic sector. The team reached out to with the Washington Dulles Cargo Association (WDCA) to identify other firms directly involved in the air cargo sector at Dulles but located off the property. The team asked their members to participate. The team made multiple follow-up efforts with the WDCA to communicate with the firms engaged in this industry sector. The team then contacted all the firms responding to the outreach.

Hotels

The team asked the carriers about their use of nearby hotels to accommodate misconnecting passengers or airline crews as part of the analysis of the impacts associated with airline activity at Virginia's airports. The project team surveyed those hotels to assess the extent to which their business was directly associated with the airport. Only that proportion of the employment was counted as part of the direct economic impact of the airport to avoid double-counting with tourism impacts.

Estimating the Induced Impact of Virginia's Airports

Induced impacts are those created by the spending of wages, salaries and profits earned in direct and indirect economic activities. These are the "ripple effects" of successive rounds of spending through the economy. Induced employment is employment generated from expenditures by individuals employed indirectly or directly. For instance, if an airline maintenance firm employee decides to remodel his/her home, this would result in additional (induced) employment hours in the general economy. The home renovation project would support hours of induced employment in the construction industry, the construction materials industry, etc. Induced impact is often called the household-spending effect.

Induced effects typically reflect changes in spending from households as income increases or decreases due to the changes in production (in this case, air service).

To generate estimates of the induced economic impacts of Virginia's public use airports, the project team applied the IMPLAN Model. IMPLAN is one of the models most commonly used by researchers in economic impact analysis. At the heart of the model is an input-output table. For a specified region (e.g., Virginia), the input-output table accounts for all dollar flows between different sectors of the economy. Using this information, IMPLAN models the way a dollar injected into one sector is spent and re-spent in other sectors of the economy, generating waves of economic activity, or "economic multiplier" effects. The model uses national industry data and county-level economic data to generate a series of multipliers used to estimate the total economic implications of economic activity. Similar to the indirect impacts, IMPLAN's Multi-Regional Input-Output (MRIO) analysis is used to determine the total statewide impacts of each airport throughout the Commonwealth of Virginia.[41]

Estimating the Economic Impact of Major Capital Improvements at Airports

Capital improvement programs at airports can generate and sustain significant economic impacts. These impacts are treated separately from those associated with the normal or ordinary course of business. While routine maintenance of an airport's assets is a part of ordinary operations, major capital improvement programs are not. Major capital improvements differ fundamentally in scope, scale, cost and time.

The project team obtained data from each commercial service airport on their capital improvement programs. Two data sources were considered: the capital expenditures reported on the airports' FY 2016 annual financial reports and the capital improvement expenditures reported by each airport to the FAA as part of the annual airports financial reporting program (on FAA form 127). The FAA requires airports to report their annual capital expenditures and construction in progress for projects involving the airfield; terminal; parking structures; roadways, rail, or transit; and other.[42] There were slight differences in the amounts reported by each method, due to variations in the applicable accounting rules. (The totals differed by two percent). Considering the total value of spending on capital development in 2016, those differences were not significant for purposes of estimating the overall economic impacts.

It is important to note that the airports report their capital expenditures based upon their own fiscal years, which do not necessarily coincide with calendar years. MWAA's fiscal year corresponds to the calendar year, but the other airports in Virginia follow the Commonwealth's fiscal year, which runs from July 1 to June 30. Consequently, the reports on capital improvement are not exactly aligned. In consultation with some of the Commonwealth's airports' chief financial officers, the team determined it could not obtain a consistent data set on capital spending for calendar year 2016.

Virginia's commercial service airports spent $142.5 million in capital development in 2016. None of Virginia's commercial service airports had major capital improvement projects during 2016. By contrast,

[41] For IAD and DCA, only the induced impacts occurring within the Commonwealth of Virginia are included in this study.

[42] FAA Advisory Circular No: 150/5100-19D, June 23, 2011, *Guide for Airport Financial Reports Filed by Airport Sponsors.*

in 2017, MWAA kicked off a $1 billion, multi-year capital expansion effort at Ronald Reagan Washington National Airport. "Project Journey" improvements include construction of two new security checkpoints to connect the concourse level of Terminal B/C to airline gate areas, buildout of an enclosed commuter concourse to replace the 14 outdoor gates now served by buses from a single ground-level gate and future improvements to roadways and parking. Projects of this magnitude have a notable economic impact, especially in the number of construction jobs generated. The projects are not expected to be completed until 2020-2021.[43]

Estimating the Economic Impact of Visitor Spending

The team used a variety of approaches to develop estimates of the amount and distribution of spending by travelers who visited Virginia via airports. The methods applied at commercial service airports differed somewhat from those used at GA airports. In addition, the team applied different estimation techniques to different commercial service airports, based on the circumstances of each. In general, however, at all airports, the methods built on a common foundation dependent on some form of self-reporting by visitors, responding to different surveys.

The team reviewed a considerable body of background research on the economic impact of visitor spending, in the U.S. in general and the Commonwealth in particular. The review focused on spending associated with travelers who arrive by air as opposed to those to arrive via ground transportation.[44] Travelers who visit an area via commercial airlines tend to spend more on average than those who visit using their personal autos. The team examined available data on visitor spending from the U.S. National Travel and Tourism Office (NTTO, which produces estimates of spending by international visitors by country of origin) and various convention and visitor bureaus in the Commonwealth to determine if these data met statistical requirements for estimating the impact of spending by tourists who arrive in the Commonwealth by air. The team also analyzed data from the Virginia Travel Corporation (VTC), which surveys visitors to the Commonwealth on their travel spending and experiences.

The economic impact of visitor spending can be analyzed by generating estimates on average spending by visitors at each airport. The impact of visitor spending depends on the amount the visitors spend daily, the length of stay, and the different categories of spending, mostly in the hospitality sector: hotels, restaurants, retail, local transportation and entertainment. Econometric models applied to data on visitor spending convert those data into estimated person years of employment.

At the commercial service airports, surveyors approached individuals near the departure gates and asked if they would be willing to participate in the study.

The project team recruited students from local universities to assist with the survey at several airports. This effort served to help introduce students to the airport, commercial aviation, and tourism industries. At Ronald Reagan Washington National Airport and Washington Dulles International Airport, the team subcontracted with a professional survey research firm to assist with data collection.

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[43] http://www.mwaa.com/about/reagan-national-launches-project-journey

[44] For example, research from the Virginia Travel Corporation shows that all travelers to the Commonwealth – those who arrive not only by air but also by ground transport – on average spent $538 per trip and stayed an average of 3.6 nights in 2015. Those who arrived by air spent an average (median) of $680 and stayed an average (median) of 4 nights.

Estimating Visitor Spending at the Commercial Service Airports

The project team developed and conducted in-terminal passenger intercept surveys at the Commonwealth's commercial service airports to produce statistically-reliable estimates of the spending and length of stay by non-resident visitors. The surveys captured differences in spending patterns by different passenger types: domestic and international travelers, as well as leisure and business travelers. International visitors tend to stay longer and spend more than domestic visitors.

There were three exceptions to the use of visitor surveys:

- At Norfolk International Airport, the airport already had survey data of sufficient statistical reliability that the survey would be redundant and unnecessary. The team adopted the existing estimates on average spending by visitors.
- At Richmond International Airport, airport management's policy prohibits on-site surveys, regardless of the surveying entity or the survey's purpose. Consequently, the project team adapted estimates of average spending yielded by all other Virginia airports.
- Shenandoah Valley Regional Airport (SHD) is served by an air carrier subsidized by the Essential Air Service (EAS) program. During the first part of the year, the EAS service changed providers at SHD, and the new carrier faced operational difficulties and subsequent service reliability problems. Because the carrier scheduled fewer than two flights per day on small regional aircraft, and because low load factors were expected, the airport staff volunteered to survey passengers. But because of the carrier's operational challenges, those employees had other responsibilities. The project team agreed with the airport management to use statewide average spending estimates as an alternative to the survey.

A slightly different approach was implemented at the two Washington-area airports serving the greater metropolitan region, incorporating Virginia, Maryland, and the District of Columbia. Because visitors who fly into those airports often distribute their spending across those different jurisdictions, the survey asked passengers to estimate where their travel dollars were spent. Because of the expansive international operations at Washington Dulles International Airport, the survey was offered to international travelers in different languages besides English: Arabic, Mandarin Chinese, Dutch, French, German, Japanese, Korean, and Spanish. These were selected based on the volume of travelers from different countries who fly into the greater Washington area. The team that interviewed passengers at Washington Dulles included surveyors fluent in Arabic, Mandarin Chinese, and Spanish.

At Washington Dulles International, the project team made a special appeal to the international airlines to support the survey. In collaboration with the Metropolitan Washington Airports Authority, the project team asked the international carriers to allow hard copies of the survey to be made available to passengers at the departure gates, and to make pre-boarding announcements about the survey of visitor spending and ask passengers to voluntarily fill out and submit the surveys. This special step came in response to a noted reluctance on the part of some international travelers to participate in the survey, following the federal government's efforts to tighten travel restrictions for passengers from certain points of origin and to increase immigration enforcement in early 2017.

A copy of the survey used at the airports other than the two Washington-area facilities is shown in Appendix III.

Sample size and sampling error

Unless every individual visitor who departed from Virginia's airports reported his or her spending, it would not be possible to determine exactly how much all visitors spent during their stays. Statistical sampling allows researchers to generate estimates about characteristics of the entire visitor population.

The project team developed a detailed sampling plan to ensure statistically appropriate coverage of passengers at each airport. The sampling plan was designed so the results would be generalizable for each individual airport and the immediate community/region it serves. Based on the volumes of passengers at each airport, the team determined the number of passengers to be surveyed to generate a statistically reliable estimate. The sample size was set to 95 percent confidence interval with a margin of error of +/- 5 percent. In other words, as designed and implemented, the sample allows the project team to claim that it is 99 percent certain that the estimated average amounts spent are within 5 percent of the true average. For example, if the sample produced an average total daily amount spent by visitors to Roanoke of $200, the sampling allows the team to be 99 percent certain the true amount is between $190 and $210.

Because the volume of passengers at the commercial service airports in Virginia differ so greatly, the required sample sizes also varied. Total 2015 enplanements at both Washington-area airports exceeded 10 million, so the sample size at those facilities was greater than that at smaller airports like Roanoke-Blacksburg Regional (300,000 total enplanements) or Lynchburg (75,000).[45] For each airport, the project team estimated the total number of non-resident visitors who traveled through the airport by applying point of sale data to the number of enplaned travelers at the airport in 2015.

This provided an estimate of total annual non-local passengers and became the basis for developing annualized estimates of spending by visitors. For travelers who flew from Washington Dulles International Airport, the team also applied data on the point of origin for international travelers.

Table A-I.3: Sample Size by Airport (responses for each wave of surveys)

Airport	Sample
Charlottesville Albemarle	255
Lynchburg Regional	237
Newport News-Williamsburg International	248
Roanoke-Blacksburg Regional	272
Ronald Reagan Washington National	839
Washington Dulles International	760

Note: As discussed above, surveys were not conducted at Norfolk International and Richmond International airports.

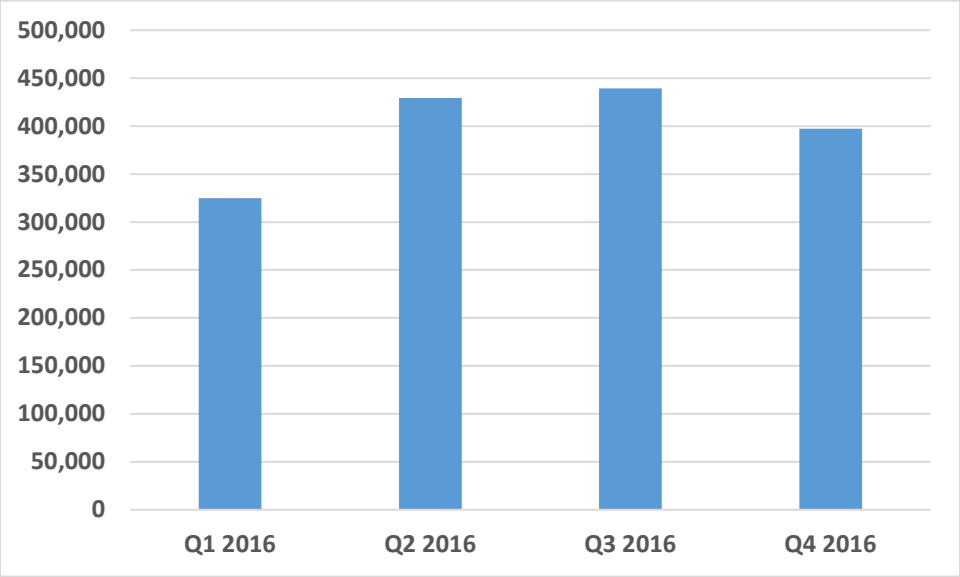
Adjusting for the Seasonality of Travel Spending

Airports in Virginia are subject to significant travel seasonality. At each airport, passenger traffic is lowest during the first quarter of the calendar year (January – March) and highest during the third quarter (July - September). Figure A-I.1 illustrates of the variation in passenger traffic at Norfolk International Airport. Traffic during the 3rd quarter of 2016 was 35 percent higher than during the first quarter. Airlines and the tourism and hospitality industries respond to such changes in demand by offering attractive prices during the off-peak periods to stimulate demand. Conversely, prices generally

[45] Enplanement data for 2015 was the latest available from the FAA at the time the sample sizes were determined.

tend to be higher during the peak summer months, as demand outpaces the supply of available airline seats, tours, and hotel rooms.[46]

Figure A-I.1: Seasonality of Travel – Passenger Enplanements at Norfolk International in 2016



Source: T-100 on-board passenger data from Diio online portal.

To obtain a more complete picture of the nature of visitor spending in each location, the project team conducted two waves of surveys at the airports. The first was early February 2017 during the slowest period of travel demand. The second was in April and May, during what is widely recognized as a "shoulder" season for travel – between the winter low season and the peak summer months. Because of the timing of the contract, the team could not survey during the peak summer months.

The team then made statistical adjustments to the data to adjust for the seasonality of travel spending and hospitality industry pricing. Data from Destination DC (the destination marketing organization for Washington, DC) indicates that average hotel prices can vary somewhat during the year, despite the relatively stable foundation of federal government travel and government-set lodging per diem maximums. The team adjusted the average amounts spent on hotels during the first wave of visitor surveys to account for the seasonally-low rates. The net effect of the adjustment was to render all spending estimates "seasonally-neutral" to produce estimates unbiased by when the responses were captured.

Benchmarking These Estimates Against Other Published Data

The team reviewed the results of its analysis against data published by multiple other sources to provide additional confirmation on the estimates' reliability. These included the Virginia Travel Corporation (VTC), Destination DC, Capital Region USA (CRUSA), and the U.S. National Travel and Tourism Office (NTTO) in the U.S. Department of Commerce.

[46] Counter-intuitively, hotel rates in greater Washington, DC may be lower on average in July and August. The federal per diem allowance for hotel charges is lower in those two months ($172/night) than any other time of the year. The rate rises to $231/night in Sept. and Oct. and to $242/night in March-June. These months generally correspond to times when the U.S. Congress is in session or in recess.

- First, the team obtained VTC data on average spending by visitors to the Commonwealth who arrive by air. The VTC began established as the Virginia Travel Authority by the Commonwealth's General Assembly in 1999.[47] Its mission is to promotes and develops the tourism and motion picture industries to stimulate Virginia's economy and enhance the quality of life of all Virginians. VTC's research team assists with a wide range of tourism-related data gathering and analysis, including the economic impact of tourism on the state and localities, visitor profiles, and other matters.[48] The VTC's estimates do not distinguish whether travelers arrived from other U.S. points of origin or foreign destinations.
- Destination DC (DDC) is the destination marketing organization for Washington. It publishes annual statistics on travel and spending in Washington, gathered from surveys by a consulting firm. According to its data, in 2010, the average visitor spent $329 in Washington, DC. Domestic visitors stayed an average of three nights.[49] In 2016, the average visitor spent $333. The average length of stay for domestic visitors was not reported.[50] DDC's data did not specify if the average amount spent was per person *per day* or per person *per trip.*
- Capital Region USA (CRUSA) is the official regional destination marketing organization promoting Washington, DC, Virginia and Maryland internationally, in partnership with Destination DC, the Virginia Tourism Corporation, the Maryland Office of Tourism Development and the Metropolitan Washington Airports Authority. CRUSA provided the project team with data on visitor spending from multiple international points. Examples of the data provided by CRUSA and the changes that have occurred with some visitors to the region from different countries are shown below in Table A-I.4.
- The U.S. National Travel and Tourism Office (NTTO) is part of the International Trade Administration in the U.S. Department of Commerce. The NTTO works to enhance the international competitiveness of the U.S. travel and tourism industry and increase its exports, to help create U.S. employment and economic growth. The NTTO administers a research program that gathers statistical data about air passenger travelers in U.S. - overseas and U.S. - Mexican markets, particularly on non-U.S. residents traveling to the U.S. The survey has been conducted monthly since 1983.

Collectively, these benchmarks provide valuable reinforcement for the reliability of this study's estimates.

Table A-I.4: CRUSA Summary Data on International Visitor Spending, Selected Countries of Origin, 2010 vs. 2015

	United Kingdom		France		China	
Metric	2010	2015	2010	2015	2010	2015
Total estimated arrivals	246,000	275,000	119,000	117,000	123,000	349,000
Nights spent in CRUSA	9	8	8	6	7	15
Average spend per person per stay	$833	$672	$640	$465	$852	$1,575

Source: CRUSA. Data for 2015 were the most current available at the time.

[47] Code of Virginia, § 2.2-2315 et seq.
[4848] http://www.vatc.org/research
[49] http://destinationdc.dmplocal.com/dsc/collateral/2010__Washington_DC_Visitor_Statistics_FINAL.pdf
[50] https://washington-org.s3.amazonaws.com/s3fs-public/2015_destination_dc_visitor_statistics.pdf

Limitations. The team was unable to generate sufficient survey responses for travelers to and from Shenandoah Valley Regional Airport. This was due in part to operational challenges the commercial carrier was experiencing at the time of the survey. Shenandoah Valley Regional Airport receives service via the Essential Air Service program. At the time of the survey, the airport was transitioning from one carrier to another. During the week that the survey was planned, the new carrier cancelled some operations. Because passengers were being re-accommodated, the airport and project team made the decision to abandon the effort. The estimates of visitor spending applied for this airport were averages of all airports in Virginia, excluding the two Washington area airports.

In addition, by policy, Richmond International Airport does not allow any organization to survey passengers anywhere on airport property. The team applied an average of the amounts available from VTC, adjusted slightly for higher average hotel costs in Richmond compared to many other destinations in the Commonwealth, combined with those from Norfolk International Airport. The project team recognizes that actual average spending by visitors who use RIC may differ from the estimates applied but believes those estimates to be reasonable.

Estimating Spending by Visitors Using General Aviation

Visitors who fly into Virginia's GA airports also contribute to the local, regional, and Commonwealth-wide economic impacts in ways similar to those who arrive via commercial aviation. The project team developed estimates of the amount and type of spending who arrived at Virginia's GA airports using multiple approaches.

First, the team sought to develop estimates of spending by visitors who flew into and from several different GA airports. The project team collaborated with the DOAV to identify airports in each GA classification – reliever, regional, community, and local service – where surveys could be conducted. The DOAV determined the airports to be representative of other airports in the same classification. The project team contacted airport and FBO management at each of those airports and distributed hard copy surveys for GA visitors to report their spending voluntarily. These surveys were made during May at the FBOs or airport offices at each airport. The surveys promised respondents the information obtained would be anonymous and confidential. It sought information on the following:

- type of aircraft (single engine piston fixed wing, multi-engine piston fixed wing, turboprop fixed wing, business jet, or other);
- purpose of travel;
- number of individuals in the traveling party;
- average length of stay; and
- total amount spent on lodging, food, ground transport, retail, and entertainment.

The survey included a screening question to rule out responses from individuals who were local residents. By doing so, the survey captured data only from individuals who self-identified themselves as transient travelers rather than those whose aircraft was based locally. Further, the information was broadly comparable to that sought from the visitors who used commercial air transport.

By surveying travelers at different types and sizes of airports, the project team developed estimates of spending by these travelers at each classification of airports. The project team extrapolated the results to those airports where surveying did not directly take place. The project team acknowledges that the nature of the voluntary responses and the selection of the airports prevents it from asserting the estimates are statistically representative of GA travelers across Virginia. The results are summarized below.

Table A-I.5: Summary of GA Visitor Spending Survey Results

Airport Classification	Purpose of travel (business% / leisure% / business & leisure%)	Average* number of travelers per flight	Average* length of stay	Average** total spending (ex-fuel)
Reliever	76% / 4% / 20%	5	2	$66.17
GA- Regional	38% / 52% / 10%	3	1	$74.35
GA - Community	15% / 85% / 0%	2	0	$22.29
Total	41% / 48% / 10%	3	1	$59.45

Notes
* Averages shown are arithmetic means, rounded to nearest whole number.
** Averages shown are arithmetic means, per person per day.

Because of the low volumes of aircraft activity, the project team did not include local service airports in the survey. The team applied the same estimated average travelers per flight, length of stay, and total spending that was derived from the GA – Community airports to these airports. The total estimated dollar amount of visitor spending was then calculated based on estimated itinerant operations at those facilities.

Independently, the project team asked each manager of the GA airport or the local FBO to report some basic metrics about aircraft operations at their facilities and estimates of visitors and their spending. Airport managers were asked to estimate:

- The percentage of their operations that were local vs. transient;
- The percentage of visitors who used local ground transportation (e.g., rental cars, car services);
- Average number of persons on board, including the pilots;
- Average catering purchases by visiting aircraft;
- Average length of stay for visitors; and
- Average amount spent on lodging by visitors.

GA airport managers were also asked if their airports supported or served a range of local activities or destinations. These could include NASCAR races, college or university sports or other events, luxury resorts (e.g., the Homestead or Primland resorts), or other activities. In each case, the managers were asked to estimate the number of visiting aircraft arriving annually and the average number of people on board.

The project team used these data to generate estimates of the total number of visitors who arrived at each airport, the average length of stay, and spending by those visitors. They used estimates of the number of GA operations at each airport in the Commonwealth; and the average amount VTC reported

as spent by visitors to the state. These data were input to the IMPLAN model to generate estimates of related employment.

Case Studies of GA Airports

To supplement the statistical information, the project team completed case studies of selected airports to illustrate and provide more qualitative descriptions of the amount and variety of activities at GA airports. Case studies provide a valuable means by which those less familiar with the aviation industry can link the abstract figures and concepts of economic impacts with concrete descriptions of airport operations. The team collaborated with the DOAV to identify GA airports across the different classifications. Project staff visited each airport and interviewed representatives on site, including airport managers, FBO managers, pilots, and other visitors. The site visits were in the fall of 2016.

Estimating the Economic Impact Visitors Who Arrive at Commercial Service Airports via General Aviation

Many travelers fly into one of the Commonwealth's commercial service airports not via commercial airlines, but on general aviation, either for personal or business purposes. Like passengers who arrive and depart on commercial airlines, these visitors also contribute to local economic activity by spending money on lodging, meals, entertainment, or retail. Estimating the extent of the impact from this sector is more challenging for researchers because of some inherent differences between GA and commercial air travel, especially as related to business aviation.

Visitors who arrive on general aviation aircraft for business often do so to maintain certain levels of anonymity or confidentiality. These travelers may be engaged in sensitive business matters that demand their movements are unnoticed. Similarly, high-profile individuals traveling for personal reasons may also want to avoid public attention and may use general aviation to do so. Many large corporations insist their executives travel on company-owned or -chartered GA aircraft for security and schedule reasons. In these cases, it is impractical (and insensitive) to attempt to obtain survey data on their spending in an area.

Data from the FAA show that each of Virginia's commercial service airports – with the notable exception of Ronald Reagan Washington National Airport, where GA operations are restricted by national security regulations[51] – experience relatively large numbers of GA flights.

The project team worked with airport managers and officials at major FBOs to develop a method to obtain some estimates of the spending from this segment of the traveling public. These officials believe that local FBOs have a deep understanding of the travel patterns and general spending habits of many visitors who use their facilities. Passengers who arrive at the FBOs often ask the FBOs to arrange rental

[51] Following the events of Sept. 11, 2001, access to Ronald Reagan National Airport in Washington, D.C., was restricted. After several years in which all general and corporate aviation flights to DCA were forbidden, the federal government gradually opened access. GA and corporate flights now are subject to enrollment in the TSA DC Access Standard Security Program or require a TSA waiver. In addition, prior to arriving at DCA, GA and corporate flights must be screened at and depart from a designated gateway airport as the last point of departure.

cars and lodging. Based on their experience, the FBO managers can offer opinions on the average spending resulting from transient GA activity at these airports.

The project team asked the FBOs at the commercial service airports (except for DCA) to provide estimates on a number of topics:

- Percent of GA traffic at the airport that is local vs. transient
- Average number of people on board
- Average length of stay
- Catering
- Use of rental cars
- Average lodging costs/night

The project team used these data and those on total 2016 GA operations at the airports to calculate estimates of the total numbers of visitors who arrived at these airports and their average spending.

Estimating Other Airport-related Impacts

Catalytic Impacts

Catalytic impacts are those resulting from the airport facilitating other sectors of the economy. Impacts can include trade, investment and productivity. Economic catalytic impacts capture the way in which the airport facilitates the business of other sectors of the economy. As such, air transportation facilitates employment and economic development in the national economy through several mechanisms:

- Trade effects – air transport provides connections to export markets for both goods and services;
- Investment effects – a key factor many companies consider when making decisions about the location of offices, manufacturing plants or warehouses is proximity to an international airport;
- Productivity effects. Air transportation offers access to new markets which in turn enables businesses to achieve greater economies of scale. Air access also helps companies attract and retain high quality employees.

To calculate how air service provides connectivity benefits to the economy which in turn boosts trade, investment, and productivity, the project team applied a measure of connectivity developed on behalf of the International Air Transport Association (IATA).[52] The IATA connectivity index measures the scope of access between an individual airport, region or country, and the global economy. The index measures the number and size (in terms of passenger air traffic) of destinations served, the frequency of service to each destination and the number of onward connections available from those destinations. Thus, the index recognizes that connections to major global gateways provide greater global connectivity than connections to the same number of spoke ends. For example, direct service to 40 small regional destinations does not have the same importance as direct connections to 40 major global markets.

[52] Inter*VISTAS* Consulting Inc., "Measuring the Economic Rate of Return on Investment in Aviation", December 2006. This study is one of the few that are based on global data and provides a parameter that specifically addresses productivity rather than other aspects of aviation economic impacts such as airport activity or tourism.

The IATA index is calculated from airline schedule data for passenger services and is based on both domestic and international services. The connectivity index measures the number of frequencies and available seats to a destination. It then weights the number of available seats by the size of the destination airport (in terms of number of passengers handled in each year). This weighting reflects both the size and economic importance of the destination and the potential for convenient onward connections.

To quantify the wider economic benefits related to productivity, trade and investment, the project team analyzed the changes in air connectivity at airports in Virginia between 2011 and 2016. The analysis estimates the GDP per capita (and from that, regional and statewide GDP) stemming from the growth in connectivity.

Airport-dependent Businesses

In addition to being the source of significant amounts of economic activity described in all the previous sections, airports are economic accelerants. Airports *enable* or *facilitate* business transactions.

GA and commercial air services are often critical *inputs* to the production of a final good or service. For example, in foreign trade, a portion of that industry may be dependent on air services (ground – whether by rail or by truck -- and sea transport may or may not be substitutes). In these cases, airlines and airports are inputs to the production of the final good. As such, the role aviation plays in the production of those goods and services are recognized separately.

To quantify the extent to which other sectors of the Commonwealth's economy are dependent upon the public use airports, the project team examined other input-output data from the U.S. Bureau of Economic Analysis (BEA) that quantified the purchases of air services by different sectors of the economy.

One measure of the value of commercial aviation to businesses in Virginia is the number of foreign owned businesses in the Commonwealth. The project team analyzed other data from the BEA that summarizes the number of foreign-owned businesses in Virginia and their holdings.

Appendix II: Glossary and Acronyms

Aircraft Operation: Either a landing or a take-off of an aircraft. Counts of total operations include both.

Based aircraft: Aircraft that are "operational and airworthy" which are stored at an airport for a majority of the year. This is the definition used by airports when reporting based aircraft on the website www.basedaircraft.com, National Based Aircraft Inventory Program (Airport Master Record, FAA Form 5010-1).

Catalytic Impacts: The economic impact resulting from the airport facilitating other sectors of the economy. Impacts can include tourism, trade, investment and productivity.

Commercial Service Airports: Airports that receive service from scheduled commercial airlines. There are nine in Virginia: Charlottesville Albemarle Airport, Lynchburg Regional Airport, Newport News-Williamsburg International Airport, Norfolk International Airport, Richmond International Airport, Roanoke-Blacksburg Regional Airport, Ronald Reagan Washington National Airport, Shenandoah Valley Regional Airport, and Washington Dulles International Airport.

Contract Work: Any work which is done for a company by an individual who is not on the payroll or work done for a company by another company. Generally speaking, firms will contract out work in areas in which they do not have expertise or when there are cost advantages to doing so.

Direct Employment: Direct employment is employment that can be directly attributable to the operations in an industry, firm, etc. It is literally a head count of those people who work in a sector of the economy. In the case of the airport, all of those people who work in an aviation related capacity would be considered direct employment.

Economic Activity (also Economic Output): The end product of transforming inputs into goods. The end product does not necessarily have to be a tangible good (for example, knowledge), nor does it have to create utility (for example, pollution). Or, more generally, the process of transforming the factors of production into goods and services desired for consumption.

Economic Output: (also Economic Activity, Production) The end product of transforming inputs into goods. The end product does not necessarily have to be a tangible good (for example, knowledge), nor does it have to create utility (for example, pollution). Or, more generally, it is defined as the process of transforming the factors of production into goods and services desired for consumption.

Employment Impact Analysis: Employment impact analysis determines the economic impact of employment in terms of jobs created and salaries and wages paid out. Economic impact analysis involves applying a change in final demand to a model and analyzing the resulting changes in the economy. In practice, economic impact analysis can mean many different things. It might measure the impacts of a new factory moving into an area. It also might involve estimating the local impacts of new air service or tourist spending.

Enplanement: one fare-paying passenger—originating or connecting—boarding an aircraft. An "enplanement" is not synonymous with a "passenger"; the former refers to individuals boarding an

aircraft, and the latter may also refer to individuals deplaning from an aircraft. Counts of total passengers usually incorporate both enplanements and deplanements.

Essential Air Service Program (EAS): A federal program put into place by the Airline Deregulation Act of 1978 to guarantee that small communities that were served by certificated air carriers before deregulation maintain a minimal level of scheduled air service. The U.S. Department of Transportation currently subsidizes commuter airlines to serve approximately 115 rural communities across the contiguous 48 states that otherwise would not receive any scheduled air service.

Fixed-Base Operator (FBO): An organization granted the right by an airport to operate at the airport and provide aeronautical services such as fueling, hangaring, tie-down and parking, aircraft rental, aircraft maintenance, flight instruction, and similar services.

Full Time Equivalent (FTE): (also Person Year) One full time equivalent (FTE) year of employment is equivalent to the number of hours that an individual would work on a full-time basis for one year. In this study, we have calculated one full time equivalent year to be equivalent to 1,832 hours. Full time equivalent years are useful because part time and seasonal workers do not account for one full time job.

General aviation (GA): Refers to all segments of aircraft activity that are not related to the commercial airlines or the military. GA is often divided into two broad categories: leisure or recreational flying and business aviation.

Gross Domestic Product: (GDP, also value-added): A measure of the money value of final goods and services produced as a result of economic activity in the nation. This measure is net of the value of intermediate goods and services used up to produce the final goods and services.

Ground Transportation: Includes any vehicles which transport passengers from the airport to the cities or from the cities to the airport. This would include taxi services, limousine services, public buses and public transit.

Indirect Employment: Employment which results because of direct employment. For the FBO, it would include that portion of employment in supplier industries which are dependent on sales to the air transport sector. In some cases, contract work would be considered indirect employment.

Induced Employment: Employment created because of expenditures by direct and indirect employees.

Maintenance Repair and Overhaul (MRO): Generally, a company whose primary mission involves fixing any sort of mechanical, plumbing, or electrical device should it become out of order. In the aircraft maintenance market sector, MRO services also include inspection, rebuilding, alteration and the supply of spare parts, accessories, raw materials, adhesives, sealants, coatings and consumables for aircraft manufacturing.

Metropolitan and Micropolitan Statistical Areas (MSA) (metro and micro areas) are geographic entities defined by the Office of Management and Budget for use by Federal statistical agencies in collecting, tabulating, and publishing Federal statistics. The term “Core Based Statistical Area” is a collective term for both metro and micro areas. A metro area contains a core urban area of 50,000 or more population, and a micro area contains an urban core of at least 10,000 (but less than 50,000) population. Each metro or micro area consists of one or more counties and includes the counties containing the core urban area,

as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core.

Multiplier Analysis: Analysis using economic multipliers in which indirect and induced economic impacts is quantified. Essentially, a multiplier number is applied to the "directly traceable economic impact" to produce indirect, induced and total effects (see Multiplier.)

Multiplier: Economic multipliers are used to infer indirect and induced effects from a particular sector of the economy. They come in a variety of forms and differ in definition and application. A multiplier is a number which would be multiplied by direct effects in order to calculate indirect or induced effects. In the case of the airport, as in many other cases, multipliers can lead to illusory results, and thus must be used with great care.

National Plan of Integrated Airport Systems (NPIAS): A system of nearly 3,300 existing and proposed airports that have been designated by the FAA as being significant to national air transportation and thus eligible to receive Federal grants under the Airports Improvement Program.

Nonprimary commercial service airports: Airports with scheduled air carrier service and annual passenger boardings (enplanements) between 2,500 and 10,000.

Primary airports: Publicly owned airports with scheduled air carrier service and more than 10,000 passenger boardings (enplanements) each year.

Public use airports: Those distinct from private use airports in that the former are available to be used by any aircraft operating in the U.S. “Private use” airports are privately-owned and may be intended for use only by the airport’s owners. These could include, for example, helipads on corporate land that are reserved for corporate aircraft. In addition, “public use” airports generally refer to those intended for civil, non-military use.

Reliever airports: General aviation airports in metropolitan areas that provide pilots with alternatives to using congested commercial service airports or provide general aviation access to the surrounding area.

Value-Added: See Gross Domestic Product (GDP)

Acronyms

CBP - Customs and Border Protection

CHO – Charlottesville Albemarle Airport

DCA – Ronald Reagan Washington National Airport

FAA – Federal Aviation Administration

FBO – Fixed Base Operator

FTE – Full-Time Equivalent

GA – General Aviation

GDP – Gross Domestic Product

IAD – Washington Dulles International Airport

LYH – Lynchburg Regional Airport

MRO – Maintenance Repair and Overhaul

MWAA – Metropolitan Washington Airports Authority

NTTO – the National Travel and Tourism Office within the U.S. Department of Commerce, International Trade Administration

ORF – Norfolk International Airport

PHF – Newport News-Williamsburg International Airport

RIC – Richmond International Airport

ROA – Roanoke-Blacksburg Regional Airport

SHD – Shenandoah Valley Regional Airport

TSA – Transportation Security Administration

Appendix III: Surveys Sent to Airports and Air Carriers on Employment and Wages

Virginia Department of Aviation
Employment Survey

October 2016

The figures you provide in the following sections are **strictly confidential**. Only aggregate survey totals will be published in the final report.

Please complete this survey as soon as possible and no later than **December 16, 2016**.

For the purposes of this study, it is important that the figures you provide are as accurate as possible. However, where it is not possible to provide precise information, we would appreciate estimates rather than no response at all. When answering the questions below regarding your business, please include all related subsidiary businesses.

Name of Company: _____

Address of Company: _____

Contact Person: _____ Phone number: _____

Email: _____

Q1. VA Commercial Airport

Please select the airport(s) you are responsible for. *(Check all that apply.)*

- ☐ Richmond International (RIC)
- ☐ Norfolk International (ORF)
- ☐ Roanoke Blacksburg Regional (ROA)
- ☐ Newport News – Williamsburg International (PHF)
- ☐ Charlottesville Albemarle (CHO)
- ☐ Lynchburg Regional (LYH)
- ☐ Shenandoah Valley Regional (SHD)

Virginia Department of Aviation
Employment Survey
October 2016

Q2. Principal Business Activity

Please indicate your principal business activity. If you are involved in more than one of the business types below, please choose the one that best describes your business (i.e., contributes the largest proportion of revenues).

Air Carriers

- ☐ 1. Scheduled Air Passenger Carrier
- ☐ 2. Charter Air Passenger Carrier
- ☐ 3. Dedicated Cargo Carrier
- ☐ 4. Courier / Integrator
- ☐ 5. General Aviation Operator
- ☐ 6. Other: _____

Other Business Types

- ☐ 7. Airport Operator
- ☐ 8. Freight Forwarder, Cargo Agent, etc.
- ☐ 9. Warehousing
- ☐ 10. Customs Broker
- ☐ 11. Aircraft Maintenance, Repair and Overhaul
- ☐ 12. Airport Ground Handler
- ☐ 13. Fuelling Company
- ☐ 14. Fixed Base Operator
- ☐ 15. Aircraft Parts Supplier
- ☐ 16. Aviation Related Manufacturing
- ☐ 17. Aviation Related Training
- ☐ 18. In-flight Catering Company
- ☐ 19. Security Services
- ☐ 20. Airport Retail Outlet, Restaurant, etc.
- ☐ 21. Government Agency/Department
- ☐ 22. Car Rental
- ☐ 23. Taxi, Bus, Limousine, Shuttle
- ☐ 24. Hotel
- ☐ 25. Other: _____

Virginia Department of Aviation
Employment Survey
October 2016

Q3. Employment at Your Company

Please state the number of **permanent & seasonal** staff employed by your company at the airport(s) you are responsible for in Q3 2016. This should include employees both on-site at the airport(s) and off-site (where off-site employees are involved with providing service to the airport(s), e.g. catering employees at an off-site location).

Please break down the employment into permanent, seasonal, full-time and part-time. *This should not include employment for work done on contract.*

Location	PERMANENT EMPLOYEES		SEASONAL EMPLOYEES	
	Full-Time	Part-Time	Full-Time	Part-Time
RIC				
ORF				
ROA				
PHF				
CHO				
LYH				
SHD				
Off-Site				

Note: For employees that split their time between airports, please allocate them to the location where they spend the most time.

Please indicate how many hours per week **part-time employees** worked *on average* in Q3 2016.

	Number of Weeks per Year	Number of Weekly Hours
Part-time Employees		

For **seasonal employees** in general, please indicate how many weeks per year and how many hours per week **seasonal employees** worked *on average* in Q3 2016.

	Number of Weeks per Year	Number of Weekly Hours
Seasonal Employees		

Virginia Department of Aviation
Employment Survey
October 2016

Q4. Payroll and Wages

Please state the total gross payroll paid by your company in Q3 2016 for the employees included in Question 3 above.

This figure should include all full-time, part-time and seasonal employees. If you are unable to estimate payroll for Q3 2016, please provide figures for your last financial period, and indicate which period that was.

Total Payroll (Q3 2016):	$
Financial Period *(if not Q3 2016):*	

Note: Total payroll includes gross (pre-tax) wages or salaries, including overtime pay, commissions, allowances and bonuses.

Alternatively, if you are unable to answer this question, please provide an estimate of the average annual wage/salary **per employee** (including overtime pay, commissions, allowances and bonuses), or select one of the options below.

Average Annual Salary/Wage per Employee: $ _____ per annum.

Or: Estimate of the average annual salary range per employee

- ☐ Less than $20,000
- ☐ $20,000 - $39,999
- ☐ $40,000 - $59,999
- ☐ $60,000 - $79,999
- ☐ $80,000 - $99,999
- ☐ $100,000 or more

Q5. Employment by Occupation

Please estimate the number of employees included in Question 3 that are in the following occupation categories.

The figures entered below should sum to the same total as Question 3.

Employment by Occupation		Number of Employees
General	Managerial/Supervisory	
	Clerical	
	Craft Trades (Electricians, Steam Fitters, etc.)	
Airline & Airline Servicing Trades	Pilots	
	Flight Attendants	
	Aircraft & Vehicle Mechanics	
	Customer Service Agents	
	Aircraft Servicing	
Support Trades	Security Agents	
	Food Service Workers	
	Drivers / Delivery / Couriers	
	Dispatchers	
	Call Center / Reservations	
	Air Traffic Control	
Retail Trades	Sales / Cashiers	
	Food & Beverage Staff	
Other (Please specify)		

Q6. Outsourcing and Contracting Out

Since we do not want to exclude any employment from the airport(s), we would like you to briefly comment on whether your firm contracts out any important services.

Individuals on Contract: If you pay some individuals through a contract, as opposed to through payroll, please indicate the number of such employees, how many hours per week worked in Q3 2016, as well as how many weeks worked in Q3 2016, on average.

	Number of Contract Employees	Number of Weeks per Year	Number of Weekly Hours
Contract Employees			

Firms on Contract: If you outsource or contract out any work to other companies (e.g., cleaning services, IT, ground handling, etc.), please complete the following table, indicating the functions you outsource to third party companies, and provide an estimate of the annual contracted hours of work completed in Q3 2016. Also, please specify the company's name(s) and indicate whether they are located at the airport. This will allow us to avoid any double counting of work performed by other companies which may also be surveyed as a part of this study

Function	Name of Firm	Located On-site? (Check if Yes)	Number of Hours Performed by the Company in Q3 2016
Example: Cleaning services	*Spic and Span Cleaners*	☐	*100 hours per year (2 hours per week)*
		☐	
		☐	
		☐	

Q7. Business Related to Airport

Please estimate the proportion of your company's business revenues that is related to activities at the airport(s). For example, some businesses will derive all their business from airport related activities, while others will do business in other sectors of the economy (e.g., maritime shipping).

Airport	% Related Business Revenue (2016)
RIC	%
ORF	%
ROA	%
PHF	%
CHO	%
LYH	%
SHD	%

Q8. Property Taxes Paid

Please indicate the amount of municipal property taxes paid by your firm in 2016.

Total Property Taxes Paid (2016):	$
Other Taxes Paid – State & Local (2016):	$

Q9. Business Revenue Related to Air Cargo

We would like to be able to document the impact of air cargo services. Please help us by indicating the proportion of your business revenues that is related to servicing air cargo at the airport(s).

% Business Revenue Related to Air Cargo (2016):	%

Note: The percentage entered should be the same or less than that entered in Question 7.

Additional Comments

Please use the space below to provide any additional comments.

Additional Comments

Thank you.

Please enter your responses to this questionnaire online at:

http://InterVISTAS.VA-EI-Commercial-Airport-Employment-Survey.sgizmo.com/s3/

If you have any questions, please call
Steve Martin at 202-688-2236
or Doris Mak / Celina Estrella at 1-877-717-6246.

Virginia Department of Aviation
Air Carrier Employment Survey

October 2016

The figures you provide in the following sections are **strictly confidential**. Only aggregate survey totals will be published in the final report.

Please complete this survey as soon as possible and no later than **November 21, 2016**.

For the purposes of this study, it is important that the figures you provide are as accurate as possible. However, where it is not possible to provide precise information, we would appreciate estimates rather than no response at all. When answering the questions below regarding your business, please include all related subsidiary businesses.

Name of Company: _____

Address of Company: _____

Contact Person: _____ Phone number: _____

Email: _____

Q1. Airport

Please select the airport(s) where service is provided. *(Check all that apply.)*

- ☐ Richmond International (RIC)
- ☐ Norfolk International (ORF)
- ☐ Roanoke-Blacksburg Regional (ROA)
- ☐ Newport News – Williamsburg International (PHF)
- ☐ Charlottesville Albemarle (CHO)
- ☐ Lynchburg Regional (LYH)
- ☐ Shenandoah Valley Regional (SHD)

Q2. Principal Business Activity

Please indicate your principal business activity. If you are involved in more than one of the business types below, please choose the one that best describes your business (i.e., contributes the largest proportion of revenues).

Air Carriers

- ☐ 1. Scheduled Air Passenger Carrier
- ☐ 2. Charter Air Passenger Carrier
- ☐ 3. Dedicated Cargo Carrier
- ☐ 4. Courier / Integrator
- ☐ 5. General Aviation Operator
- ☐ 6. Other: _____

Q3. Employment at Your Company

Please state the number of **permanent & seasonal** staff employed by your company at the airport(s) you are responsible for in Q3 2016. This should include employees both on-site at the airport(s) and off-site (where off-site employees are involved with providing service to the airport(s), e.g. administrative employees at a downtown office). ***For pilots and flight crews, please report their employment figures only if they are based at the airport(s).***

Please break down the employment into permanent, seasonal, full-time and part-time. *This should not include employment for work done on contract.*

Location	PERMANENT EMPLOYEES		SEASONAL EMPLOYEES	
	Full-Time	Part-Time	Full-Time	Part-Time
RIC				
ORF				
ROA				
PHF				
CHO				
LYH				
SHD				
Off-Site				

Note: For employees that split their time between airports, please allocate them to the location where they spend the most time.

Please indicate how many hours per week **part-time employees** worked *on average*.

	Number of Weeks per Year	Number of Weekly Hours
Part-time Employees		

For **seasonal employees** in general, please indicate how many weeks per year and how many hours per week **seasonal employees** worked *on average*.

	Number of Weeks per Year	Number of Weekly Hours
Seasonal Employees		

Q4. Payroll and Wages

Please state the total gross payroll paid by your company in Q3 2016 for the employees included in Question 3 above.

This figure should include all full-time, part-time and seasonal employees. If you are unable to estimate payroll for Q3 2016, please provide figures for your last financial period, and indicate which period that was.

Total Payroll (Q3 2016):	$
Financial Period *(if not Q3 2016)*:	

Note: Total payroll includes gross (pre-tax) wages or salaries, including overtime pay, commissions, allowances and bonuses.

Alternatively, if you are unable to answer this question, please provide an estimate of the average annual wage/salary **per employee** (including overtime pay, commissions, allowances and bonuses), or select one of the options below.

Average Annual Salary/Wage per Employee: $ _____ per annum.

Or: Estimate of the average annual salary range per employee

- ☐ Less than $20,000
- ☐ $20,000 - $39,999
- ☐ $40,000 - $59,999
- ☐ $60,000 - $79,999
- ☐ $80,000 - $99,999
- ☐ $100,000 or more

Q5. Employment by Occupation

Please estimate the number of employees included in Question 3 that are in the following occupation categories.

The figures entered below should sum to the same total as Question 3.

Employment by Occupation		Number of Employees
General	Managerial/Supervisory	
	Clerical	
	Craft Trades (Electricians, Steam Fitters, etc.)	
Airline & Airline Servicing Trades	Pilots	
	Flight Attendants	
	Aircraft & Vehicle Mechanics	
	Customer Service Agents	
	Aircraft Servicing	
Other (Please specify)		

Q6. Outsourcing and Contracting Out

Since we do not want to exclude any employment from the airport(s), we would like you to briefly comment on whether your firm contracts out any important services.

Individuals on Contract: If you pay some individuals through a contract, as opposed to through payroll, please indicate the number of such employees, how many hours per week worked in Q3 2016, as well as how many weeks worked in Q3 2016, on average.

	Number of Contract Employees	Number of Weeks per Year	Number of Weekly Hours
Contract Employees			

Firms on Contract: If you outsource or contract out any work to other companies (e.g., cleaning services, IT, ground handling, etc.), please complete the following table, indicating the functions you outsource to third party companies, and provide an estimate of the annual contracted hours of work completed in Q3 2016. Also, please specify the company's name(s) and indicate whether they are located at the airport. This will allow us to avoid any double counting of work performed by other companies which may also be surveyed as a part of this study

Function	Name of Firm	Located On-site? (Check if Yes)	Number of Hours Performed by the Company in Q3 2016
Example: Cleaning services	*Spic and Span Cleaners*	☐	*100 hours per year (2 hours per week)*
		☐	
		☐	
		☐	

Q7. Property Taxes Paid

Please indicate the amount of municipal property taxes paid by your firm in 2016.

Total Property Taxes Paid (2016):	$
Other Taxes Paid – State & Local (2016):	$

Q8. Business Revenue Related to Air Cargo

We would like to be able to document the impact of air cargo services. Please help us by indicating the proportion of your business revenues that is related to servicing air cargo at the airport(s).

% Business Revenue Related to Air Cargo (2016):	%

Q9. Hotel Accommodation for Airline Crew

If you use any hotels in Virginia for the layover of airline crew, please complete the following table indicating the name and address of the hotel, and the estimated number of room nights booked with the hotel in 2016.

Hotel Name	Hotel Address	Number of Room Nights Booked in 2016

Additional Comments

Please use the space below to provide any additional comments.

Additional Comments

Thank you.

Please enter your responses to this questionnaire online at:

http://InterVISTAS.VA-EI-Commercial-Airport-Employment-Survey.sgizmo.com/s3/

If you have any questions, please call
Steve Martin at 202-688-2236
or Doris Mak / Celina Estrella at 1-877-717-6246.

Appendix IV: Visitor Spending Survey Example

Washington Dulles International Airport
Visitor Spending Survey

InterVISTAS a company of Royal HaskoningDHV
DULLES INTERNATIONAL

Q1. Are you connecting through Washington Dulles International Airport today?
☐ Yes (*if selected, end the survey and thank participant for their time)*

☐ No

Q2. Are you a resident of Washington D.C., Virginia, or Maryland?
☐ Yes (*if selected, end the survey and thank participant for their time)*

☐ No

Q3. What was your primary purpose of travel on this trip?
☐ Business ☐ Leisure ☐ Business & Leisure

Q4. Including yourself, how many people are in your travelling party?
Size of Travelling Party: _____

Q5. How many nights did you stay in the Dulles International Airport area?
Length of Stay (Nights): _____

Of those nights, how many days were spent in the following areas:
Virginia: _____ DC: _____ Maryland: _____

Q6. How much did you spend (to the nearest dollar estimate) on the following in the area during your stay?
(if answering on behalf of a family or couple, please provide estimates for the entire party's spending).

Hotel Nights:	($)_____
Did you stay with friends and/or family for the duration of your visit?	☐ Yes ☐ No
Ground Transportation (e.g., transit, taxi, car rental):	($)_____
Food (e.g., restaurants, grocery store snacks):	($)_____
Retail (e.g., clothing, souvenirs):	($)_____
Attractions (e.g., sporting events, museums, movies):	($)_____
Other:	($)_____

Could you please estimate the proportion of money spent in the following areas:
Virginia: _____ (%)
DC: _____ (%)
Maryland: _____ (%)

Passenger's Flight Destination: _____

Appendix V: Economic Impact at Each GA Airport

Summary of 2016 Economic Impact and Changes Since 2010
Accomack County Airport
$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	8,816	N/A	N/A
	Estimated Visitors	3,360	8,816	5,456	162%
	GA Departures **	N/A	3,112	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	15	14	(1)	-8%
	Labor Income	$ 310	$ 922	$ 612	198%
	GDP	N/A	$ 1,218	N/A	N/A
	Economic Output	$ 1,180	$ 2,147	$ 967	82%
	Visitor Spending				
	Employment	17	32	15	86%
	Labor Income	$ 400	$ 681	$ 281	70%
	GDP	N/A	$ 1,031	N/A	N/A
	Economic Output	$ 1,190	$ 2,050	$ 860	72%
	Total Economic Impact				
	Employment	32	45	13	42%
	Labor Income	$ 700	$ 1,603	$ 903	129%
	GDP	N/A	$ 2,249	N/A	N/A
	Economic Output	$ 2,380	$ 4,198	$ 1,818	76%

Notes * Estimated traffic based on itinerant operations
** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010
Blackstone AAF (Allen C. Perkinson Airport)
$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	179	N/A	N/A
	Estimated Visitors	1,322	179	(1,144)	-86%
	GA Departures **	N/A	64	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	8	159	151	1881%
	Labor Income	$ 60	$ 8,249	$ 8,189	13648%
	GDP	N/A	$ 13,034	N/A	N/A
	Economic Output	$ 200	$ 27,080	$ 26,880	13440%
	Visitor Spending				
	Employment	7	0	(7)	-93%
	Labor Income	$ 140	$ 15	$ (125)	-89%
	GDP	N/A	$ 24	N/A	N/A
	Economic Output	$ 470	$ 45	$ (425)	-91%
	Total Economic Impact				
	Employment	15	159	144	960%
	Labor Income	$ 200	$ 8,264	$ 8,064	4032%
	GDP	N/A	$ 13,058	N/A	N/A
	Economic Output	$ 670	$ 27,125	$ 26,455	3948%

Notes * Estimated traffic based on itinerant operations
** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Blue Ridge Regional Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	7,203	N/A	N/A
	Estimated Visitors	7,427	7,203	(224)	-3%
	GA Departures **	N/A	2,201	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	25	36	11	44%
	Labor Income	$ 480	$ 2,255	$ 1,775	370%
	GDP	N/A	$ 2,850	N/A	N/A
	Economic Output	$ 2,560	$ 4,903	$ 2,343	92%
	Visitor Spending				
	Employment	34	76	42	123%
	Labor Income	$ 830	$ 1,495	$ 665	80%
	GDP	N/A	$ 2,222	N/A	N/A
	Economic Output	$ 2,640	$ 4,819	$ 2,179	83%
	Total Economic Impact				
	Employment	59	112	53	90%
	Labor Income	$ 1,310	$ 3,751	$ 2,441	186%
	GDP	N/A	$ 5,072	N/A	N/A
	Economic Output	$ 5,200	$ 9,723	$ 4,523	87%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Bridgewater Air Park

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	2,493	N/A	N/A
	Estimated Visitors	13,519	2,493	(11,026)	-82%
	GA Departures **	N/A	890	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	536	631	95	18%
	Labor Income	$ 17,740	$ 40,415	$ 22,675	128%
	GDP	N/A	$ 77,079	N/A	N/A
	Economic Output	$ 82,950	$143,414	$ 60,464	73%
	Visitor Spending				
	Employment	29	10	(19)	-67%
	Labor Income	$ 690	$ 234	$ (456)	-66%
	GDP	N/A	$ 358	N/A	N/A
	Economic Output	$ 2,190	$ 701	$ (1,489)	-68%
	Total Economic Impact				
	Employment	565	641	76	13%
	Labor Income	$ 18,430	$ 40,650	$ 22,220	121%
	GDP	N/A	$ 77,437	N/A	N/A
	Economic Output	$ 85,140	$144,115	$ 58,975	69%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Brookneal - Campbell County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	525	N/A	N/A
	Estimated Visitors	504	525	21	4%
	GA Departures **	N/A	188	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	2	(0)	-7%
	Labor Income	$ 100	$ 66	$ (34)	-34%
	GDP	N/A	$ 95	N/A	N/A
	Economic Output	$ 460	$ 226	$ (234)	-51%
	Visitor Spending				
	Employment	2	2	0	7%
	Labor Income	$ 60	$ 42	$ (18)	-30%
	GDP	N/A	$ 69	N/A	N/A
	Economic Output	$ 180	$ 143	$ (37)	-21%
	Total Economic Impact				
	Employment	4	4	0	0%
	Labor Income	$ 160	$ 108	$ (52)	-32%
	GDP	N/A	$ 164	N/A	N/A
	Economic Output	$ 640	$ 369	$ (271)	-42%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Chase City Municipal Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	1,027	N/A	N/A
	Estimated Visitors	383	1,027	644	168%
	GA Departures **	N/A	367	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	2	0	19%
	Labor Income	$ 60	$ 185	$ 125	208%
	GDP	N/A	$ 231	N/A	N/A
	Economic Output	$ 390	$ 389	$ (1)	0%
	Visitor Spending				
	Employment	1	4	3	252%
	Labor Income	$ 20	$ 101	$ 81	404%
	GDP	N/A	$ 143	N/A	N/A
	Economic Output	$ 60	$ 263	$ 203	339%
	Total Economic Impact				
	Employment	3	6	3	97%
	Labor Income	$ 80	$ 286	$ 206	257%
	GDP	N/A	$ 374	N/A	N/A
	Economic Output	$ 450	$ 652	$ 202	45%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Chesapeake Regional Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	12,219	N/A	N/A
	Estimated Visitors	19,958	12,219	(7,739)	-39%
	GA Departures **	N/A	2,633	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	102	82	(20)	-20%
	Labor Income	$ 3,890	$ 3,841	$ (49)	-1%
	GDP	N/A	$ 5,214	N/A	N/A
	Economic Output	$ 14,580	$ 9,134	$ (5,446)	-37%
	Visitor Spending				
	Employment	80	45	(35)	-44%
	Labor Income	$ 2,420	$ 1,189	$ (1,231)	-51%
	GDP	N/A	$ 1,846	N/A	N/A
	Economic Output	$ 4,040	$ 3,438	$ (602)	-15%
	Total Economic Impact				
	Employment	182	126	(56)	-31%
	Labor Income	$ 6,310	$ 5,030	$ (1,280)	-20%
	GDP	N/A	$ 7,061	N/A	N/A
	Economic Output	$ 21,670	$ 12,572	$ (9,098)	-42%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Crewe Municipal Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	144	N/A	N/A
	Estimated Visitors	1,114	144	(970)	-87%
	GA Departures **	N/A	51	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	2	0	9%
	Labor Income	$ 80	$ 128	$ 48	60%
	GDP	N/A	$ 178	N/A	N/A
	Economic Output	$ 260	$ 328	$ 68	26%
	Visitor Spending				
	Employment	2	1	(1)	-50%
	Labor Income	$ 60	$ 12	$ (48)	-81%
	GDP	N/A	$ 18	N/A	N/A
	Economic Output	$ 180	$ 41	$ (139)	-77%
	Total Economic Impact				
	Employment	4	3	(1)	-20%
	Labor Income	$ 140	$ 139	$ (1)	0%
	GDP	N/A	$ 196	N/A	N/A
	Economic Output	$ 440	$ 369	$ (71)	-16%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Culpeper Regional Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	22,854	N/A	N/A
	Estimated Visitors	17,104	22,854	5,750	34%
	GA Departures **	N/A	8,162	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	25	47	22	90%
	Labor Income	$ 1,080	$ 2,062	$ 982	91%
	GDP	N/A	$ 2,919	N/A	N/A
	Economic Output	$ 3,660	$ 5,563	$ 1,903	52%
	Visitor Spending				
	Employment	83	112	29	35%
	Labor Income	$ 2,020	$ 2,172	$ 152	8%
	GDP	N/A	$ 3,350	N/A	N/A
	Economic Output	$ 6,080	$ 7,350	$ 1,270	21%
	Total Economic Impact				
	Employment	108	160	52	48%
	Labor Income	$ 3,100	$ 4,234	$ 1,134	37%
	GDP	N/A	$ 6,269	N/A	N/A
	Economic Output	$ 9,740	$ 12,913	$ 3,173	33%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Danville Regional Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	5,134	N/A	N/A
	Estimated Visitors	5,647	5,134	(513)	-9%
	GA Departures **	N/A	1,812	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	43	32	(11)	-26%
	Labor Income	$ 1,280	$ 1,235	$ (45)	-4%
	GDP	N/A	$ 1,941	N/A	N/A
	Economic Output	$ 4,830	$ 4,178	$ (652)	-13%
	Visitor Spending				
	Employment	29	22	(7)	-23%
	Labor Income	$ 630	$ 478	$ (152)	-24%
	GDP	N/A	$ 705	N/A	N/A
	Economic Output	$ 2,010	$ 1,460	$ (550)	-27%
	Total Economic Impact				
	Employment	72	54	(18)	-25%
	Labor Income	$ 1,910	$ 1,713	$ (197)	-10%
	GDP	N/A	$ 2,646	N/A	N/A
	Economic Output	$ 6,830	$ 5,639	$ (1,191)	-17%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Dinwiddie County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	19,391	N/A	N/A
	Estimated Visitors	8,024	19,391	11,367	142%
	GA Departures **	N/A	6,844	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	39	72	33	84%
	Labor Income	$ 2,080	$ 4,364	$ 2,284	110%
	GDP	N/A	$ 7,522	N/A	N/A
	Economic Output	$ 7,490	$ 11,897	$ 4,407	59%
	Visitor Spending				
	Employment	36	79	43	120%
	Labor Income	$ 910	$ 1,993	$ 1,083	119%
	GDP	N/A	$ 3,063	N/A	N/A
	Economic Output	$ 2,850	$ 5,996	$ 3,146	110%
	Total Economic Impact				
	Employment	75	151	76	101%
	Labor Income	$ 3,000	$ 6,357	$ 3,357	112%
	GDP	N/A	$ 10,585	N/A	N/A
	Economic Output	$ 10,340	$ 17,893	$ 7,553	73%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Emporia - Greensville Regional Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	697	N/A	N/A
	Estimated Visitors	671	697	26	4%
	GA Departures **	N/A	246	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	12	10	(2)	-20%
	Labor Income	$ 300	$ 503	$ 203	68%
	GDP	N/A	$ 676	N/A	N/A
	Economic Output	$ 1,050	$ 1,350	$ 300	29%
	Visitor Spending				
	Employment	4	4	0	7%
	Labor Income	$ 80	$ 93	$ 13	16%
	GDP	N/A	$ 133	N/A	N/A
	Economic Output	$ 240	$ 276	$ 36	15%
	Total Economic Impact				
	Employment	16	14	(2)	-13%
	Labor Income	$ 380	$ 595	$ 215	57%
	GDP	N/A	$ 808	N/A	N/A
	Economic Output	$ 1,290	$ 1,625	$ 335	26%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Falwell Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	873	N/A	N/A
	Estimated Visitors	1,054	873	(742)	-70%
	GA Departures **	N/A	312	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	51	6	(45)	-89%
	Labor Income	$ 2,000	$ 210	$ (1,790)	-90%
	GDP	N/A	$ 299	N/A	N/A
	Economic Output	$ 8,940	$ 694	$ (8,246)	-92%
	Visitor Spending				
	Employment	2	4	2	86%
	Labor Income	$ 60	$ 70	$ 10	17%
	GDP	N/A	$ 114	N/A	N/A
	Economic Output	$ 170	$ 239	$ 69	41%
	Total Economic Impact				
	Employment	53	9	(44)	-82%
	Labor Income	$ 2,060	$ 280	$ (1,780)	-86%
	GDP	N/A	$ 413	N/A	N/A
	Economic Output	$ 9,110	$ 934	$ (8,176)	-90%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Farmville Municipal Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	5,383	N/A	N/A
	Estimated Visitors	4,070	5,383	1,313	32%
	GA Departures **	N/A	1,900	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	25	6	(19)	-76%
	Labor Income	$ 670	$ 318	$ (352)	-53%
	GDP	N/A	$ 451	N/A	N/A
	Economic Output	$ 2,160	$ 886	$ (1,274)	-59%
	Visitor Spending				
	Employment	19	25	6	29%
	Labor Income	$ 490	$ 520	$ 30	6%
	GDP	N/A	$ 803	N/A	N/A
	Economic Output	$ 1,450	$ 1,670	$ 220	15%
	Total Economic Impact				
	Employment	44	31	(13)	-30%
	Labor Income	$ 1,160	$ 838	$ (322)	-28%
	GDP	N/A	$ 1,255	N/A	N/A
	Economic Output	$ 3,600	$ 2,556	$ (1,044)	-29%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Franklin Municipal Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	2,336	N/A	N/A
	Estimated Visitors	2,237	2,336	99	4%
	GA Departures **	N/A	834	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	8	11	3	42%
	Labor Income	$ 350	$ 913	$ 563	161%
	GDP	N/A	$ 1,249	N/A	N/A
	Economic Output	$ 1,670	$ 2,033	$ 363	22%
	Visitor Spending				
	Employment	11	8	(3)	-31%
	Labor Income	$ 240	$ 240	$ 0	0%
	GDP	N/A	$ 352	N/A	N/A
	Economic Output	$ 800	$ 624	$ (176)	-22%
	Total Economic Impact				
	Employment	19	19	(0)	0%
	Labor Income	$ 600	$ 1,153	$ 553	92%
	GDP	N/A	$ 1,601	N/A	N/A
	Economic Output	$ 2,470	$ 2,657	$ 187	8%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Front Royal - Warren County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	7,140	N/A	N/A
	Estimated Visitors	5,543	7,140	1,597	29%
	GA Departures **	N/A	2,550	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	20	37	17	84%
	Labor Income	$ 530	$ 1,584	$ 1,054	199%
	GDP	N/A	$ 2,195	N/A	N/A
	Economic Output	$ 2,620	$ 4,569	$ 1,949	74%
	Visitor Spending				
	Employment	25	30	5	19%
	Labor Income	$ 630	$ 664	$ 34	5%
	GDP	N/A	$ 978	N/A	N/A
	Economic Output	$ 1,970	$ 2,007	$ 37	2%
	Total Economic Impact				
	Employment	45	67	22	48%
	Labor Income	$ 1,160	$ 2,249	$ 1,089	94%
	GDP	N/A	$ 3,172	N/A	N/A
	Economic Output	$ 4,590	$ 6,575	$ 1,985	43%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Gordonsville Municipal Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	1,170	N/A	N/A
	Estimated Visitors	1,975	1,170	(805)	-41%
	GA Departures **	N/A	418	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	7	26	19	270%
	Labor Income	$ 250	$ 2,124	$ 1,874	750%
	GDP	N/A	$ 2,716	N/A	N/A
	Economic Output	$ 800	$ 4,503	$ 3,703	463%
	Visitor Spending				
	Employment	4	5	1	N/A
	Labor Income	$ 110	$ 117	$ 7	182%
	GDP	N/A	$ 175	N/A	N/A
	Economic Output	$ 320	$ 341	$ 21	19%
	Total Economic Impact				0%
	Employment	11	31	20	178%
	Labor Income	$ 350	$ 2,241	$ 1,891	540%
	GDP	N/A	$ 2,891	N/A	N/A
	Economic Output	$ 1,120	$ 4,844	$ 3,724	333%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

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Summary of 2016 Economic Impact and Changes Since 2010

Grundy Municipal Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	295	N/A	N/A
	Estimated Visitors	1,051	295	(756)	-72%
	GA Departures **	N/A	106	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	2	(0)	-20%
	Labor Income	$ 70	$ 58	$ (12)	-18%
	GDP	N/A	$ 76	N/A	N/A
	Economic Output	$ 360	$ 190	$ (170)	-47%
	Visitor Spending				
	Employment	2	2	(0)	-20%
	Labor Income	$ 60	$ 20	$ (40)	-67%
	GDP	N/A	$ 29	N/A	N/A
	Economic Output	$ 170	$ 80	$ (90)	-53%
	Total Economic Impact				
	Employment	4	3	(1)	-20%
	Labor Income	$ 130	$ 77	$ (53)	-41%
	GDP	N/A	$ 105	N/A	N/A
	Economic Output	$ 530	$ 270	$ (260)	-49%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Hampton Roads Executive Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	59,670	N/A	N/A
	Estimated Visitors	28,933	59,670	30,737	106%
	GA Departures **	N/A	12,860	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	121	231	110	91%
	Labor Income	$ 5,320	$ 12,876	$ 7,556	142%
	GDP	N/A	$ 20,721	N/A	N/A
	Economic Output	$ 19,120	$ 43,618	$ 24,498	128%
	Visitor Spending				
	Employment	116	218	102	88%
	Labor Income	$ 3,490	$ 5,849	$ 2,359	68%
	GDP	N/A	$ 9,124	N/A	N/A
	Economic Output	$ 10,280	$ 16,926	$ 6,646	65%
	Total Economic Impact				
	Employment	237	449	212	90%
	Labor Income	$ 8,810	$ 18,725	$ 9,915	113%
	GDP	N/A	$ 29,845	N/A	N/A
	Economic Output	$ 29,400	$ 60,543	$ 31,143	106%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Hanover County Municipal Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	11,565	N/A	N/A
	Estimated Visitors	19,102	11,565	(7,537)	-39%
	GA Departures **	N/A	2,492	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	112	71	(41)	-36%
	Labor Income	$ 6,120	$ 2,720	$ (3,400)	-56%
	GDP	N/A	$ 4,420	N/A	N/A
	Economic Output	$ 22,580	$ 7,469	$ (15,111)	-67%
	Visitor Spending				
	Employment	2	40	37	1655%
	Labor Income	$ 2,260	$ 1,296	$ (964)	-43%
	GDP	N/A	$ 2,069	N/A	N/A
	Economic Output	$ 6,790	$ 3,563	$ (3,227)	-48%
	Total Economic Impact				
	Employment	191	111	(80)	-42%
	Labor Income	$ 8,380	$ 4,016	$ (4,364)	-52%
	GDP	N/A	$ 6,489	N/A	N/A
	Economic Output	$ 29,360	$ 11,032	$ (18,328)	-62%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Hummel Field

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	553	N/A	N/A
	Estimated Visitors	3,413	553	(2,860)	-84%
	GA Departures **	N/A	198	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	17	7	(10)	-61%
	Labor Income	$ 1,500	$ 245	$ (1,255)	-84%
	GDP	N/A	$ 343	N/A	N/A
	Economic Output	$ 5,100	$ 687	$ (4,413)	-87%
	Visitor Spending				
	Employment	6	2	(4)	-60%
	Labor Income	$ 190	$ 46	$ (144)	-76%
	GDP	N/A	$ 73	N/A	N/A
	Economic Output	$ 550	$ 155	$ (395)	-72%
	Total Economic Impact				
	Employment	23	9	(14)	-61%
	Labor Income	$ 1,690	$ 291	$ (1,399)	-83%
	GDP	N/A	$ 416	N/A	N/A
	Economic Output	$ 5,650	$ 842	$ (4,808)	-85%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Ingalls Field Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	10,425	N/A	N/A
	Estimated Visitors	893	10,425	9,532	1067%
	GA Departures **	N/A	3,680	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	6	2	(4)	-73%
	Labor Income	$ 180	$ 40	$ (140)	-78%
	GDP	N/A	$ 56	N/A	N/A
	Economic Output	$ 610	$ 173	$ (437)	-72%
	Visitor Spending				
	Employment	4	32	28	699%
	Labor Income	$ 110	$ 767	$ 657	598%
	GDP	N/A	$ 1,134	N/A	N/A
	Economic Output	$ 320	$ 2,682	$ 2,362	738%
	Total Economic Impact				
	Employment	10	34	24	235%
	Labor Income	$ 290	$ 807	$ 517	178%
	GDP	N/A	$ 1,190	N/A	N/A
	Economic Output	$ 930	$ 2,855	$ 1,925	207%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Lake Anna Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	37	N/A	N/A
	Estimated Visitors	96	37	(59)	-61%
	GA Departures **	N/A	13	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	8	6	319%
	Labor Income	$ 70	$ 1,397	$ 1,327	1895%
	GDP	N/A	$ 1,609	N/A	N/A
	Economic Output	$ 230	$ 2,137	$ 1,907	829%
	Visitor Spending				
	Employment	-	-	-	N/A
	Labor Income	$ 10	$ 5	$ (5)	-51%
	GDP	N/A	$ 6	N/A	N/A
	Economic Output	$ 20	$ 10	$ (10)	-52%
	Total Economic Impact				
	Employment	2	8	6	319%
	Labor Income	$ 80	$ 1,402	$ 1,322	1652%
	GDP	N/A	$ 1,615	N/A	N/A
	Economic Output	$ 250	$ 2,147	$ 1,897	759%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Lake Country Regional Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	756	N/A	N/A
	Estimated Visitors	448	756	308	69%
	GA Departures **	N/A	270	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	3	1	55%
	Labor Income	$ 60	$ 332	$ 272	453%
	GDP	N/A	$ 396	N/A	N/A
	Economic Output	$ 390	$ 593	$ 203	52%
	Visitor Spending				
	Employment	2	2	0	20%
	Labor Income	$ 50	$ 79	$ 29	59%
	GDP	N/A	$ 112	N/A	N/A
	Economic Output	$ 160	$ 198	$ 38	24%
	Total Economic Impact				
	Employment	4	5	1	37%
	Labor Income	$ 110	$ 411	$ 301	274%
	GDP	N/A	$ 508	N/A	N/A
	Economic Output	$ 550	$ 791	$ 241	44%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Lawrenceville - Brunswick Municipal Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	359	N/A	N/A
	Estimated Visitors	479	359	(120)	-25%
	GA Departures **	N/A	128	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	4	2	(2)	-45%
	Labor Income	$ 20	$ 185	$ 165	825%
	GDP	N/A	$ 229	N/A	N/A
	Economic Output	$ 150	$ 385	$ 235	157%
	Visitor Spending				
	Employment	1	1	0	14%
	Labor Income	$ 30	$ 36	$ 6	18%
	GDP	N/A	$ 50	N/A	N/A
	Economic Output	$ 80	$ 92	$ 12	15%
	Total Economic Impact				
	Employment	5	3	(2)	-33%
	Labor Income	$ 50	$ 220	$ 170	341%
	GDP	N/A	$ 279	N/A	N/A
	Economic Output	$ 230	$ 477	$ 247	107%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Lee County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	3,439	N/A	N/A
	Estimated Visitors	862	3,439	2,577	299%
	GA Departures **	N/A	1,228	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	2	(0)	-20%
	Labor Income	$ 90	$ 74	$ (16)	-18%
	GDP	N/A	$ 100	N/A	N/A
	Economic Output	$ 410	$ 214	$ (196)	-48%
	Visitor Spending				
	Employment	5	11	6	130%
	Labor Income	$ 100	$ 313	$ 213	213%
	GDP	N/A	$ 414	N/A	N/A
	Economic Output	$ 310	$ 798	$ 488	157%
	Total Economic Impact				
	Employment	7	13	6	87%
	Labor Income	$ 180	$ 387	$ 207	115%
	GDP	N/A	$ 514	N/A	N/A
	Economic Output	$ 720	$ 1,012	$ 292	41%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Leesburg Executive Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	15,775	N/A	N/A
	Estimated Visitors	31,983	15,775	(16,208)	-51%
	GA Departures **	N/A	2,629	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	528	527	(1)	0%
	Labor Income	$ 28,540	$ 53,901	$ 25,361	89%
	GDP	N/A	$ 71,681	N/A	N/A
	Economic Output	$ 66,700	$116,056	$ 49,356	74%
	Visitor Spending				
	Employment	106	59	(47)	-45%
	Labor Income	$ 4,200	$ 2,328	$ (1,872)	-45%
	GDP	N/A	$ 3,402	N/A	N/A
	Economic Output	$ 11,360	$ 5,427	$ (5,933)	-52%
	Total Economic Impact				
	Employment	634	586	(48)	-8%
	Labor Income	$ 32,740	$ 56,229	$ 23,489	72%
	GDP	N/A	$ 75,083	N/A	N/A
	Economic Output	$ 78,060	$121,482	$ 43,422	56%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Lonesome Pine Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	6,488	N/A	N/A
	Estimated Visitors	4,083	6,488	2,405	59%
	GA Departures **	N/A	2,290	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	6	6	0	8%
	Labor Income	$ 220	$ 322	$ 102	46%
	GDP	N/A	$ 435	N/A	N/A
	Economic Output	$ 790	$ 898	$ 108	14%
	Visitor Spending				
	Employment	20	41	21	104%
	Labor Income	$ 480	$ 535	$ 55	12%
	GDP	N/A	$ 814	N/A	N/A
	Economic Output	$ 1,450	$ 2,129	$ 679	47%
	Total Economic Impact				
	Employment	26	47	21	82%
	Labor Income	$ 690	$ 858	$ 168	24%
	GDP	N/A	$ 1,248	N/A	N/A
	Economic Output	$ 2,240	$ 3,027	$ 787	35%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Louisa County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	9,129	N/A	N/A
	Estimated Visitors	5,073	9,129	4,056	80%
	GA Departures **	N/A	3,260	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	28	38	10	35%
	Labor Income	$ 950	$ 6,600	$ 5,650	595%
	GDP	N/A	$ 7,953	N/A	N/A
	Economic Output	$ 2,950	$ 11,209	$ 8,259	280%
	Visitor Spending				
	Employment	22	22	(0)	-1%
	Labor Income	$ 540	$ 1,165	$ 625	116%
	GDP	N/A	$ 1,505	N/A	N/A
	Economic Output	$ 1,800	$ 2,325	$ 525	29%
	Total Economic Impact				
	Employment	50	59	9	19%
	Labor Income	$ 1,900	$ 7,765	$ 5,865	309%
	GDP	N/A	$ 9,458	N/A	N/A
	Economic Output	$ 4,760	$ 13,534	$ 8,774	184%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Lunenburg County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	41	N/A	N/A
	Estimated Visitors	192	41	(151)	-79%
	GA Departures **	N/A	15	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	6	4	179%
	Labor Income	$ 70	$ 309	$ 239	342%
	GDP	N/A	$ 415	N/A	N/A
	Economic Output	$ 440	$ 739	$ 299	68%
	Visitor Spending				
	Employment	-	0	0	N/A
	Labor Income	$ 10	$ 5	$ (5)	-53%
	GDP	N/A	$ 7	N/A	N/A
	Economic Output	$ 30	$ 13	$ (17)	-57%
	Total Economic Impact			-	N/A
	Employment	2	6	4	188%
	Labor Income	$ 80	$ 314	$ 234	293%
	GDP	N/A	$ 421	N/A	N/A
	Economic Output	$ 470	$ 752	$ 282	60%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Luray County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	6,097	N/A	N/A
	Estimated Visitors	2,293	6,097	3,804	166%
	GA Departures **	N/A	2,178	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	12	4	(8)	-70%
	Labor Income	$ 130	$ 164	$ 34	26%
	GDP	N/A	$ 228	N/A	N/A
	Economic Output	$ 610	$ 478	$ (132)	-22%
	Visitor Spending				
	Employment	11	22	11	104%
	Labor Income	$ 260	$ 550	$ 290	112%
	GDP	N/A	$ 827	N/A	N/A
	Economic Output	$ 820	$ 1,595	$ 775	95%
	Total Economic Impact				
	Employment	23	26	3	13%
	Labor Income	$ 390	$ 714	$ 324	83%
	GDP	N/A	$ 1,054	N/A	N/A
	Economic Output	$ 1,420	$ 2,074	$ 654	46%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Manassas Regional Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	41,341	N/A	N/A
	Estimated Visitors	40,191	41,341	1,150	3%
	GA Departures **	N/A	9,075	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	914	1,226	312	34%
	Labor Income	$ 64,770	$112,786	$ 48,016	74%
	GDP	N/A	$178,803	N/A	N/A
	Economic Output	$220,330	$364,327	$143,997	65%
	Visitor Spending				
	Employment	142	125	(17)	-12%
	Labor Income	$ 5,110	$ 4,652	$ (458)	-9%
	GDP	N/A	$ 6,814	N/A	N/A
	Economic Output	$ 14,280	$ 11,164	$ (3,116)	-22%
	Total Economic Impact				
	Employment	1,056	1,351	295	28%
	Labor Income	$ 69,870	$117,438	$ 47,568	68%
	GDP	N/A	$185,618	N/A	N/A
	Economic Output	$234,610	$375,492	$140,882	60%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Mecklenburg - Brunswick Regional Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	3,019	N/A	N/A
	Estimated Visitors	3,633	3,019	(614)	-17%
	GA Departures **	N/A	1,078	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	16	16	(0)	0%
	Labor Income	$ 210	$ 1,128	$ 918	437%
	GDP	N/A	$ 1,420	N/A	N/A
	Economic Output	$ 1,430	$ 2,492	$ 1,062	74%
	Visitor Spending				
	Employment	18	10	(8)	-44%
	Labor Income	$ 420	$ 304	$ (116)	-28%
	GDP	N/A	$ 426	N/A	N/A
	Economic Output	$ 1,290	$ 779	$ (511)	-40%
	Total Economic Impact				
	Employment	34	26	(8)	-23%
	Labor Income	$ 630	$ 1,432	$ 802	127%
	GDP	N/A	$ 1,846	N/A	N/A
	Economic Output	$ 2,720	$ 3,271	$ 551	20%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010
Middle Penninsula Regional Airport
$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	8,784	N/A	N/A
	Estimated Visitors	4,034	8,784	4,750	118%
	GA Departures **	N/A	3,100	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	73	97	24	33%
	Labor Income	$ 1,610	$ 4,376	$ 2,766	172%
	GDP	N/A	$ 6,076	N/A	N/A
	Economic Output	$ 5,600	$ 12,885	$ 7,285	130%
	Visitor Spending				
	Employment	20	44	24	120%
	Labor Income	$ 470	$ 879	$ 409	87%
	GDP	N/A	$ 1,385	N/A	N/A
	Economic Output	$ 1,430	$ 2,945	$ 1,515	106%
	Total Economic Impact				
	Employment	93	141	48	51%
	Labor Income	$ 2,090	$ 5,255	$ 3,165	151%
	GDP	N/A	$ 7,461	N/A	N/A
	Economic Output	$ 7,030	$ 15,831	$ 8,801	125%

Notes * Estimated traffic based on itinerant operations
** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Mountain Empire Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	6,180	N/A	N/A
	Estimated Visitors	3,847	6,180	2,333	61%
	GA Departures **	N/A	2,181	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	12	6	(6)	-52%
	Labor Income	$ 230	$ 270	$ 40	17%
	GDP	N/A	$ 372	N/A	N/A
	Economic Output	$ 1,520	$ 771	$ (749)	-49%
	Visitor Spending				
	Employment	19	23	4	23%
	Labor Income	$ 420	$ 485	$ 65	15%
	GDP	N/A	$ 691	N/A	N/A
	Economic Output	$ 1,370	$ 1,481	$ 111	8%
	Total Economic Impact				
	Employment	31	29	(2)	-6%
	Labor Income	$ 650	$ 755	$ 105	16%
	GDP	N/A	$ 1,063	N/A	N/A
	Economic Output	$ 2,880	$ 2,252	$ (628)	-22%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

New Kent County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	10,631	N/A	N/A
	Estimated Visitors	4,946	10,631	5,685	115%
	GA Departures **	N/A	3,797	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	16	14	(2)	-15%
	Labor Income	$ 550	$ 655	$ 105	19%
	GDP	N/A	$ 922	N/A	N/A
	Economic Output	$ 2,130	$ 1,673	$ (457)	-21%
	Visitor Spending				
	Employment	20	32	12	61%
	Labor Income	$ 590	$ 1,131	$ 541	92%
	GDP	N/A	$ 1,803	N/A	N/A
	Economic Output	$ 1,760	$ 2,977	$ 1,217	69%
	Total Economic Impact				
	Employment	36	46	10	27%
	Labor Income	$ 1,140	$ 1,787	$ 647	57%
	GDP	N/A	$ 2,725	N/A	N/A
	Economic Output	$ 3,880	$ 4,650	$ 770	20%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

New London Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	3,540	N/A	N/A
	Estimated Visitors	2,729	3,540	811	30%
	GA Departures **	N/A	1,264	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	4	2	(2)	-48%
	Labor Income	$ 200	$ 72	$ (128)	-64%
	GDP	N/A	$ 103	N/A	N/A
	Economic Output	$ 910	$ 240	$ (670)	-74%
	Visitor Spending				
	Employment	11	15	4	39%
	Labor Income	$ 280	$ 301	$ 21	8%
	GDP	N/A	$ 487	N/A	N/A
	Economic Output	$ 890	$ 1,031	$ 141	16%
	Total Economic Impact				
	Employment	15	17	2	16%
	Labor Income	$ 480	$ 373	$ (107)	-22%
	GDP	N/A	$ 590	N/A	N/A
	Economic Output	$ 1,790	$ 1,271	$ (519)	-29%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

New Market Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	2,226	N/A	N/A
	Estimated Visitors	2,167	2,226	59	3%
	GA Departures **	N/A	795	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	12	28	16	131%
	Labor Income	$ 540	$ 830	$ 290	54%
	GDP	N/A	$ 1,127	N/A	N/A
	Economic Output	$ 2,270	$ 2,154	$ (116)	-5%
	Visitor Spending				
	Employment	5	9	4	81%
	Labor Income	$ 110	$ 215	$ 105	95%
	GDP	N/A	$ 324	N/A	N/A
	Economic Output	$ 350	$ 646	$ 296	84%
	Total Economic Impact				
	Employment	18	37	19	108%
	Labor Income	$ 650	$ 1,045	$ 395	61%
	GDP	N/A	$ 1,451	N/A	N/A
	Economic Output	$ 2,620	$ 2,799	$ 179	7%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

New River Valley Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	2,857	N/A	N/A
	Estimated Visitors	6,070	2,857	(3,213)	-53%
	GA Departures **	N/A	1,008	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	37	25	(12)	-33%
	Labor Income	$ 1,000	$ 1,103	$ 103	10%
	GDP	N/A	$ 1,580	N/A	N/A
	Economic Output	$ 3,770	$ 3,053	$ (717)	-19%
	Visitor Spending				
	Employment	30	10	(20)	-68%
	Labor Income	$ 690	$ 253	$ (437)	-63%
	GDP	N/A	$ 405	N/A	N/A
	Economic Output	$ 2,160	$ 731	$ (1,429)	-66%
	Total Economic Impact				
	Employment	67	34	(33)	-49%
	Labor Income	$ 1,690	$ 1,356	$ (334)	-20%
	GDP	N/A	$ 1,985	N/A	N/A
	Economic Output	$ 5,930	$ 3,784	$ (2,146)	-36%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Orange County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	5,632	N/A	N/A
	Estimated Visitors	2,901	5,632	2,731	94%
	GA Departures **	N/A	2,012	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	91	72	(19)	-20%
	Labor Income	$ 1,520	$ 2,657	$ 1,137	75%
	GDP	N/A	$ 3,682	N/A	N/A
	Economic Output	$ 4,680	$ 6,112	$ 1,432	31%
	Visitor Spending				
	Employment	13	26	13	99%
	Labor Income	$ 330	$ 462	$ 132	40%
	GDP	N/A	$ 744	N/A	N/A
	Economic Output	$ 1,030	$ 1,655	$ 625	61%
	Total Economic Impact				
	Employment	104	98	(6)	-6%
	Labor Income	$ 1,850	$ 3,118	$ 1,268	69%
	GDP	N/A	$ 4,426	N/A	N/A
	Economic Output	$ 5,710	$ 7,767	$ 2,057	36%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010
Richmond Exceutive Chesterfield County Airport
$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	8,437	N/A	N/A
	Estimated Visitors	21,942	8,437	(13,505)	-62%
	GA Departures **	N/A	2,344	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	149	237	88	59%
	Labor Income	$ 5,300	$ 14,246	$ 8,946	169%
	GDP	N/A	$ 24,992	N/A	N/A
	Economic Output	$ 7,140	$ 49,902	$ 42,762	599%
	Visitor Spending				
	Employment	90	28	(62)	-69%
	Labor Income	$ 2,610	$ 935	$ (1,675)	-64%
	GDP	N/A	$ 1,489	N/A	N/A
	Economic Output	$ 4,440	$ 2,548	$ (1,892)	-43%
	Total Economic Impact				
	Employment	239	266	27	11%
	Labor Income	$ 7,900	$ 15,181	$ 7,281	92%
	GDP	N/A	$ 26,482	N/A	N/A
	Economic Output	$ 27,800	$ 52,450	$ 24,650	89%

Notes * Estimated traffic based on itinerant operations
** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Shannon Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	4,711	N/A	N/A
	Estimated Visitors	10,137	4,711	(5,426)	-54%
	GA Departures **	N/A	1,683	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	41	53	12	29%
	Labor Income	$ 1,850	$ 2,082	$ 232	13%
	GDP	N/A	$ 2,910	N/A	N/A
	Economic Output	$ 8,230	$ 5,596	$ (2,634)	-32%
	Visitor Spending				
	Employment	42	16	(26)	-61%
	Labor Income	$ 1,190	$ 444	$ (746)	-63%
	GDP	N/A	$ 678	N/A	N/A
	Economic Output	$ 3,600	$ 1,258	$ (2,342)	-65%
	Total Economic Impact				
	Employment	83	69	(14)	-17%
	Labor Income	$ 3,040	$ 2,526	$ (514)	-17%
	GDP	N/A	$ 3,588	N/A	N/A
	Economic Output	$ 11,830	$ 6,854	$ (4,976)	-42%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Smith Mountain Lake Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	1,603	N/A	N/A
	Estimated Visitors	1,244	1,603	359	29%
	GA Departures **	N/A	573	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	15	13	668%
	Labor Income	$ 90	$ 764	$ 674	749%
	GDP	N/A	$ 1,215	N/A	N/A
	Economic Output	$ 400	$ 2,244	$ 1,844	461%
	Visitor Spending				
	Employment	3	8	5	169%
	Labor Income	$ 70	$ 151	$ 81	116%
	GDP	N/A	$ 221	N/A	N/A
	Economic Output	$ 200	$ 508	$ 308	154%
	Total Economic Impact				
	Employment	5	23	18	369%
	Labor Income	$ 150	$ 915	$ 765	510%
	GDP	N/A	$ 1,436	N/A	N/A
	Economic Output	$ 600	$ 2,752	$ 2,152	359%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Stafford Regional Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	22,320	N/A	N/A
	Estimated Visitors	7,919	22,320	14,401	182%
	GA Departures **	N/A	4,810	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	74	126	52	70%
	Labor Income	$ 3,510	$ 5,873	$ 2,363	67%
	GDP	N/A	$ 8,556	N/A	N/A
	Economic Output	$ 15,600	$ 17,350	$ 1,750	11%
	Visitor Spending				
	Employment	33	77	44	134%
	Labor Income	$ 930	$ 2,103	$ 1,173	126%
	GDP	N/A	$ 3,214	N/A	N/A
	Economic Output	$ 2,810	$ 5,960	$ 3,150	112%
	Total Economic Impact				
	Employment	107	203	96	90%
	Labor Income	$ 4,440	$ 7,977	$ 3,537	80%
	GDP	N/A	$ 11,769	N/A	N/A
	Economic Output	$ 18,410	$ 23,310	$ 4,900	27%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Suffolk Executive Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	1,540	N/A	N/A
	Estimated Visitors	12,008	1,540	(10,468)	-87%
	GA Departures **	N/A	479	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	85	45	(40)	-47%
	Labor Income	$ 2,990	$ 2,352	$ (638)	-21%
	GDP	N/A	$ 3,350	N/A	N/A
	Economic Output	$ 11,040	$ 6,110	$ (4,930)	-45%
	Visitor Spending				
	Employment	51	6	(45)	-89%
	Labor Income	$ 1,420	$ 169	$ (1,251)	-88%
	GDP	N/A	$ 245	N/A	N/A
	Economic Output	$ 4,270	$ 445	$ (3,825)	-90%
	Total Economic Impact				
	Employment	136	51	(85)	-62%
	Labor Income	$ 4,410	$ 2,521	$ (1,889)	-43%
	GDP	N/A	$ 3,595	N/A	N/A
	Economic Output	$ 15,300	$ 6,555	$ (8,745)	-57%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Tangier Island Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	497	N/A	N/A
	Estimated Visitors	1,800	497	(1,303)	-72%
	GA Departures **	N/A	177	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	2	(0)	-5%
	Labor Income	$ -	$ 132	$ 132	N/A
	GDP	N/A	$ 174	N/A	N/A
	Economic Output	$ 10	$ 307	$ 297	2968%
	Visitor Spending				
	Employment	9	2	(7)	-82%
	Labor Income	$ 210	$ 37	$ (173)	-82%
	GDP	N/A	$ 56	N/A	N/A
	Economic Output	$ 640	$ 112	$ (528)	-82%
	Total Economic Impact				
	Employment	11	4	(7)	-68%
	Labor Income	$ 220	$ 169	$ (51)	-23%
	GDP	N/A	$ 230	N/A	N/A
	Economic Output	$ 650	$ 419	$ (231)	-36%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Tappahannock - Essex County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	677	N/A	N/A
	Estimated Visitors	2,382	677	(1,705)	-72%
	GA Departures **	N/A	239	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	6	66	60	1003%
	Labor Income	$ 190	$ 4,846	$ 4,656	2451%
	GDP	N/A	$ 6,010	N/A	N/A
	Economic Output	$ 680	$ 10,449	$ 9,769	1437%
	Visitor Spending				
	Employment	11	3	(8)	-75%
	Labor Income	$ 260	$ 58	$ (202)	-78%
	GDP	N/A	$ 88	N/A	N/A
	Economic Output	$ 850	$ 182	$ (668)	-79%
	Total Economic Impact				
	Employment	17	69	52	306%
	Labor Income	$ 450	$ 4,905	$ 4,455	990%
	GDP	N/A	$ 6,098	N/A	N/A
	Economic Output	$ 1,520	$ 10,631	$ 9,111	599%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Tazewell County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	1,241	N/A	N/A
	Estimated Visitors	1,343	1,241	(102)	-8%
	GA Departures **	N/A	438	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	6	5	(1)	-10%
	Labor Income	$ 100	$ 208	$ 108	108%
	GDP	N/A	$ 294	N/A	N/A
	Economic Output	$ 560	$ 677	$ 117	21%
	Visitor Spending				
	Employment	6	4	(2)	-30%
	Labor Income	$ 160	$ 119	$ (41)	-26%
	GDP	N/A	$ 158	N/A	N/A
	Economic Output	$ 480	$ 302	$ (178)	-37%
	Total Economic Impact				
	Employment	12	10	(2)	-20%
	Labor Income	$ 260	$ 327	$ 67	26%
	GDP	N/A	$ 452	N/A	N/A
	Economic Output	$ 1,030	$ 978	$ (52)	-5%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Twin County Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	6,064	N/A	N/A
	Estimated Visitors	1,167	6,064	4,897	420%
	GA Departures **	N/A	2,166	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	8	9	1	8%
	Labor Income	$ 270	$ 430	$ 160	59%
	GDP	N/A	$ 759	N/A	N/A
	Economic Output	$ 930	$ 1,374	$ 444	48%
	Visitor Spending				
	Employment	6	26	20	325%
	Labor Income	$ 130	$ 392	$ 262	202%
	GDP	N/A	$ 579	N/A	N/A
	Economic Output	$ 420	$ 1,397	$ 977	233%
	Total Economic Impact				
	Employment	14	34	20	144%
	Labor Income	$ 400	$ 823	$ 423	106%
	GDP	N/A	$ 1,338	N/A	N/A
	Economic Output	$ 1,350	$ 2,771	$ 1,421	105%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Virginia Highlands Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	9,894	N/A	N/A
	Estimated Visitors	11,848	9,894	(1,954)	-16%
	GA Departures **	N/A	3,492	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	25	41	16	65%
	Labor Income	$ 730	$ 2,483	$ 1,753	240%
	GDP	N/A	$ 3,260	N/A	N/A
	Economic Output	$ 3,360	$ 4,982	$ 1,622	48%
	Visitor Spending				
	Employment	45	46	1	2%
	Labor Income	$ 1,480	$ 665	$ (815)	-55%
	GDP	N/A	$ 977	N/A	N/A
	Economic Output	$ 4,210	$ 2,481	$ (1,729)	-41%
	Total Economic Impact				
	Employment	70	87	17	24%
	Labor Income	$ 2,220	$ 3,148	$ 928	42%
	GDP	N/A	$ 4,237	N/A	N/A
	Economic Output	$ 7,570	$ 7,463	$ (107)	-1%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

VA Tech - Montgomery Executive Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	13,919	N/A	N/A
	Estimated Visitors	4,091	13,919	9,828	240%
	GA Departures **	N/A	4,971	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	50	48	(2)	-4%
	Labor Income	$ 1,520	$ 2,523	$ 1,003	66%
	GDP	N/A	$ 3,658	N/A	N/A
	Economic Output	$ 7,950	$ 6,993	$ (957)	-12%
	Visitor Spending				
	Employment	20	46	26	132%
	Labor Income	$ 460	$ 1,214	$ 754	164%
	GDP	N/A	$ 1,944	N/A	N/A
	Economic Output	$ 1,450	$ 3,523	$ 2,073	143%
	Total Economic Impact				
	Employment	70	94	24	35%
	Labor Income	$ 1,980	$ 3,737	$ 1,757	89%
	GDP	N/A	$ 5,602	N/A	N/A
	Economic Output	$ 9,400	$ 10,516	$ 1,116	12%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Wakefield Municipal Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	8,136	N/A	N/A
	Estimated Visitors	2,891	8,136	5,245	181%
	GA Departures **	N/A	2,906	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	4	2	95%
	Labor Income	$ 80	$ 236	$ 156	195%
	GDP	N/A	$ 319	N/A	N/A
	Economic Output	$ 500	$ 601	$ 101	20%
	Visitor Spending				
	Employment	15	27	12	83%
	Labor Income	$ 310	$ 761	$ 451	146%
	GDP	N/A	$ 1,156	N/A	N/A
	Economic Output	$ 1,030	$ 2,117	$ 1,087	106%
	Total Economic Impact				
	Employment	17	31	14	85%
	Labor Income	$ 380	$ 998	$ 618	163%
	GDP	N/A	$ 1,475	N/A	N/A
	Economic Output	$ 1,530	$ 2,719	$ 1,189	78%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Warrenton - Fauquier Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	25,358	N/A	N/A
	Estimated Visitors	22,273	25,358	3,085	14%
	GA Departures **	N/A	5,465	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	40	39	(1)	-2%
	Labor Income	$ 1,690	$ 1,754	$ 64	4%
	GDP	N/A	$ 2,467	N/A	N/A
	Economic Output	$ 6,450	$ 4,937	$ (1,513)	-23%
	Visitor Spending				
	Employment	91	91	0	0%
	Labor Income	$ 2,650	$ 2,548	$ (102)	-4%
	GDP	N/A	$ 3,869	N/A	N/A
	Economic Output	$ 7,910	$ 7,116	$ (794)	-10%
	Total Economic Impact				
	Employment	131	131	(0)	0%
	Labor Income	$ 4,340	$ 4,302	$ (38)	-1%
	GDP	N/A	$ 6,336	N/A	N/A
	Economic Output	$ 14,360	$ 12,052	$ (2,308)	-16%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Waynesboro - Eagle's Nest Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	1,155	N/A	N/A
	Estimated Visitors	5,231	1,155	(4,076)	-78%
	GA Departures **	N/A	413	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	2	2	0	10%
	Labor Income	$ 60	$ 124	$ 64	106%
	GDP	N/A	$ 172	N/A	N/A
	Economic Output	$ 270	$ 323	$ 53	20%
	Visitor Spending				
	Employment	11	4	(7)	-61%
	Labor Income	$ 270	$ 110	$ (160)	-59%
	GDP	N/A	$ 169	N/A	N/A
	Economic Output	$ 850	$ 321	$ (529)	-62%
	Total Economic Impact				
	Employment	13	7	(6)	-50%
	Labor Income	$ 330	$ 234	$ (96)	-29%
	GDP	N/A	$ 341	N/A	N/A
	Economic Output	$ 1,120	$ 644	$ (476)	-42%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

William M. Tuck Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	3,523	N/A	N/A
	Estimated Visitors	2,958	3,523	565	19%
	GA Departures **	N/A	1,244	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	6	4	(2)	-25%
	Labor Income	$ 150	$ 317	$ 167	112%
	GDP	N/A	$ 411	N/A	N/A
	Economic Output	$ 530	$ 710	$ 180	34%
	Visitor Spending				
	Employment	16	13	(3)	-18%
	Labor Income	$ 310	$ 405	$ 95	31%
	GDP	N/A	$ 534	N/A	N/A
	Economic Output	$ 1,050	$ 979	$ (71)	-7%
	Total Economic Impact				
	Employment	22	18	(4)	-20%
	Labor Income	$ 460	$ 722	$ 262	57%
	GDP	N/A	$ 945	N/A	N/A
	Economic Output	$ 1,580	$ 1,690	$ 110	7%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010
Williamsburg - Jamestown Airport
$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	12,635	N/A	N/A
	Estimated Visitors	6,571	12,635	6,064	92%
	GA Departures **	N/A	4,512	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	36	23	(13)	-36%
	Labor Income	$ 510	$ 829	$ 319	63%
	GDP	N/A	$ 1,134	N/A	N/A
	Economic Output	$ 1,750	$ 2,121	$ 371	21%
	Visitor Spending				
	Employment	26	50	24	91%
	Labor Income	$ 780	$ 1,209	$ 429	55%
	GDP	N/A	$ 1,836	N/A	N/A
	Economic Output	$ 2,340	$ 3,594	$ 1,254	54%
	Total Economic Impact				
	Employment	62	73	11	17%
	Labor Income	$ 1,290	$ 2,039	$ 749	58%
	GDP	N/A	$ 2,969	N/A	N/A
	Economic Output	$ 4,080	$ 5,716	$ 1,636	40%

Notes * Estimated traffic based on itinerant operations
** Estimated itinerant aircraft departures only

Summary of 2016 Economic Impact and Changes Since 2010

Winchester Regional Airport

$ in thousands (000's)

	Metric	2010	2016	Change	% Change
Activity Measures	GA Passengers *	N/A	19,308	N/A	N/A
	Estimated Visitors	19,542	19,308	(234)	-1%
	GA Departures **	N/A	6,815	N/A	N/A
Economic Impact	**Airport Operations**				
	Employment	84	94	10	12%
	Labor Income	$ 3,630	$ 5,053	$ 1,423	39%
	GDP	N/A	$ 8,529	N/A	N/A
	Economic Output	$ 15,600	$ 15,300	$ (300)	-2%
	Visitor Spending				
	Employment	84	84	0	0%
	Labor Income	$ 2,260	$ 1,803	$ (457)	-20%
	GDP	N/A	$ 2,701	N/A	N/A
	Economic Output	$ 6,940	$ 5,660	$ (1,280)	-18%
	Total Economic Impact				
	Employment	168	179	11	6%
	Labor Income	$ 5,880	$ 6,855	$ 975	17%
	GDP	N/A	$ 11,230	N/A	N/A
	Economic Output	$ 22,540	$ 20,960	$ (1,580)	-7%

Notes * Estimated traffic based on itinerant operations

** Estimated itinerant aircraft departures only

Appendix VI: Airport Catchment Areas

Airport Name	Counties/Cities in Region
Accomack County	Accomack
Blackstone AAF	Dinwiddie Lunenburg Nottoway
Blue Ridge Regional	Henry Martinsville City
Bridgewater Air Park	Augusta Harrisonburg City Rockingham
Brookneal-Campbell County	Campbell Lynchburg City
Charlottesville Albemarle	Albemarle Charlottesville City
Chase City Municipal	Charlotte Mecklenburg
Chesapeake Regional	Chesapeake City Norfolk City Portsmouth City Virginia Beach City
Chesterfield County	Chesterfield Henrico Richmond City
Crewe Municipal	Amelia Lunenburg Nottoway Prince Edward
Culpeper County	Culpeper Fauquier
Danville Regional	Danville City Pittsylvania
Dinwiddie County Airport	Chesterfield Petersburg City Dinwiddie Colonial Heights City
Emporia-Greensville Regional	Brunswick Greensville Southampton
Falwell	Amherst Campbell Lynchburg City
Farmville Regional	Buckingham Cumberland Prince Edward

Airport Name	Counties/Cities in Region
Franklin Municipal	Southampton Suffolk City Isle of Wight
Front Royal-Warren County	Frederick Shenandoah Warren
Gordonsville Municipal	Albemarle Charlottesville City Orange
Grundy Municipal	Buchanan Dickenson
Hampton Roads Executive	Chesapeake City Norfolk City Virginia Beach City Suffolk City
Hanover County Municipal	Chesterfield Henrico Richmond City Hanover
Hummel Field	Gloucester Middlesex Lancaster
Ingalls Field	Bath
Lake Anna	Louisa
Lake Country Regional	Mecklenburg
Lawrenceville-Brunswick Municipal	Brunswick Greensville Mecklenburg
Lee County	Lee Wise
Leesburg Executive	Fairfax Loudoun
Lonesome Pine	Dickenson Wise
Louisa County	Louisa Orange
Lunenburg County	Lunenburg Mecklenburg Nottoway
Luray Caverns	Page Rockingham Shenandoah
Lynchburg Regional	Bedford Campbell Lynchburg City

Airport Name	Counties/Cities in Region
Manassas Regional	Fairfax Prince William Manassas City Manassas Park City
Mecklenburg-Brunswick Regional	Brunswick Mecklenburg
Middle Peninsula Regional	Gloucester King and Queen New Kent King William
Mountain Empire	Smyth Wythe
New Kent County	Henrico Richmond City New Kent
New London	Bedford Campbell Lynchburg City
Newport News-Williamsburg	Norfolk City Virginia Beach City Newport News City Hampton City James City York
New Market	Harrisonburg City Rockingham Shenandoah
New River Valley	Montgomery Pulaski
Norfolk International	Chesapeake City Hampton City Newport News City Norfolk City Virginia Beach City
Orange County	Culpeper Orange
Richmond International	Richmond City Henrico Chesterfield Hanover
Roanoke-Blacksburg Regional	Roanoke City
Shannon	Prince William Spotsylvania Stafford

Airport Name	Counties/Cities in Region
Shenandoah Valley Regional	Augusta Rockingham Staunton City Waynesboro City
Smith Mountain Lake	Bedford Bedford City Franklin
Stafford Regional	Prince William Spotsylvania Stafford
Suffolk Executive	Chesapeake City Portsmouth City Suffolk City
Tangier Island	Accomack
Tappahannock-Essex County	Essex Richmond Westmoreland
Tazewell County	Russell Tazewell
Twin County	Carroll Wythe
Virginia Highlands	Bristol City Washington
Virginia Tech	Montgomery Radford City Pulaski
Wakefield Municipal	Isle Of Wight Prince George Southampton Sussex
Warrenton-Fauquier	Fauquier Manassas City Prince William
Waynesboro/Eagle's Nest	Augusta Staunton City Waynesboro City
William M. Tuck	Halifax
Williamsburg-Jamestown	James City Newport News City York
Winchester Regional	Frederick Warren Winchester City