5. DEVELOPMENT COSTS

5.1 Chapter Overview

This chapter identifies and quantifies the projected unconstrained Virginia air transportation system project costs over a 25-year period. Project costs for Virginia system airports were assembled by identifying planned projects by airport and assigning estimated costs to these projects in 2014 dollars.

Projects were identified from the following sources:

- Individual Airport Capital Improvement Programs (ACIP)
- Individual Airport Master Plans (AMP) and Airport Layout Plans (ALP)
- Sponsor input from individual meetings
- Facility, Service, and Equipment (FS&E) Objectives covering Basic Airport Unit Criteria and Airport Licensing Standards

Projects in this chapter were categorized by type into airside, landside, planning, terminal, facilities service and equipment (FS&E), or other for general capital projects and either facilities and equipment (F&E), maintenance, or security for state special fund eligible projects. The assigned project category, along with the National Plan of Integrated Airport Systems (NPIAS) status of the airport, determined funding eligibility shares from Federal Aviation Administration (FAA) Airport Improvement Program (AIP) grants or Virginia Department of Aviation (DOAV) grants as well as, in some cases, the specific source of the DOAV grant.

Cost estimates were taken from source documentation when assigned to projects generated in ACIP, AMP, or ALP. For both the VATSP-recommended facility requirements projects and other projects with missing or incomplete project cost information, project costs were developed. Start dates for each project were estimated based on ACIP or Master Plan schedules, ALP phasing, or sponsor input when available. Final calculated project costs used the most recently available unit prices and incorporated regional cost differences, allowance for design and construction phase services, cost contingency, and projected annual inflation rates to account for cost escalation. For comparison, project costs in 2014 dollars are also included in the individual airport summary sheets in Appendix C.

Final cost breakdowns by airport, role, project type, and project source reveal the total cost for each as well as the eligible funding breakdown into FAA, state, and local funding allocation.

5.2 Cost Development

Program costs submitted in master plans, airport layout plans, or capital improvement plans were input directly into the database and escalated to the year in which they are projected to be constructed. For the projects identified in this study as a facility requirement, in sponsor interviews, or found in a source document; but missing cost information, program costs were developed. This is excepting the two Metropolitan Washington Airport Authority (MWAA) airports, Washington Dulles International and Reagan Washington National, where no project-level breakdown was produced. These two airports receive a combined standard flat rate of $2 million annually from the DOAV to the MWAA. Project lists were compiled for each of the remaining 64 airports in the Virginia system and associated cost estimates developed to identify the total program cost at each airport.

Cost Escalation

Cost escalation was assumed to be 2.6 percent per year through the year 2016. This annual rate was based on the Engineering News-Record construction cost index from April 2014.[1] The assumed appreciation rate for projects beginning in year 2017 onward was 4 percent. This assumption is based on historical data[2] and expected material cost appreciations in the future. For proposed projects with an unidentified start date, the midpoint of the development period (2024) was used to assign an average of the total appreciation to the projects.

Unit Costs

Cost estimates for projects involving the construction of structural pavement were accomplished through the creation of hypothetical typical pavement sections for the type of airport being improved. Costs based on current or recent bids, for each of the seven Virginia Aviation Board regions, were assigned to the structural components of the pavement section—including the bituminous asphalt concrete, the stabilized base, the subgrade, and the subgrade preparation—and converted to square yardage costs. Regional differences in costs were also captured by increasing the earthwork costs in Regions 1 and 2. These western regions encompass mountainous counties within the Commonwealth where the quantities of excavation or embankment are greater due to elevation changes and the presence of imbedded rock. The metrics developed here directly relate to real-time construction costs linked to current bid tabulations and incorporate regional differences in pricing.

By analyzing historical bids, items integral to the construction that could not be measured in square yardage were identified as a percentage of the structural pavement costs. Items that fell into this category included mobilization, demolition, earthwork, erosion and sediment control, pavement marking, drainage systems, airfield electrical, site stabilization, and fencing. Though construction can vary from project to project, the historical bids used to develop these costs represent typical cost percentages on a broad scale.

For pavement rehabilitation projects, certain assumptions were made for lump sum costs and price per square yard. For taxiway rehabilitation projects a lump sum price of $750,000 was used. Taxilane rehabilitation was set at a lump sum price of $500,000. Runway and apron rehabilitation was calculated with a set price of $75 per square yard and $100 per square yard, respectively.

Multipliers

Multipliers were applied to the subtotal of project costs to account for known and unknown additional costs. A contingency factor of 20 percent was applied to each project to cover for additional issues and unknown costs that could arise over the duration of the project. For phased or more complex construction projects, a construction phase services (CPS) multiplying factor of 10 percent was applied to the subtotal cost to account for project oversight services during construction. CPS includes contract administration, resident inspection and project closeout. Projects that required design services also had an additional 10 percent multiplier applied to the subtotal to account for the costs of the design and planning. For projects taken from FAA and DOAV capital improvement plan documents, the design and CPS multipliers were not added as it was assumed that these project costs accounted for these items; however, a contingency factor was still applied.

[1] "Current Cost Indices," Engineering News-Record, http://enr.construction.com/economics/, Accessed 04/2014

[2] U.S. Army Corps of Engineers, *Civil Works Construction Cost Index System*, Feature Code 08: Roads, Railroads, and Bridges from 1968-2010, March 2011.

5.3 Funding Sources

The funding sources available to finance airport capital improvement projects include federal grants, Commonwealth grants, and local revenue sources.

The Airport Improvement Program (AIP) is a federal grant program that provides a major source of funding for airport development and planning. These grants are available to airports included in the NPIAS which includes public-use airports considered significant to national airport transportation and therefore eligible to apply for AIP grants. These grants fund eligible projects for airports at up to 90 percent of eligible costs for small hub, reliever, and general aviation airports. Large and medium hub NPIAS airports are eligible for 75 percent federal funding. Of the 66 airports within the VATSP, 48 are NPIAS airports and thus eligible for federal funding. Of these 48 NPIAS airports, only two are classified as large or medium hubs: Ronald Reagan Washington National Airport and Washington Dulles International Airport.

AIP eligible projects include those enhancing airport safety, capacity, or security as well as the planning, surveying, and design necessary to complete eligible projects. Projects related to airport operations or revenue-generating improvements are typically not eligible.[3] Historical AIP funding allocations to Virginia AIP projects through the FAA since 2003 are shown in **Table 5-1**.

Table 5 - 1: Virginia AIP Funding 2003-2013
(in thousands of dollars)

Year	Annual Funding[4]
2003	$61,556
2004	74,129
2005	41,298
2006	79,289
2007	88,737
2008	66,572
2009	98,657
2010	72,236
2011	62,653
2012	91,804
2013	66,877
Total:	**$803,813**
Annual Average	$80,381

Note: Totals have been rounded.

State aviation funds, offered by the DOAV, are provided through several programs including the Airport Capital Program, Facilities and Equipment Program, Voluntary Security Program, Maintenance Program, Aviation Promotion Program, and Air Service Development and Enhancement Program. In addition to these programs with specified qualifications for eligibility, there are state discretionary funds available. The DOAV may participate in the funding of a project with an airport sponsor either as part of a federally funded project

[3] Airport Improvement Program, FAA Website, www.faa.gov/airports/aip
[4] Airport Improvement Program, FAA Website, www.faa.gov/airports/aip/grant_histories

or as a state funded project.[5] DOAV administers the grant funds for the Virginia Aviation Board (VAB). The VAB allocates grant monies from the funding projects in the form of discretionary funds for airport capital improvement projects.

Local sources of funding may include airport revenues, bonds, or passenger facility charges at commercial service airports. Other sources include terminal rents, landing fees, fuel sales, or local property taxes. Both federal and state funded projects require local participation at some level.

5.4 Project Classification and Funding Distribution

For those projects eligible to receive federal funding, the FAA agrees to pay 90 percent of project costs. Of the remaining 10 percent, the Commonwealth of Virginia agrees to pay the majority with the local airport sponsor contributing one-fifth of the non-federal share, putting the total cost split for federally eligible projects at 90 percent federal, 8 percent state, and 2 percent local. For those projects not eligible for federal grants, the majority will be covered by DOAV grants at 80 percent of the eligible project cost with the local sponsor responsible for covering the remaining 20 percent. Projects ineligible for either federal or state funds must be supported with local funds. There may be cases where the DOAV accepts a funding request for state/local allocations although a project is FAA AIP eligible, because sufficient Federal funding is not available.

Project categorization was used to determine the funding allocation. For the purposes of this study, projects at NPIAS airports within the categories of Airside, Landside, FS&E, Planning, Security, Terminal, and F&E are considered AIP-eligible while Maintenance projects are not. Projects at non-NPIAS airports were all treated with the same state-local allocation split. These general rules had a few exceptions:

- Projects classified as Terminal had different allocation percentages based on their status as either a NPIAS or non-NPIAS airport. Due to the restriction against funding projects related to revenue generating improvements, only the public use portion of terminal projects are eligible for state or federal funding. With the assumption that approximately 65 percent of a terminal building is public-use, then for NPIAS airports with a 90/8/2 percent funding split, funding of that public-use space would yield 58.5 percent and 5.2 percent of the terminal project eligible for federal and state funding, respectively. The remainder of the allocation for NPIAS airports of 36.3 percent is the responsibility of the local sponsor. At non-NPIAS airports based on an 80/20 percent funding split, 52 percent is covered by the state 0 percent by the FAA with the remainder of 48 percent the responsibility of the local sponsor. For terminal improvement projects considered 100 percent public use, such as restroom renovations, an 80-20 percent split was used. Due to the fact that terminal projects for General Aviation NPIAS airports historically do not compete well for federal discretionary dollars, with no improvement expected in the future, only the terminal projects at Commercial Service Airports are included under the NPIAS funding allocation. All General Aviation airport terminal projects are considered to be funded under the non-NPIAS allocation formula.

- Hangar projects, classified in the F&E project category, were split into two phases—the site construction phase and the building construction phase with separate funding distributions applied to

[5] Airport Program Manual, Virginia Department of Aviation, November 2013

each. For the construction of the hangar site state funds are available, but for the construction of the hangar building itself the full project cost (100 percent) was allocated to the local sponsor.

- Some specific projects non-eligible for state and federal funding were treated as 100 percent locally sponsored. These include profit-generating aircraft rental or charter services and flight training as well as other non-profit generating upgrading projects such as utility improvements.

The general project-based breakdown for funding allocation is shown in **Table 5-2**. Of the 66 airports within the VATSP, 48 are NPIAS airports and the remaining 18 are ineligible for AIP funding because they are not listed in the latest NPIAS.

Table 5 - 2: Virginia Airport Capital Plan Funding
(Federal and State Capital Improvement Programs)

Project Category	Funding Allocation, NPIAS (in percent)			Funding Allocation, Non-NPIAS (in percent)	
	Federal	State	Local	State	Local
Airside	90.0	8.0	2.0	80	20
Landside	90.0	8.0	2.0	80	20
Maintenance	0.0	80.0	20.0	80	20
Planning	90.0	8.0	2.0	80	20
Security	90.0	8.0	2.0	80	20
Terminal*	58.5	5.2	36.3	52	48
FS&E	90.0	8.0	2.0	80	20
F&E	90.0	8.0	2.0	80	20

*Percentage of state participation for terminal buildings is not standard and is subject to eligibility determinations on a case by case basis.

5.5 Summary of Costs

Individual project costs at each airport were summed to reveal the total cost of the recommended projects at the airport, the eligible funding distribution, and the cost split between the facility requirements identified in this system plan versus the local airport CIP, AMP, and/or ALP. The airport project costs and the funding source eligibility were further summed by airport role and by project type. These costs are unconstrained and have not been reviewed or prioritized with respect to the ultimate objectives and initiatives resulting from the System Plan, which are presented in subsequent Chapters 6 and 7. The summary costs by role, project type, and individual airport for existing airports are included in **Tables 5-3** and **5-4** on the following pages. The costs associated with the proposed rebuilding of Grundy Airport were included in the summary cost as listed in the airport's CIP. Individual airport project cost estimates are presented in **Appendix C**. Summary costs for several phased development scenarios for the three proposed airports at Northern Neck, Lexington-Rockbridge County, or Franklin County-Rocky Mount Airport are included separately in **Appendix D**.

Notable findings include:

- Development costs total $4.374 billion over the 25 year horizon, with $511 million allocated to the state funding source.
- Individual airport CIP, AMP, and ALP identify approximately $3.378 billion in development projects.
- System Plan recommended FS&E upgrades identified in Chapter 3 require $996 Million in projects.
- The seven commercial service airports in the Virginia system, excluding MWAA airports, account for an average of $234 million per airport over the 25 year horizon, while the reliever and general aviation-regional airports include $60 million and $45 million respectively. General aviation-community airports are lower at nearly $29 million and local airports are the lowest at $9 million worth of projects per airport.
- Airside projects are the most prominent of those identified and make up more than 58 percent of the total cost, while FS&E and Terminal projects combine to account for 35 percent of the total.

Table 5 - 3: Development Cost Summary Tables (in thousands of dollars)*

Virginia Air Transportation System Plan (Unconstrained) Summary					
VATSP Service Role	Total, in 2014 Dollars	Total Escalated Dollars	FAA	State	Local
Commercial Service	$1,280,743	$1,641,382	$1,299,086	$119,801	$222,494
Reliever	482,218	654,811	536,440	51,488	66,884
GA-Regional	861,308	1,242,262	790,024	99,507	352,731
GA-Community	459,941	654,436	355,171	175,481	123,785
Local Service	127,340	181,172	40,753	65,133	75,286
Total (*rounded)	**$3,211,550**	**$4,374,063**	**$3,021,474**	**$511,410**	**$841,180**

Development Plan Breakdown Based on Escalated Dollars									
		Airport CIP/MP/ALP				System Plan Requirements			
VATSP Service Role	Total Plan Requirements	Total ACIP/AMP/ALP	FAA	State	Local	Total System Plan	FAA	State	Local
Commercial Service	$1,641,382	$1,410,983	$1,117,307	$103,643	$190,033	$230,399	$181,780	$16,158	$32,461
Reliever	654,811	379,407	297,968	30,290	51,149	275,404	238,472	21,198	15,734
GA-Regional	1,242,262	1,019,111	630,713	82,180	306,219	223,151	159,312	17,327	46,512
GA-Community	654,436	444,852	255,410	108,268	81,175	209,584	99,761	67,213	42,610
Local Service	181,172	123,232	40,474	43,821	38,937	57,940	279	21,313	36,348
Total (*rounded)	**$4,374,063**	**$3,377,585**	**$2,341,872**	**$368,202**	**$667,513**	**$996,478**	**$679,604**	**$143,209**	**$173,665**

Project Type Summary					
			Funding Source Eligibility		
Project Type	Total, in 2014 Dollars	Total Escalated Dollars	FAA	State	Local
Airside	$1,923,502	$2,555,601	$2,124,992	$295,061	$135,550
F&E	17,143	23,330	15,494	5,289	2,546
FS&E	841,397	1,232,358	551,751	136,033	544,574
Landside	146,900	194,942	160,181	15,366	19,395
Maintenance	1,538	1,695	-	1,356	339,000
Planning	21,552	28,612	22,269	3,656	2,686
Security	21,870	25,735	23,068	2,134	533,420
Terminal	237,282	311,397	123,719	52,201	135,477
Other	367	393	-	314	79
Total (*rounded)	**$3,211,555**	**$4,374,063**	**$3,021,474**	**$511,410**	**$841,180**

Table 5 - 4: Development Cost Summary Tables by Airport
(in thousands of dollars)

Airport Name	Airport Code	Type	Total	FAA	State	Local	ACIP/AMP/ALP	System Plan
Charlottesville-Albemarle	CHO	Commercial Service	$164,098	$136,240	$15,167	$12,691	$83,932	$80,166
Lynchburg Regional	LYH	Commercial Service	140,303	60,498	5,378	74,428,	140,147	156
Newport News-Williamsburg International	PHF	Commercial Service	77,565	61,390	5,457	10,718	75,970	1,595
Norfolk International	ORF	Commercial Service	717,504	606,509	54,109	56,886	607,765	109,739
Richmond International	RIC	Commercial Service	234,545	182,327	16,207	36,012	230,939	3,606
Roanoke-Blacksburg Regional	ROA	Commercial Service	245,955	202,718	19,019	24,218	228,137	17,818
Shenandoah Valley Regional	SHD	Commercial Service	61,412	49,405	4,465	7,542	44,093	17,319
Chesapeake Regional	CPK	Reliever	72,484	56,359	5,261	10,864	10,048	62,436
Hampton Roads Executive	PVG	Reliever	153,769	135,010	12,001	6,758	15,957	137,812
Hanover County Municipal	OFP	Reliever	88,023	71,803	7,759	8,461	60,409	27,614
Leesburg Executive	JYO	Reliever	39,228	34,762	3,573	893	14,307	24,921
Manassas Regional	HEF	Reliever	62,029	50,634	4,334	7,061	60,749	1,280
Richmond Executive-Chesterfield County	FCI	Reliever	95,561	69,443	6,257	19,861	79,881	15,680
Stafford Regional	RMN	Reliever	76,202	64,483	5,732	5,987	73,746	2,456
Warrenton-Fauquier	HWY	Reliever	67,515	53,946	6,572	6,997	64,310	3,205
Accomack County	MFV	GA-Regional	34,372	26,387	2,360	5,625	19,269	15,103
Blue Ridge Regional	MTV	GA-Regional	91,442	55,528	4,936	30,978	84,597	6,845
Culpeper Regional	CJR	GA-Regional	93,301	74,175	9,099	10,026	93,216	85
Danville Regional	DAN	GA-Regional	100,807	43,660	3,957	53,190	100,807	-
Dinwiddie County	PTB	GA-Regional	39,590	29,606	2,843	7,141	35,656	3,934
Emporia-Greensville Regional	EMV	GA-Regional	40,455	29,201	3,080	8,173	35,999	4,456
Farmville Municipal	FVX	GA-Regional	41,694	31,444	4,462	5,788	30,433	11,261
Ingalls Field	HSP	GA-Regional	20,549	10,355	2,453	7,740	10,828	9,721
Lonesome Pine	LNP	GA-Regional	66,717	54,419	4,922	7,377	42,481	24,236
Mecklenburg-Brunswick Regional	AVC	GA-Regional	44,310	28,691	3,494	12,125	36,211	8,099
Middle Peninsula Regional	FYJ	GA-Regional	56,804	41,053	5,459	10,296	51,688	5,116
Mountain Empire	MKJ	GA-Regional	22,571	18,183	1,616	2,772	19,541	3,030
New River Valley	PSK	GA-Regional	32,885	22,694	2,103	8,089	32,885	-
Suffolk Executive	SFQ	GA-Regional	33,968	28,124	3,024	2,820	28,113	5,855
Tappahannock-Essex County	XSA	GA-Regional	34,063	24,206	2,837	7,021	16,560	17,503
Tazewell County	JFZ	GA-Regional	75,610	58,015	5,157	12,438	59,817	15,793
Virginia Highlands	VJI	GA-Regional	147,947	93,624	23,722	30,601	143,649	4,298
William M. Tuck	W78	GA-Regional	66,376	45,693	4,874	15,809	34,290	32,086

Table 5 - 4: Development Cost Summary Tables by Airport (Continued)

Airport Name	Airport Code	Type	Total	FAA	State	Local	ACIP/AMP/ALP	System Plan
Winchester Regional	OKV	GA-Regional	198,801	74,967	9,109	114,723	143,071	55,730
Blackstone AAF	BKT	GA-Community	18,207	-	11,180	7,027	13,266	4,941
Brookneal-Campbell County	0V4	GA-Community	16,863	-	9,969	6,894	1,662	15,201
Franklin Municipal	FKN	GA-Community	12,548	11,053	982	513	2,495	10,053
Front Royal-Warren County	FRR	GA-Community	59,430	50,594	4,530	4,307	29,522	29,908
Lake Country Regional	W63	GA-Community	29,734	-	20,119	9,615	12,097	17,637
Lee County	0VG	GA-Community	37,573	26,347	2,441	8,785	34,461	3,112
Louisa County	LKU	GA-Community	47,001	33,060	5,770	8,171	26,508	20,493
Luray Caverns	LUA	GA-Community	47,784	32,968	4,785	10,031	33,964	13,820
New Kent County	W96	GA-Community	57,246	47,574	4,229	5,443	29,439	27,807
Orange County	OMH	GA-Community	27,909	20,112	1,940	5,857	20,052	7,857
Shannon		GA-Community	20,059	-	14,558	5,501	7,501	12,558
Tangier Island	TGI	GA-Community	10,315	5,486	1,073	3,757	-	10,315
Twin County	HLX	GA-Community	55,411	22,902	20,029	12,480	55,296	115
Virginia Tech-Montgomery Executive	BCB	GA-Community	130,031	105,076	13,741	11,214	128,095	1,936
Wakefield Municipal	AKQ	GA-Community	22,105	-	13,977	8,128	8,604	13,501
Williamsburg-Jamestown	JGG	GA-Community	62,220	-	46,157	16,063	41,890	20,330
Bridgewater Air Park		Local Service	5,274	-	2,853	2,421	106	5,168
Chase City Municipal	CXE	Local Service	8,595	-	2,273	6,322	259	8,336
Crewe Municipal	W81	Local Service	5,558	-	1,991	3,567	-	5,558
Falwell	W24	Local Service	470	-	290	180	-	470
Gordonsville Municipal	GVE	Local Service	14,433	-	6,329	8,104	9,271	5,162
Grundy Municipal	GDY	Local Service	51,784	40,753	4,300	6,731	51,474	310
EZF								
Hummel Field	W75	Local Service	45,400	-	24,873	20,527	43,452	1,948
Lake Anna	7W4	Local Service	15,916	-	7,260	8,656	11,489	4,427
VBW								
Lawrenceville-Brunswick Municipal	LVL	Local Service	7,496	-	2,150	5,346	979	6,517
Lunenburg County	W31	Local Service	10,850,	-	3,396	7,454	5,257	5,593
New London	W90	Local Service	2,676	-	249	2,427	-	2,676
New Market	8W2	Local Service	5,940	-	4,410	1,530	-	5,940
Smith Mountain Lake	W91	Local Service	3,157	-	2,005	1,152	945	2,212
Waynesboro-Eagle's Nest	W13	Local Service	3,623		2,755	868	-	3,623
		Totals	**$4,374,063**	**$3,021,477**	**$511,412**	**$841,180**	**$3,377,585**	**$996,478**

Note: Totals have been rounded.