MANASSAS REGIONAL AIRPORT

HARRY P. DAVIS FIELD

AIRPORT LAYOUT PLAN TECHNICAL REPORT

OCTOBER 2002

Prepared For:
Manassas Regional Airport Commission

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SECTION ONE:

EXISTING CONDITIONS

Manassas Regional Airport - Harry P. Davis Field (HEF) is located on approximately 850-acres of land within the incorporated limits of the City of Manassas and central Prince William County (see **Figure 1.1**). The airport is approximately 15 air miles to the south of Washington-Dulles International Airport and 28 air miles to the southwest of Washington-Reagan National Airport. The airport is designated as a general aviation reliever airport in the National Plan of Integrated Airport Systems (NPIAS) and is designed in part to provide capacity relief for the heavily congested airspace around Reagan-National and Dulles International Airports.

1.1_ PURPOSE OF ALP UPDATE AND MAJOR PLANNING ISSUES

The purpose of this Airport Layout Plan Update (ALP) is to re-examine and update the existing approved Airport Layout Plan prepared originally with the 1990 Master Plan Update Study. Specifically, this effort will result in updated forecasts of the anticipated aviation activities that will then be used to identify what types and sizes of facilities will likely be required to meet those demands over the next ten to twenty year planning horizon. An updated Airport Layout Plan will then be prepared to show where and how these facilities should be developed on the remaining undeveloped areas of airport property to promote its continued safe and efficient operation. The assessment of these updated facility requirements will also be used to determine whether any additional property may be required beyond the existing boundaries of airport property to accommodate the anticipated aviation activities.

While the development plan prepared with the 1990 Airport Master Plan Update included a variety of recommended landside and airside facility improvements in both the East and West Complexes, many of the plan recommendations have already been implemented. In fact by the time that study was completed, the West Complex had already been substantially built-out leaving limited space for any additional t-hangars and apron facility development on that side of the airfield. Likewise, most of the basic airside infra-structure was also already in place by 1990 so the only major long term airside facility expansion identified by the approved Airport Layout Plan was the 1,000-foot extension of the Runway 16L-34R system. As a result, most of the recommended

improvements from the 1990 study focused on the development of a new terminal area and additional FBO/hangar areas on the East Complex with the attendant mixture of tie-down and transient apron expansions necessary to support these activities. Much of that facility development has now been implemented as well. And while many of the same issues originally identified in that study will be reviewed again, this ALP Update effort report is not to be considered a complete Master Plan Update. No major change in the types of aircraft using the facility is expected nor is the service role of the airport in the national airport system anticipated to change. No significant airside facility development is anticipated beyond that already conceptually identified in the 1990 Master Plan. This updated study will purposely focus on how to optimize

Figure 1.1 - Airport Location

the use of the existing infra-structure (i.e., how much runway length is really necessary) and how to arrange the development of the traditional general aviation and business aircraft facilities (i.e., hangars, t-hangars, aprons, taxiways, etc.) on the available property to meet the forecasted aviation needs while balancing the non-aviation needs and concerns of the entire community affected by the airport. One of the important goals of the recommended plan will also be to have a plan flexible enough to respond to change and to enable the City to take advantage of unanticipated economic development opportunities that could not have been forecasted. While no major changes affecting the airport development plans are anticipated, the recommendations flowing from this study effort will be just as valuable in guiding the airport development over the next ten to twenty years as the 1990 study was to this date.

Major planning issues to be examined in the Technical Report include:

- ***Activity Planning Forecasts***: Forecasts of based aircraft and operations at Manassas Regional Airport (HEF) will be updated (from the 1990 Master Plan) as part of this study taking into account the most recent Terminal Area Forecast prepared by the FAA and the forecasts prepared by the Virginia Department of Aviation (DOAV) for the most recent update of the Virginia Air Transportation System Plan (VATSP).
- ***Ultimate Runway Length Requirements***: An updated assessment of the ultimate runway length requirements will be prepared based on the updated activity forecasts and critical aircraft determination.
- ***Airport Reference Code (ARC):*** The 1990 ALP and Master Plan indicate that the airport is
designed to accommodate ARC C-II/III aircraft. This ALP Update will examine the potential and physical requirements/costs/benefits of planning facilities to accommodate general aviation and business aircraft types in the C-III category in an effort to meet both experienced and anticipated demand.
- ***Obstruction Analysis:*** Using aerial photogrammetry conducted on June 17, 2001, a re-evaluation of existing and future FAR Part 77 surfaces surrounding the airport will be completed to identify any existing or potential obstructions to air navigation and identify any mitigation measures.
- ***Land Acquisition/Release:*** This report will examine the need for additional property acquisition to support forecasted and/or potential aeronautical and aeronautical related uses. Two potential areas have already been identified during the scoping for the study. One identified study area is a 10-15 acre portion of adjacent property east of Wakeman Drive near the fuel farm and planned Route 234 connector which is “isolated” to some extent by the Cannon Branch flood plain and the alignment of the Prince William County Service Authority‘s Area 6 Interceptor sewer easement/corridor. A second study area is the ±20 acre property northwest of the intersection of Observation Road and Piper Lane adjacent to the Virginia Railway Express (VRE) station.
- ***Long-term Development of Vacant Land:*** Development alternatives will be examined to optimize the remaining available land within airport property. The uses and general configuration of proposed development, as described on the 1990 ALP, will be re-evaluated for its ability to meet the updated facility requirements.

- ***Airport Access:*** The new airport access connection with the Route 234 Bypass will change surface transportation patterns and could result in additional commuters using airport owned/maintained roads to access the VRE station in the northwest quadrant of the airport. The results of a surface traffic study will be included in the report.
- ***Taxiway Improvements:*** Based on the updated facility requirements, the ALP will identify necessary taxiway system improvements to support the development plans.
- ***Feasibility of Potential Commercial Service:*** Facility and operational improvements required to meet requirements of FAR Part 139 will be examined and briefly evaluated for potential feasibility and cost vs. benefits.
- ***Tower Location:*** A cursory review of the existing tower location and height will be examined to identify any line-of-sight considerations affecting the recommended development plans and any proposed extension of Runway 16L-34R.

1.2 HISTORY OF MANASSAS REGIONAL AIRPORT

Manassas Regional Airport was originally constructed in 1928 on 98-acres of land which has subsequently been developed as the Manaport Plaza Shopping Center on Route 234 (Sudley Road). The original facility consisted of two intersecting turf runways approximately 2,000-feet in length. The land was purchased by a group of prominent local businessmen and citizens who saw a need for an airport in the vicinity of Manassas. With urban growth pressures, primarily residential and commercial uses encroaching upon the airport, the town realized that the 1928 site could no longer support the airport. After 34 years of continuous service at the original site, Manassas Airport was relocated in 1964 to a 268-acre site at its present location. Mayor Harry P. Davis, whom the airport was named after, was an ardent supporter of the original airport site and was instrumental in the purchase of the land for the original and relocated airport sites. Mr. Davis was the mayor of Manassas for over 40 years, serving from 1921-1967 and always believed that the airport would make Manassas more than a bedroom community of the Washington, D.C. area.

Initial airport construction on the new site consisted of a 3,700-foot runway, stub taxiway, and a 150-foot by 300-foot apron. The construction of initial airport facilities was completed in October 1964 (FAA Project No. 9-44-015-D301). An early photograph of the 1964 facility is included in the appendix. The following is a list of some of the major items of development that have been accomplished since 1964:

- 1964: 30 T-hangars, maintenance hangar, administration building and sewage treatment facilities (sand filter)
- 1967: Parallel taxiway (FAA Project No. 9-44-015-D702)
- 1968: Apron extension (FAA Project No. 9-44-015-D803)
- 1972: Runway, stub taxiway and apron strengthening and apron extension (ADAP Project No. 8-15-0030-01-71)
- 1974: Apron extension, parallel taxiway strengthening, high speed exits and an additional land acquisition of 214 acres (ADAP Project 5-51-0030-02)
- 1975: Additional FBO storage hangar
- 1976: Apron and access road strengthening (ADA Project No. 5-51-0030-03)
- 1977: Apron expansion, taxiway strengthening and access road extension

(ADAP Project No. 5-51-0030-04)

- 1979: Apron expansion and taxiway signage (ADAP Project No. 5-51-0030-05)
- 1979: Parallel (4,000-foot by 100-foot) runway 16L-34R and taxiway construction (ADAP Project No. 5-51-0030-06)
- 1980: 30 T-hangar units (West Complex)
- 1981: Perimeter access road and an additional land acquisition of 20-acres (ADAP Project No. 5-51-0030-08)
- 1981: Instrument landing system - Runway 16L
- 1982: 1,700-foot extension to Runway 16L-34R and taxiway, east apron strengthening and additional land acquisition of 188-acres (AIP 3-51-0030-01/02)
- 1984: New airport entrance road - Wakeman Drive (AIP 3-51-0030-03)
- 1985: Public water and sewer utilities for East Complex area
- 1986: Rehabilitate north apron - West Complex (AIP 3-51-0030-04)
- 1987: East Complex common taxiway (AIP 3-51-0030-05)
- 1988: Expand East Complex apron (AIP 3-51-0030-06)
- 1988: East Complex t-hangars (53 units) East Complex storage hangars (3)
- 1989: Update Airport Master Plan and Part 150 Noise Study (AIP 3-51-0030-07)
- 1990: East Complex taxiway extension and East and West Complex access road extension (AIP 3-51-0030-08).
- 1992: Air Traffic Control Tower (Purchased/Relocated from Colorado)
- 1992 Initial Construction-Central Fuel Storage Facility (DOAV Grant Funds)
- 1992: East Complex FBO Common Taxiway (AIP 3-51-0030-08)
- 1993: West Apron Rehabilitation (AIP 3-51-0030-09)
- 1993: Lighting and Beacon Improvements (AIP 3-51-0030-011)
- 1993: Property acquisition for Approach Protection (AIP 3-51-0030-012)
- 1995: Business/General Aviation Passenger Terminal Complex (DOAV Grant Funds)
- 1996: East Apron Tie-Downs
- 1996: Part 150 property acquisition (AIP 3-51-0030-013)
- 1997: Part 150 property acquisition (AIP 3-51-0030-014)
- 1997: New airfield electrical vault, Runway 16L PAPI, Segmented Circle (AIP 3-51-0030-015)
- 1998: Corporate Hangar Development - East Complex
- 2000: Runway 16L-34R Reconstruction (AIP 3-51-0030-016)
- 2000: Taxiway Alpha Rehabilitation (AIP 3-51-0030-017)
- 2000: Southwest T-Hangar Development
- 2000: Acquire Part 150 Property (AIP 3-51-0030-018)

Manassas Regional Airport represents a tremendous investment of capital for the region and the returns on this investment are not only seen in the revenue generated from the airport itself, but also by the businesses that are attracted to the Manassas area and the economic benefits that they bring to the city through tax revenue and
local employment. The history of careful and thoughtful improvements at the airport has also demonstrated a level of sensitivity toward surrounding communities and has promoted the overall

safety of the traveling public in the air and on the ground.

Figure 1.2 - Existing Airfield

1.3 AIRPORT FACILITIES INVENTORY

1.3.1 Runway and Taxiway Facilities

The existing close-in parallel runway system consists of the main precision instrument 5,700-foot Runway 16L-34R separated by 750 feet from the non-precision 3,700-foot Runway 16R-34L. The 750-feet separation between the two runways exceeds the minimum 700-feet separation required for simultaneous VFR operations but keeps the Part 77 Primary Surfaces of the two runways from overlapping each other. The parallel runway system is fully supported by a convenient full length parallel taxiway system. **Table 1.1** identifies the major airfield facility components available in 2001.

1.3.2 On-Airport Navigational Facilities

On-airport navigational facilities at Manassas Regional Airport include a full CAT-I Instrument Landing System (ILS) with an off-set localizer, DME, glide slope and MALSR; an Automated Weather Observation System (AWOS-III), Segmented Circle with Lighted Wind Cone, Rotating Beacon (70-foot tower) and a 70-foot tall Air Traffic Control Tower (ATCT) that is in operation 16-hours a day. Four-box Precision Approach Path Indicators (PAPI's) are available for both approaches on Runway 16L-34R and two-box PAPIs are available for both approaches on Runway 16R-34L.

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TABLE 1.1

Major Airfield Facilities Available at Manassas Regional Airport - 2001

FACILITY	DIMENSIONS	FEATURES
Runway 16L-34R ***(HIRL)***	**5,700' x 100'**	Runway 16L - Precision ILS Approach Runway 34R - GPS Approach
Runway 16R-34L ***(MIRL)***	**3,700' x 100'**	Runway 16R - VOR/DME/GPS Runway 34L - NDB/GPS-A
East Apron	**±70,000 square yards**	114 tie-downs
West Apron	**±67,000 square yards**	158 tie-downs
T-Hangars - East Complex	**90 units**	90 units privately owned and operated
T-Hangars - West Complex	**68 units**	30 units operated by City of Manassas 38 units privately owned and operated
Fuel Farm	**5 Tanks**	82,000 gallons
General Aviation Terminal Facility	**±21,000 sq. ft.**	Pilot lounge, flight planning, airport administration, vending, museum.
NAVAIDS	**PAPIs (all approaches), Segmented Circle, Lighted Windcone, Rotating Beacon, AWOS-III, MALSR, *REILs***	

Air Traffic Control Tower **Relocated from Centennial Airport, Colorado**

Source:
Manassas Regional Airport 2002

1.3.3 Landside Facilities

Landside facilities at the airport include the traditional mixture of t-hangar and larger group storage and corporate hangars (see **Figure 1.2**). Approximately 158 individual t-hangar units located in 12 buildings are distributed relatively evenly between the East (7 Bldgs- 90-units) and West (5 Bldgs-68-units) Complexes. The t-hangar units are generally large enough to house most of the single-engine Group I (wingspans less than 49-foot) aircraft. Ownership of the t-hangars is predominantly through condominium management (T-Hangars of Virginia and Airframe Hangars, Inc) with the airport owning two hangar buildings with 30-units located within the West Complex.

Approximately 200,000 square feet of large hangar space exists in (12) large group storage and corporate hangar facilities ranging in size from 10,000 to 28,000 square feet (Aerographics) located within leased areas on the East (±145,000-square feet in nine buildings) and West (±50,000-square feet in three buildings) Complexes.

Approximately 272 apron tie-down positions are available at Manassas Regional Airport with the West Complex having a majority of the available tie-downs (158). Tie-downs located in the West Complex are accommodated in two aprons; the west apron, located in front of Dulles Aviation, and the southwest apron, located south of the ATCT. The remaining 114 tie-downs available are located in the East Apron.

A two-story terminal/administration building was constructed in 1995 on the East Complex. A public lobby area, flight planning area, vending and pilot lounge are all provided for on the first floor of the terminal facility. Airport administration offices and conference room are provided on the second floor of the terminal facility. Leased space is provided on the first floor only. In addition to the facilities necessary for operation of the airport, the first floor of the terminal building is temporarily housing the Freedom Museum until a more permanent location can be developed.

1.3.4 Fuel Storage Facilities

The central fuel storage complex was originally constructed in 1992 at its present site as a replacement for underground storage tanks that were removed in order to comply with EPA requirements (see **Figure 1.2**) The facilities consist of five (5) above ground storage tanks which were constructed and are owned/leased by the FBO's who have fueling lease rights (i.e., Dulles Aviation, Falconhead/Jet Services and Geneva Aviation). Three Jet A tanks have a total capacity of 52,000 gallons while two (2) AvGas 100LL tanks have a total capacity of 30,000 gallons. Into-plane aircraft fueling is a service provided by the authorized FBOs using their own fuel tenders.

1.3.5 Helicopter Facilities

Several marked landing spots and pads are designated as helicopter landing areas by the ATCT; however, no separate rotor-wing FBO and/or helicopter storage facilities are located on the airport.

Helicopters are occasionally stored with fixed wing aircraft in some of the other group hangars. The single helicopter landing pad located near the south end of the t-hangar area on the East Complex is primarily used by the Virginia State Police and other governmental helicopter activities. A second stand alone helicopter landing facility is located just south of the East Apron.

1.4 EXISTING AIRPORT ACTIVITY

An integral part in determining any future needs in airport facilities is an understanding of historical trends at the airport. Traditional measures of historical airport activity are based aircraft and levels of aircraft operations.

1.4.1 Based Aircraft

According to airport administration, there are 343 aircraft permanently based at the airport on tie-down aprons or in hangars as of August 2001. When compared to the first recorded based aircraft count of 61 in 1964, the net increase to date represents a very impressive annualized growth rate of 4.8-percent over the 37 year history of the airport at its present site. This overall growth rate is however somewhat misleading when you consider the fact that since reaching a reported peak of 445 based aircraft in 1995, the based aircraft population has actually declined by more than 100 aircraft during the last five years (See **Table 1.2**). A possible explanation for this is that record keeping may have been suspect prior to the establishment of the ATCT.

Even with the most robust national economy and the traditionally stronger Northern Virginia economy, it was nearly impossible to expect the double digit annual growth rate from 1964 to 1995 to continue unimpeded. The

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TABLE 1.2
Historical Based Aircraft Population at Manassas Regional Airport

YEAR	REPORTED POPULATION	GROWTH INDEX
1964	61	1.00
1970	160	2.62
1980	216	3.54
1990	400	6.56
1995	445	7.30
1999[1]	369	6.05
2000[2]	315	5.16

2001[3]	*343*	*5.62*
Annualized Rate of Growth (1964-2001)	4.78%	

Sources:
1990 Manassas Municipal Airport Master Plan
[1] 2001 Federal Aviation Administration Terminal Area Forecast
[2] VATSP 2001 Update
[3] Manassas Regional Airport

apparent "downturn" in the based aircraft population since 1995 is most likely attributed to the regulatory influence of the ATCT airspace discouraging some of the more recreational flyers and the facility improvements (especially more t-hangar construction) that have occurred at the surrounding alternative general aviation airports like Warrenton-Fauquier, Culpeper Regional and Leesburg Executive. Based on the airport's most recent count of 343 based aircraft in 2001, it would appear that this attrition may have stabilized. Even with the decrease in based aircraft since 1995, Manassas Regional Airport still maintains the largest general aviation based aircraft population of all airports in the Commonwealth of Virginia.

Consistent with the composition of the active aircraft fleet over the same time period, the based aircraft population at Manassas Regional Airport has historically been comprised mostly of the single and multi-engine general aviation aircraft but with a relatively strong 10- to 15-percent turbo-props and business jets in the mix. With the completion of the 1,700-foot extension to Runway 16L-34R in 1982 and the almost simultaneous completion of the ILS, the resultant 5,700-feet precision runway capability satisfied the needs for most of the traditional business aircraft fleet (Gulfstreams, Lears, Falcons, Citations, etc.) The construction of the ATCT in 1990 completed the transition from a general aviation facility to a state-of-the-art all-weather business airport facility. Correspondingly, the population of based aircraft has gradually reflected that transition by showing a shift away from the single-engine propeller driven aircraft and towards the larger business aviation multi-engine/turbo-props and turbo-jets. **Table 1.3** presents the based aircraft population at Manassas Regional Airport in 1990 and in 1999 and the composite percentage of the fleet by aircraft type.

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TABLE 1.3
Historical Based Aircraft by Aircraft Type - 1990 and 1999

AIRCRAFT TYPE	1990 BASED AIRCRAFT TYPE[1]		1999 BASED AIRCRAFT TYPE[2]	
Single Engine Propeller	**317**	**79.3%**	**279**	**75.6%**

Multi-Engine Propeller & Turbo-Prop[3]	**60**	**15.0%**	**56**	**15.2%**
Turbo-Jet	**12**	**3.0%**	**15**	**4.1%**
Helicopters/Others	**11**	**2.8%**	**19**	**5.1%**
TOTAL	**400**	**100%**	**369**	**100%**

Sources:
[1] 1990 Manassas Municipal Airport Master Plan
[2] 2001 Federal Aviation Administration Terminal Area Forecast
[3] FAA 5010 does not distinguish between multi-engine and turbo-prop aircraft.

The single largest percentage increase in based aircraft at the airport has been in the helicopter segment (approximately 5-percent of the total population). Operators of helicopters at Manassas include several governmental agencies and helicopter flight schools using a mixture of helicopter types, primarily Robinsons and Bells.

The based aircraft population is divided between the East and West Complexes and is generally consistent with the capacity of available facilities. Although the characteristics of the West Complex facilities, including pavement strength, taxiway width, Runway 16R-34L length and apron dimensions, are generally better suited for the smaller B-II aircraft types, the FBO accommodates the entire fleet of based and transient aircraft types on a regular basis within the complex. The East Complex was designed and constructed in concert with the longer Runway 16L-34R. The pavement and geometry of the infra-structure are specifically designed for the largest aircraft types that can use the longer runway including many of the largest twin-engine C-II turbo-prop and turbo-jet business aviation aircraft in the fleet (even occasionally larger aircraft weighing more than 70,000 lbs and with wingspans up to 100-feet or more). Even with the shift in the based aircraft population expected to trend more toward the larger multi-engine turbo-prop and business jet aircraft types, the largest segment of the based aircraft population at Manassas Regional Airport will continue to be the small single-engine propeller driven aircraft. As a result, future aviation facilities in both complexes will have to be designed to accommodate all types of general and business aviation aircraft.

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TABLE 1.4
Based Aircraft Distribution on East/West Complexes

AIRCRAFT TYPE	WEST COMPLEX	EAST COMPLEX	TOTAL
Available Tie Down Positions	**158**	**114**	**272**
T-Hangar Units	**68**	**90**	**158**

Conventional Hangar Capacity	**50,000 (16 A/C)**	**148,000 (50 A/C)**	**198,000 (66 A/C)**
Total Based Aircraft Capacity	**242**	**250**	**496**
Total Based Aircraft (2001)	**189**	**154**	**343**
Positions Available for Transient Aircraft	**53**	**96**	**153**

Source:
Manassas Regional Airport

Note: Split of based aircraft estimated by airport management

1.4.2 Aircraft Operations

An aircraft operation is defined as either an aircraft takeoff or landing. A "touch and go" is reported as two operations. The Air Traffic Control Tower maintains an accurate and reliable count of all aircraft operations. However, prior to the ATCT becoming operational in 1990, determining the actual volume of aircraft activity at the airport proved to be difficult as no formal mechanism existed at the airport to count aircraft operations. Typically, planning documents had to rely on an extrapolation of one or two week traffic counts that may have been observed at various times during the census year and may not have accounted for yearly variations in activity levels. As a result, historical aircraft operations reported for the airport show a rather large variation in operation levels. This large variation may be attributable to a significant level of flight training and other local operations which are dependent upon weather conditions and subsequently may or may not have been counted in the two-week observations. **Table 1.5** presents the reported historical operational activity at Manassas Regional Airport since it relocated to its present site in 1964.

Dividing the number of operations in a certain year by the number of based aircraft in that same year results in what is referred to as the "operations per based aircraft" or OPBA. The number of operations per based aircraft

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TABLE 1.5
Historical Annual Operations at Manassas Regional Airport

YEAR	REPORTED ANNUAL OPERATIONS	GROWTH INDEX
1964[1]	**40,000**	1.00
1972[1]	**121,500**	3.04
1980[2]	**106,000**	2.65

1990[3]	**146,800**	3.67
1995[3]	**136,353**	3.41
1999[3]	**119,007**	2.98
2000[4]	**136,650**	3.42
2001	**139,709**	3.49
Annualized Rate of Growth (1964-2001)	**3.44%**	

Sources:
1 1973 Airport Master Plan
2 1986 Federal Aviation Administration Terminal Area Forecast
3 2001 Federal Aviation Administration Terminal Area Forecast
4 FAA ATCT Airport Traffic Record.

Note:
For 2001 operations, percent change between Jan-Aug 2001 and Jan.-Aug 2000 was applied to reported Sept.-Dec. 2000 activity levels to determine predicted Sept. - Dec. 2001 activity levels which were then added back to YTD 2001 activity.

at the airport in 1990 was 369 which increased to 434 operations per based aircraft in 2000. The OPBA is an accepted planning tool to forecasting aircraft operations and will be used in the Forecast of Aviation Demand in this Airport Layout Plan Update Report.

1.4.3 Existing Peaking Conditions

Peaking characteristics at an airport are typically measured in three ways: peak month, average day of the peak month (ADPM) and peak-hour of the average-day. FAA Advisory Circular 150/5060-5 "Airport Capacity and Delay" provides guidance in establishing these peaking characteristics. Generally, the peak days of activity would be clustered around the weekends which reflects the high levels of flight training and local operations. Based on 2000 operations reported by the Federal Aviation Administration Airport Traffic Record, the estimated average day of peak month activity in 2000 would have approximately 471 operations (annual demand/290). Average peak hour of activity would be estimated at 52 operations (average daily demand/9).

1.4.4 Operations by Type of Aircraft

For this study, the Air Traffic Control Tower provided two weeks of "tower strips" that were analyzed to determine operations by type of aircraft. Based on the two-week observation period in July 2001, the single-

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TABLE 1.6
Historical Peaking Characteristics at Manassas Regional Airport

YEAR	ANNUAL OPERATIONS	PEAK MONTH ACTIVITY	AVERAGE DAILY ACTIVITY	PEAK HOUR OF AVERAGE DAILY ACTIVITY
1964[1]	40,000	4,280	**138**	**15**
1972[1]	121,000	12,947	**417**	**46**
1980[2]	106,000	11,342	**366**	**41**
1990[3]	146,800	15,708	**506**	**56**
1995[3]	136,353	14,590	**470**	**52**
1999[3]	119,007	12,734	**410**	**46**
2000[4]	136,650	14,576	**471**	**52**

Sources:
[1] 1973 Airport Master Plan
[2] 1986 Federal Aviation Administration Terminal Area Forecast
[3] 2001 Federal Aviation Administration Terminal Area Forecast
[4] Manassas Regional Airport

Note: July is the historical peak month of activity at the airport and generally represents 11-percent of total annual operations.

engine propeller driven aircraft represented approximately 78.6-percent of total operations while multi-engine aircraft represented approximately 6.8-percent. Turbo-prop and turbo-jet aircraft represented approximately 4.2-percent of total operations, helicopter activity represented an additional 8.2-percent of total operations and "other" (i.e., military, blimp activity, etc.) accounted for 2.2-percent.

Applying these percentages to 2000 total operations results in 107,000 single-engine operations in 2000, approximately 9,300 multi-engine operations, 5,700 turbo-prop and turbo-jet operations and 11,200 helicopter operations and 3,000 "other" operations.

1.4.5 Observed Runway Usage

Runway utilization at the airport was determined from data collected from Air Traffic Control Tower flight strips. These strips typically record the tail number (or "N" number) of the aircraft, what runway the aircraft utilized, and whether the aircraft was inbound or outbound.

Historically, the shorter west side Runway 16R-34L handles more activity than the longer east side runway. The 1990 Master Plan Update reported that Runway 16R-34L accommodated 68-percent of total operations. The patterns observed in July 2001 remain generally consistent (61% favored Runway 16R-34L) with the earlier observations. This use pattern has usually been explained by the fact the largest majority of the based aircraft population are the single and light twin engine aircraft which can comfortably operate on the 3,700-foot length and perhaps prefer the west side runway because most of these aircraft have historically been located in the West Complex.

The observed runway usage during this period indicated a slight preference (54% vs 46%) for

approaches from the north which is somewhat contrary to the historical data for prevailing wind direction favoring a southerly approach during VFR conditions in the summer season. The two weeks worth of "unofficial" data should not be considered significant enough to draw any conclusions that would dispute the ten years worth of NOAA wind observations to the contrary. The availability of the ILS to Runway 16L for training and traffic management considerations by the ATCT during calm wind periods (reported to account for more than 10% of the time) are just two obvious factors that can certainly influence the data for this very short observation period.

1.4.6 Instrument Approaches

Manassas Regional Airport enjoys excellent instrument approach capability from the south and north. **Table 1.7** (**Figures A.1 thru A.2** in Appendix A) identifies the ceiling and visibility minimums for each of the instrument approaches. Despite the airport's proximity with the Dulles and Reagan National airspace and the active area of restricted airspace (R6608) and associated MOA located only 5 miles south of the airport, all four runway thresholds have at least one instrument approach available. The approach from the south with the best visibility minimums is the GPS to Runway 34R and from the north is the GPS approach to Runway 16L. While Runway 16L is equipped with a precision instrument ILS approach with an offset localizer (with DME), glide slope antenna, outer marker (located 6.4 nautical miles from the threshold to Runway 16L) and a medium intensity approach lighting system with runway alignment identification lights (MALSR). This type of equipment is approved for Category I Instrument Landing System approaches and would theoretically allow

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TABLE 1.7

Published Approaches to Manassas Regional Airport (Elev. 192 M.S.L.)

APPROACH	APPROACH TYPE	RUNWAY	ESTABLISHED MINIMUMS CEILING-VISIBILITY (FEET (M.S.l.) -MILES)
ILS	Straight	16L	**442-3/4**
VOR/DME/GPS	Straight	16R	**680-1**
NDB/GPS-A	Circling	ALL	**920-1**
GPS	Straight	16L	**640-1/2**
GPS	Straight	34R	**620-1**

Sources:
U.S. Department of Commerce, National Oceanic and Atmospheric Administration
U.S. Terminal Procedures, 25 January 2001

minimums down to ½-mile visibility and 200-feet height above threshold (HAT). However, the "penalty" associated with the off-set localizer and apparent course roughness associated with the relatively old localizer equipment prevents the airport from achieving the best minimums possible.

Periodic maintenance performed by FAA Airways and Facilities could remove the course roughness and provide the ILS approach with a ½ mile visibility minimum, however, the 250-foot HAT minimum would stay in effect until the localizer could be placed on centerline.

1.4.7 Instrument Operations

Instrument operations can occur either during instrument meteorological conditions (IMC) or visual meteorological conditions (VMC). The ATCT traffic records for 2000 indicate that approximately 10-percent of all operations were instrument operations (13,400 instrument operations). It should be noted that this observation is very consistent with the local weather patterns which indicate that instrument meteorological conditions also occur approximately 10-percent of the time. The peak month of instrument operations in 2000 was July with 1,476 instrument operations, however, instrument operations accounted for the largest percentage of monthly operations in April (11.4-percent of total monthly operations). Reduced visibility in July and prolonged periods of rain in April tend to result in these months having a higher amount of IMC weather.

1.4.8 Military Operations

Military operations at Manassas Regional Airport have historically represented less than 1-percent of total operations. According to the ATCT, this trend continued in 2000 with a total of 377 operations (less than one half of one percent). Typical military operations by small fixed-wing and helicopter military aircraft included flight training and local mission support activities.

1.5 SCHEDULED AND NON-SCHEDULED COMMERCIAL SERVICE

1.5.1 Scheduled Service

No scheduled commercial service operates through Manassas Regional Airport. Commercial service (i.e., using small 15 to 30 seat turbo-prop aircraft) was provided by Colgan Airlines from 1971 until it was discontinued in 1986. Colgan Airways (now operating Beach 1900 and Saab 340s through a code sharing agreement as U.S. Airways Express) does maintain a 15,000 square foot corporate headquarters and maintenance facility on the airport.

1.5.2 Non-Scheduled Service

Part 135 charter operations originate from both the East and West Complexes and utilize a wide variety of business aviation aircraft. Approximately 2,500 Part 135 charter operations representing about 1.8-percent of the total annual operations were reported for 2000. Monthly activity ranged from a low of 148 operations in August to a peak of 303 operations in November 2000.

1.6 WEATHER AND WIND ROSE DATA

1.6.1 General

The nearest official National Oceanic and Atmospheric Administration (NOAA) weather recording station is located at Dulles International Airport approximately 15 air miles north of Manassas Regional Airport. A total of 82,805 observations of wind speed and direction were collected from 1991 to 2000 in four ceiling and visibility classes. Although weather conditions at Dulles International Airport can

be different from weather conditions at Manassas Regional Airport at any given point in time (i.e., microclimate conditions), the wind and other climatological data collected at the Dulles weather reporting station is generally assumed to represent reliable data for the analysis of *average* weather conditions for the region including conditions at Manassas Regional Airport. While Manassas Regional Airport does have an Automated Weather Observation Station (AWOS) Level III located in the midfield, historical weather information was not available for this analysis.

1.6.2 Local Climate

Manassas Regional Airport is located in the Virginia Piedmont approximately 25-miles to the east of the Blue Ridge Mountains and 15-miles east of the Bull Run Mountains. The established airport elevation at Manassas Regional Airport is 192-feet above sea level. The terrain in the immediate proximity of the airport is mostly level with approximately half of the airport property lying in the 100-year flood plain for Broad Run. The proximity of Broad Run does result in the frequent formation of localized ground level fog.

The location of Manassas Regional Airport in the middle latitudes facilitates a weather pattern that is characterized by four distinct seasons. The average daily maximum temperature of the hottest month in 2001 was 87-degrees Fahrenheit (July) while the average daily minimum temperature of the coldest month (January) was 21-degrees Fahrenheit. Springs and Falls are characterized by cool mornings (averaging 42-degrees for nighttime lows) and warm days (averaging 66-degrees for daytime highs). Precipitation is distributed rather evenly throughout the year with the wettest months occurring in the Summer with an average of 3.7-inches of rain each month. The total annual average precipitation for any given year in the Manassas area is 40.2-inches comprised of 17.4-inches of rain and 22.8-inches of snowfall. On average, the region experiences either cloudy or partly cloudy days 273 days out of the year. Prevailing winds are from the south except during the cold winter months when a north wind is predominant.

1.6.3 Wind Rose Analysis

Wind roses were evaluated for four ceiling and visibility categories corresponding to weather conditions requiring visual flight rules (VFR), non-precision instrument flight rules (IFR) and precision instrument flight rules (IFR) for aircraft activity at Manassas Regional Airport. The type and direction of any approach to the airport is dependent upon the prevailing wind, ceiling and visibility conditions at the time of the approach. Minimum ceiling and visibility conditions have been established for each VFR and IFR approach into the airport based on available navigation aids, airspace and local terrain considerations (see **Figure A.1-A.5** and **Section 1.4.6**). The wind data used for the analysis has been collected and categorized into the four classes defined by the ceiling-visibility criteria presented in **Table 1.8**. VFR conditions exist 90.3-percent of the time which means that IFR conditions occur approximately 35 days out of the year (see Figures 1.3-1.4).

1.6.4 Crosswind Coverage

Wind conditions affect all airplanes in varying degrees, generally, the smaller the aircraft, the greater the effect of wind velocity and the corresponding crosswind component (the resulting vector that acts at a 90-degree angle to the path of flight). With this in mind, the FAA has established allowable

crosswind components based on aircraft type. Ideally, the primary runway at an airport should provide 95-percent wind coverage in all weather conditions. Based on this information and the climatological data obtained from the National Climatic Data Center in Asheville, North Carolina, the wind analysis for Manassas Regional Airport is summarized in **Table 1.9**. Based on the wind rose analysis, Manassas Regional Airport has adequate crosswind coverage for all crosswind components and in all types of weather conditions.

MANASSAS REGIONAL AIRPORT LAYOUT PLAN UPDATE

TABLE 1.8

Recorded Weather Observations by NOAA Weather Classification: 1991 to 2000 Dulles International Airport Weather Reporting Station

WEATHER CLASS	CRITERIA	RECORDED OBSERVATIONS	% OCCURRENCE
All Weather	All ceiling and visibility weather conditions	**82,805**	100.00%
VFR	Ceiling ≥1,000' and visibility ≥3 miles	**74,830**	90.37%
Non-Precision IFR	Ceiling ≥200' and <1000 feet ***and*** Visibility ≥½ mile and <3 miles	**7,226**	8.73%
Precision IFR	Ceiling <200' and/or visibility <½ mile	**735**	0.89%

Sources:
NOAA
Airman's Information Manual (FAR-AIM 2000)

Figure 1.3 Wind Rose #1

Figure 1.4 Wind Rose #2

MANASSAS REGIONAL AIRPORT LAYOUT PLAN UPDATE

TABLE 1.9
Runway 16L-34R and 16R-34L Crosswind Coverages

CROSSWIND	VFR	NON-PRECISION IFR	PRECISION IFR	ALL WEATHER
10.5 kt	96.8%	97.4%	**98.8%**	96.8%
13.0 kt	98.8%	98.6%	**99.4%**	98.8%
16.0 kt	99.7%	99.6%	**99.7%**	99.7%
20.0 kt	99.9%	99.9%	**99.9%**	99.9%

Source:
NOAA

1.7 AIRPORT SERVICE AREA AND ENVIRONMENT

1.7.1 Service Area

The airport service area for a general aviation airport is generally defined by a 30-minute drive time around the facility. Likewise a commercial airport facility typically defines its service area by a 60-minute drive time. More detailed analyses can be performed to better define these areas when necessary but it is reasonable to conclude that at least some portions of the service area for Manassas Regional Airport overlap with the service areas for Dulles, Reagan National, Leesburg Executive, Warrenton-Fauquier, Culpeper Regional and the recently opened Stafford Regional Airport. And while a certain percentage of the potential users within the Manassas Airport Service Area may choose to operate from one of the other facilities, the predominant service area for Manassas Regional Airport will continue to be defined as the Manassas-Manassas Park-Prince William County region.

1.7.2 Area Population, Income and Employment

Demographic data for the airport service area is presented in **Tables 1.10 and 1.11**. Historically, the City of Manassas has enjoyed a relatively high rate of growth in population which continued in the 1990s with an annualized rate of growth of 2.3-percent. This rate of growth in population is less than the rate of growth for Prince William County but is greater than the rate of growth for the Commonwealth of Virginia which had annual rates of growth of 2.7-percent and 1.4-percent respectively.

The region has also experienced a corresponding increase in the employment levels since 1990. **Table 1.11** presents the historical employment levels for the Commonwealth of Virginia, Prince William County and the City of Manassas as well as a list of major employers in the City of Manassas. Since 1990, the total number of employed persons in the Commonwealth of Virginia increased from 3.1 million to 3.6 million which is a 1.4-percent annualized rate of growth. Both Prince William County and the City of Manassas have experienced a greater annualized growth rate than the

Commonwealth. Total employed persons in Prince William County increased from 114,900 to 142,900 (+2.2-percent annually) and in the City of Manassas from 16,000 to 20,900 (+2.7-percent annually) over the same period.

MANASSAS REGIONAL AIRPORT LAYOUT PLAN UPDATE

TABLE 1.10

Population Trends for Virginia, Prince William County and City of Manassas: 1990-2000

Year	Virginia	Prince William County	City of Manassas	City of Manassas Population	
				As Percentage of PWC	As Percentage of Virginia
1990	6,187,358	215,677	27,957	12.96%	0.45%
1991	6,283,853	223,457	29,000	12.98%	0.46%
1992	6,383,315	227,930	30,100	13.21%	0.47%
1993	6,464,795	235,766	30,900	13.11%	0.48%
1994	6,536,774	243,559	31,700	13.02%	0.48%
1995	6,601,392	249,968	32,000	12.80%	0.48%
1996	6,665,491	257,633	32,700	12.69%	0.49%
1997	6,732,878	265,664	33,600	12.65%	0.50%
1998	6,789,225	273,745	34,300	12.53%	0.51%
1999	6,872,912	282,060	34,800	12.34%	0.51%
2000	7,078,515	280,813	35,135	12.51%	0.50%
Annual Rate of Growth	1.35%	2.67%	2.31%		

Sources:
Weldon-Cooper Center for Public Service, University of Virginia, *2000 Virginia Statistical Abstract.*
Prince William County, Virginia
City of Manassas, Virginia

MANASSAS REGIONAL AIRPORT LAYOUT PLAN UPDATE

TABLE 1.11

Employment Trends for Virginia, Prince William County and City of Manassas: 1990-2000

Year	Virginia	Prince William County	City of Manassas	Largest Employers 2000	Number of Employees
1990	3,098,145	114,870	16,070	Lockheed Martin	2,000
1991	3,148,851	116,750	16,393	Dominion Semicond.	1,150
1992	3,180,803	118,640	16,797	Prince William Hosp.	1,000
1993	3,207,393	121,200	17,274	Annaburg Manor	330
1994	3,250,202	124,180	17,817	Giant Food	302
1995	3,325,234	126,531	18,147	Merchant's, Inc.	265
1996	3,241,326	124,259	17,810	Metro Technologies	175
1997	3,277,714	126,721	18,375	SWIFT	160
1998	3,386,333	132,239	19,176	Didlake, Inc.	115
1999	3,424,001	134,879	19,730	Battlefield Ford	106
2000	3,565,389	142,936	20,909	GTE	95
Annual Rate of Growth	1.41%	2.21%	2.67%		5,698

Sources:
Virginia Employment Commission, Virginia's Electronic Labor Market Access (VELMA)
City of Manassas Community and Economic Development

Note: 2000 Employment figures are for October 2000 reporting period

1.7.3 Area Land Use

Although airport property is almost entirely contained within the City limits, the airport facility is bordered by Prince William County on three sides. Subsequently, land use planning in the vicinity of the airport is the responsibility of both the City of Manassas and Prince William County (see **Figure 1.1**).

The City has adopted an Airport Overlay District which provides guidelines to assure both land use and Part 77 height compatibility for the surrounding land uses. Specifically, most of the City property in the vicinity of the airport is planned for compatible light industrial (I-1) and general industrial (I-2) land-uses. The single largest land-use in the vicinity of the airport is associated with the Gateway Business Park located to the northeast of the airport.

Within Prince William County, a majority of the existing land-use surrounding the airport consists of agricultural, residential and commercial uses. The commercial land-uses generally border State Route 28 to the north of the airport with residential land-uses located to the east of the airport and agricultural land uses located to the south and southwest of the airport. Similar to the City, the County has established an Airport Safety Overlay District which assures both land use and Part 77 height compatibility for the surrounding land uses.

1.7.4 Local Environment

The local airport area environment can be characterized as a mixture of urban and rural. To the north and east of the airport lies the urbanized and developed areas of the City of Manassas and Prince William County while to the south and west of the airport is primarily undeveloped agricultural, heavily forested and low density residential development. Although most of the nearest residential development would be classified as relatively low density, residents in some of the subdivisions (i.e., Windy Hill, Moor Green, etc.) have voiced their concerns about airport noise.

The 850-acre airport site is located within the Potomac River Basin part of the larger protected watershed for the Chesapeake Bay. Much of the immediate airport property is impacted by the Broad Run flood plain and to a lesser extent the Cannon Branch flood plain. The Broad Run stream itself travels south and east around and through the airport property until reaching the confluence with the Occoquan River (about 5 miles downstream) and the Lake Jackson/Occoquan Reservoir area (about 8 miles downstream) which is a major source of drinking water for many portions of Northern Virginia. These environmental features and the attendant flood plain, wetland and water quality considerations obviously influence facility planning and require all development at the airport to strictly adhere to a rigid environmental approval process.

1.7.5 Area Airports

The Northern Virginia region has a variety of commercial service, general aviation and military facilities that have some influence on the operations and to varying degrees overlap the service area for Manassas Regional Airport. Recent activity levels for these airports are presented in **Table 1.12.**

Commercial service airports in the immediate vicinity of Manassas Regional Airport include two large hub airports: Washington-Dulles International Airport (15 air miles north) and Washington-Reagan National Airport (28 air miles northeast). Other commercial service airports in the region include Baltimore-Washington International Airport (55 air miles to the north and east) and Richmond International Airport (85 air miles to the south and east). In addition to scheduled commercial service, all of these airports provide general aviation facilities.

General Aviation airports in the region include three NPIAS designated Reliever Airports to either Washington-Dulles International (IAD) or Washington-Reagan National (DCA). It is important to note that since September 11, 2001 all general aviation operations have been restricted at Washington-Reagan National Airport. These restrictions have been set up to provide increased security for governmental buildings and national security agencies located in Washington D.C.

However, general aviation operations could resume in the Summer of 2002. Leesburg Executive Airport (JYO) is a reliever airport to Washington-Dulles International Airport and is located 25 nautical miles to the north and west of Manassas Regional Airport. Facilities at Leesburg Executive Airport include a 5,500-foot runway and full length parallel taxiway. The approach in Leesburg Executive Airport with the lowest visibility minimums is a DME approach

MANASSAS REGIONAL AIRPORT LAYOUT PLAN UPDATE

TABLE 1.12
Area Airport Activity - 1999

AIRPORT	DISTANCE FROM HEF	TOTAL OPERATIONS	G.A. OPERATIONS
Commercial Service			
Dulles	15 nm N	459,098	64,049
National	28 nm NE	315,737	59,791
Richmond	85 nm SE	128,892	40,883
Baltimore–Washington	55 nm NE	306,819	40,681
General Aviation			
Leesburg	25 nm NW	97,592	97,592
Warrenton-Fauquier	14 nm SW	34,330	34,330
Culpeper	20 nm SW	24,820	24,820
TOTAL		1,367,288	362,146

Source:
FAA-TAF

Note: Culpeper Regional Airport's 1999 activity is estimated based on AirNav's reported 68/operations per day.

using the localizer to Runway 17 with 720-1 visibility minimums.

Warrenton-Fauquier Airport (W66) is also a designated reliever to Washington-Dulles International Airport and is located 14 nautical miles to the south and west of Manassas Regional Airport. Facilities at Warrenton-Fauquier Airport include a 4,100-foot runway and full length parallel taxiway. The approach to Warrenton-Fauquier with the lowest visibility minimums is a VOR/GPS approach into Runway 14 with 960-1 visibility minimums. New apron and hangar facilities along with a runway extension of 1,000-feet are currently under design at Warrenton-Fauquier Airport.

Culpeper Regional Airport (CJR) is located 20-nautical miles to the southwest of the airport. Facilities at Culpeper Regional Airport include a 4,000-foot runway and full length parallel taxiway. The

approach to Culpeper Regional Airport with the lowest visibility minimums is a VOR/DME RNAV or GPS approach into Runway 22 with 820-1 visibility minimums. Similar to Warrenton-Fauquier Airport, new apron, hangars and a 1,000-foot runway extension are under design at Culpeper Regional Airport.

A third designated reliever airport in the vicinity of Manassas Regional Airport started operations on December 13, 2001. The new Stafford Regional Airport is a designated reliever to Washington-Reagan National Airport and is located 20-nautical miles to the south and east of Manassas Regional Airport. Facilities at Stafford Regional Airport include a 5,000-foot runway (with potential for a CAT-I ILS) with a full length parallel taxiway and an assortment of hangars and aircraft tie-down facilities.

Military airfields in the vicinity of Manassas Regional Airport include Davidson Airfield (Ft. Belvoir) located 15 air miles to the north and east of Manassas Regional Airport, Quantico Marine Corps Base located 20 miles south and east, Andrews Air Force Base located 35 air miles to the east and Patuxent River Naval Air Station located 60 miles to the south and east.

1.7.6 September 11, 2001

The events of September 11, 2001 and the subsequent national security decisions warrant examination as operational decisions at airports in the region have had an impact on the future demand for aviation facilities at Manassas Regional Airport. In the wake of the terrorist attacks on the World Trade Center, the Pentagon and in Southwest Pennsylvania, the Federal Aviation Administration, upon recommendation from the National Security Council, established a 25-mile radius (subsequently reduced to 18-miles) around the DCA VOR that effectively represents a “no fly zone.” In addition to the 25-mile radius, all flights at Washington-Reagan National Airport (DCA) were suspended (see **Figure 1.5**).

In the days following the terrorist attacks, operations at Manassas Regional Airport changed from primarily single-engine operations to almost all multi-engine and turbo-jet operations as a result of the FAA allowing only IFR operations and no VFR operations to occur in the United States. The result of having only IFR operations at the airport was a 200-percent increase in IFR traffic over pre-September 11th levels. As many single-engine pilots are not instrument rated, they could not operate their aircraft under the restrictions. Additionally, since Washington-Reagan National Airport was closed, many corporate jets that were located at DCA relocated to Manassas Regional Airport and Leesburg Executive Airport in the interim. When DCA was re-opened only to commercial activity, many of these corporate jets faced the possibility of relocating to one of the other airports in the Northern Virginia region.

However, the potential impact to Manassas Regional Airport may not only be limited to corporate aircraft. Within the 18-mile radius around the DCA VOR are approximately nine (9) publicly owned/public use airports. The 1999 activity and based aircraft levels as reported in the FAA-TAF for the publicly owned/public use airports is presented in **Table 1.13.**

The 18-mile “no-fly zone” has subsequently been lifted, however operations in the vicinity of the DCA

VOR are under a Special Federal Aviation Regulation (SFAR 94) which places restrictions on aircraft operations for three airports (College Park, Potomac Airfield and Washington/Hyde) in the vicinity of the DCA VOR. The restrictions include requiring a filing of flight plans for both arrivals and departures, receiving discrete transponder codes, and maintaining two-way communication with ATCT. The SFAR also states that only based aircraft at the three airports could conduct operations at these airports forces transient aircraft to use other facilities. Additionally, many pilots may not want to operate under the restrictions of SFAR 94 and may decide to relocate their aircraft at either public or private airports in Virginia, Southern Pennsylvania or Delaware.

MANASSAS REGIONAL AIRPORT LAYOUT PLAN UPDATE

TABLE 1.13
Publicly Owned/Public Use Airports Affected by the "No-fly zone" around DCA VOR

AIRPORT	NPIAS DESIGNATION	DISTANCE FROM HEF	TOTAL G.A. OPERATIONS	TOTAL ITINERANT OPERATIONS	TOTAL BASED AIRCRAFT
Davis Airport	GA	37 miles NE	15,175	175	44
Montgomery Air Park	RL (BWI)	32 miles NE	110,005	48,505	241
Suburban Airport	GA	40 miles NE	20,410	410	55
College Park Airport	GA	33 miles NE	19,797	4,940	69
Freeway Airport	GA	39 miles NE	60,840	5,530	92
Lee Airport	GA	48 miles NE	16,000	6,000	151
Washington Executive Airport	RL (DCA)	29 miles E	38,000	3,420	116
Potomac Airfield	GA	28 miles E	53,000	1,060	112
Maryland Airport	RL (DCA)	23 miles SE	27,400	12,400	74
TOTAL			360,627	82,440	954

Sources:
FAA-TAF
Air-Nav.com

While the VATSP concludes that an additional 24 aircraft will be based at Manassas Regional Airport by 2020 accounting for an additional 32,200 operations, the potential exists for these forecasts to be exceeded in the near term should based customers in the 18-mile zone chose to relocate. If the airport only picks up 2.5-percent of based aircraft from the airports in the 18-mile zone, the forecast of based aircraft presented in the VATSP will no longer hold true (this has already occurred as the airport has reported, as of Summer 2002, a based aircraft population of ±400 aircraft). While the events of

September 11, 2001 were impossible to predict, the potential outcome of the events needs to be acknowledged as they may well alter the demand for aviation facilities at Manassas Regional Airport.

1.7.7 Airspace

While the airspace around Manassas Regional Airport is complicated by the proximity of Washington-Dulles and Reagan National Airports, the local ATCT provides convenient traffic management services for the airport users so that airspace issues don't impede the use and development of the facility. Specifically, the local traffic area (10-mile diameter) and ILS approach area surrounding Manassas Regional Airport is Class D airspace with a ceiling elevation up to but not including 2,000-feet msl. Overlaying the Class D airspace for Manassas

Figure 1.5 Sectional Chart

Regional Airport is the Class B airspace associated with Dulles International Airport. The Class B airspace above Manassas Regional Airport is controlled from 2,500-feet msl to 10,000-feet msl. In addition to controlled airspace for commercial service airports, a military restricted area (R6608) and adjacent MOA (DEMO) associated with Quantico Marine Corps Base is located approximately 5-air miles to the south of Manassas Regional Airport (see **Figure 1.5**).

A major airspace redesign effort is currently being pursued by the FAA for the Baltimore-Washington area. The redesign effort is studying the impacts of consolidating five independent TRACON (Terminal RAdar CONtrol) facilities into a combined facility located in Vint Hill, Virginia. This new facility, called the Potomac Consolidated TRACON, or PCT, is needed to meet the projected growth in aviation demand while minimizing delays, resolve current air traffic control inefficiencies, and modifying aircraft routes and altitudes.

The PCT facility is currently undergoing a tiered environmental impact study. The first EIS had a FAA ROD issued on June 3, 1999 while a second EIS is currently in the Draft EIS stage. While the EIS and the PCT affect the four primary airports under study in the region (IAD, DCA, BWI and ADW), the EIS does mention 35 other airports in the region. However, the EIS does not give much consideration to the operational characteristics of these airports in the overall model. With TRACON facilities typically controlling aircraft between 5 and 50 miles of an airport (the ATCT controls aircraft within 5 miles and ARTCCs control aircraft outside of 50 miles), any airspace redesign could impact operations at Manassas Regional Airport. With the continuing increase in popularity of the airport, the demand for airspace will only increase. Coordination between the City and the FAA is recommended so that the airspace needs of Manassas are adequately addressed in the EIS for the PCT.

A local traffic pattern at Manassas Regional Airport has been adopted using non-standard right turns for traffic using the opposing thresholds to separate the parallel runway traffic and keep arriving and departing traffic streams from crossing. In order to segregate the slower single-engine aircraft from the heavier and faster turbo-prop and turbo-jet aircraft, two local traffic patterns have been established at different elevations. The established local traffic pattern for single-engine and other light aircraft is 1,200-feet msl (1,000-feet agl) while the local traffic pattern for turbo-props and turbo-jets has been established at 1,700-feet msl (1,500-feet agl). Helicopter operations have an established local traffic pattern of 800-feet msl (600-feet agl).

1.7.8 Surface Access and Ground Transportation

Manassas Regional Airport is well served by the local and regional surface transportation system. Primary access routes to Manassas Regional Airport include a convenient choice of access corridors. Primary access is available from Route 28 (Nokesville Road) via Godwin Drive (Rte 661) and Gateway Boulevard. Secondary access from Route 28 is also available using Piper Lane. Indirect access using Pennsylvania Avenue is also available from Route 28.

The internal “on-airport” surface transportation routes consist of Piper Lane, Observation Road and Wakeman Drive. Piper Lane provides access to the West Complex while Wakeman Drive provides access to the East Complex. Observation Road connects the East and West Complexes and

provides a cross-field access route for users and tenants of the airport.

Consistent with the ALP and under study for the last ten years, the new airport access road connecting the East Complex terminal area directly with the recently completed Route 234 Bypass is scheduled to begin construction in the spring 2002. This connection will facilitate high speed access between the airport and I-66 to the north and I-95 to the east. This more convenient and direct connection in addition to the increased surface traffic anticipated as a result of increased airport activities is expected to change the surface traffic patterns for the internal airport access roads.

The construction of the Virginia Railway Express (VRE) Airport/Broad Run Station in the early 1990s introduced a significant trip generator for non-airport related commuter traffic on Observation Road. Given the recently completed expansion of the VRE Station parking and the overall increased ridership forecasts for the entire rail system, there is an obvious concern that the new Route 234 Bypass access road will also provide a convenient connection for those commuters as well potentially affecting the distribution of non-airport related traffic on the airport road system.

To examine the effects, a surface traffic study was conducted as part of the ALP Update to determine the origin and destination of automobile traffic in the airport area and to predict the effects of the new connection to Route 234. Traffic counts were obtained between July 12 and July 15, 2001 for several road segments and key intersections on and near the airport road system. Recorded peak hour turning movements are presented in **Figures 1.6-1.9.** The results of the analysis confirmed that the peak hour traffic is significantly influenced by the users of the VRE Station. In fact, over 80-percent of the morning traffic and 60-percent of the evening traffic on Observation Road appears to be associated with VRE train activity.

The 24-hour road counts also confirmed the influence of the VRE activity. On Thursday July 12, 2001, approximately 3,567 vehicle trips were observed entering or leaving the airport road system. By comparison, traffic levels on Saturday, July 14, 2001, presumably without the VRE traffic (and perhaps fewer airport employee trips), totaled approximately 1,550 vehicle trips or less than 44-percent of the week day totals. According to the ATCT, there were 590 aircraft operations on July 14th which yields an average of about 2.6 vehicle trips per operation, a rate which is generally consistent with the range of observed trip generation rates documented by the ITE Trip Generation Manual for GA airports.

Observation Road was originally constructed as a cross-field connector intended to be used exclusively by airport related vehicles. With the construction of the VRE station in the 1990s and the apparent use of the roadway by VRE commuters, the eligibility of the road for future federal participation in projects for the road is brought into question. Because of this potential to lose federal participation, the popularity of the road by VRE commuters and the potential for increased use of the Observation Road by VRE commuters after the connection between Route 234 bypass and Wakeman Road is established; the City has decided to release the road to the public roadway system.

Figure 1.6 Overall Locations

Figure 1.7 Intersection traffic counts

Figure 1.8 Intersection traffic counts

Figure 1.9 Intersection traffic counts

SECTION TWO:

FORECAST OF AVIATION DEMAND

The primary airport service area for Manassas Regional Airport is generally defined as the Manassas-Manassas Park-Prince William County region. The following forecast section will present forecasts of business/general aviation activity and will provide the basis for the determination of facility requirements necessary to accommodate the forecasted demand. The recommended study forecasts presented below are based on forecasts prepared as part of the Virginia Air Transportation System Plan (VATSP) published by the Virginia Department of Aviation (DOAV). Additional forecast elements included are the Terminal Area Forecast (TAF) prepared by the Federal Aviation Administration and a multi-variate regression analysis using published socio-economic data for the Northern Virginia region. In light of the events of September 11, 2001 and the subsequent restrictions on aviation activity, airports within Northern Virginia have a potential of eclipsing the forecasted levels of aviation demand presented in the TAF and VATSP. For this reason, the multi-variate regression analysis is presented to provide potential demand should the TAF and VATSP forecasts be eclipsed in the short-term.

2.1 NATIONAL TRENDS

Since the late 1980s, the shipment of new business/general aviation aircraft into the national fleet has been approximately 1,000 aircraft a year. While business and general aviation aircraft shipments decreased as a result of the national recession in the early 1990s, the passage of the General Aviation Revitalization Act of 1994 and the national economic rebound later in the decade helped to boost the manufacturing of new aircraft, aircraft utilization, hours flown and pilot population. This trend is expected to continue with the introduction of new aircraft types such as the Embraer Legacy, Cessna X and the Eclipse 500 into the active fleet of general aviation aircraft.

The FAA considers an aircraft “active” if it flew more than one hour during the entire calendar year. The active fleet is a function of the new aircraft introduced into the national fleet added to the previous year’s population of aircraft less those aircraft retired from the system. In 2000, single-engine general aviation aircraft continue to be the backbone of the national fleet and account for 70.5-percent of the active fleet. Multi-engine aircraft account for 9.1-percent of the national active fleet and experimental aircraft account for 8.1-percent of the national active fleet. Turboprops, turbojets and rotorcraft comprise 9.6-percent of the national fleet. The based active fleet at Manassas Regional

Airport is consistent with national trends.

2.2 VATSP FORECAST OF AVIATION DEMAND

2.2.1 Based Aircraft

While the based aircraft population at Manassas Regional Airport has remained relatively stable over the last twenty years with an annual rate of growth of 2.2-percent (see **Table 1.2**), the continued development and improvement of facilities at the airport and the overall increase in the number of aircraft in the airport service area will more than likely result in an increase in based business/general aviation aircraft. The VATSP projects a total based aircraft population of 344 aircraft in 2020 which represents a 0.45-percent annual rate of growth over the reported 2000 based aircraft in the 2001 VATSP Update (see **Table 2.1**). The actual based aircraft count (343) reported by the airport for 2001 has already reached the 2020 forecast level presented in the preliminary VATSP updated information. As of Summer 2002, the airport reported a based aircraft population of ±400 aircraft, probably as a result of regional airport closures in the wake of September 11, 2001.

2.2.2 Operations

The usual method for developing the operations forecast for an airport is to project an average number of operations per based aircraft for each forecast year and to then apply that rate to the based aircraft forecast. This methodology is grounded in studies accomplished at general aviation and air carrier airports which have derived empirical relationships between based aircraft and operations. According to VATSP data, Manassas Regional Airport was estimated to have 434 operations per based aircraft in 2000. This rate was calculated by dividing the VATSP estimate of 2000 operations (136,046) by the number of based aircraft for 2000 (315).

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TABLE 2.1

VATSP Forecast of Aviation Demand for Manassas Regional Airport

	TOTAL OPERATIONS	BASED AIRCRAFT	OPERATIONS PER BASED AIRCRAFT
2000	136,650	315	434
2005	137,604	309*	445
2010	147,585	321	460
2015	157,566	332	475
2020	168,298	344	489
FORECASTED ROG	1.05%	0.44%	0.60%

Sources:
FAA Airport Traffic Records
VATSP 2001 Update

Note:

2000 Total Operations from 2000 Airport Traffic Records for Manassas Regional Airport
* Due to the opening of Stafford Regional Airport, short-term demand will be temporarily reduced.

Historically at the airport, the single-engine piston aircraft has dominated the operations at the airport. While the single-engine aircraft should still represent the majority of the based aircraft population and activity at the airport, the level of activity by single-engine aircraft is decreasing and will more than likely continue to decrease over the planning horizon. Several distinct reasons account for this. First, as more turbo-prop aircraft use Manassas Regional Airport over Dulles International Airport, more single-engine pilots will feel "uncomfortable" operating with the faster and heavier business aviation aircraft. Second, with Stafford Regional Airport opening in December 2001, some aircraft (15-20) may relocate from Manassas to Stafford, particularly the operators who live closer to Stafford.

2.3 FAA-TAF FORECAST OF AVIATION DEMAND

2.3.1 Based Aircraft

The FAA Terminal Area Forecasts (TAF) utilizes historical information on passenger enplanements, aircraft operations, and based aircraft to forecast future activity at an airport. Generally, an FAA-TAF forecast is prepared for every airport that is receiving federal funds. As a result of the FAA-TAF ending in 2010, an extrapolation of the forecasted annualized rate of growth prepared in the TAF was applied to 2010 forecasted
based aircraft and operations. The FAA forecasts based aircraft at Manassas Regional Airport to increase to 457 by 2020 which equates to an annualized rate of growth of 1.02-percent.

2.3.2 Operations

The annualized rate of growth in operations at Manassas Regional Airport included in the FAA-TAF is greater than the rate of growth in operations included in the VATSP. The FAA-TAF forecasts operations at the airport to total 155,000 which is an annualized rate of growth of 1.27-percent. *It should be noted that while the annualized rate of growth for the FAA TAF is greater than the VATSP, the total forecasted operations in 2020 in the FAA-TAF is lower than in the VATSP since the FAA rate of growth is determined on a base year of 1999.*

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TABLE 2.2
FAA-TAF Forecast of Aviation Demand for Manassas Regional Airport

	TOTAL OPERATIONS	BASED AIRCRAFT	OPERATIONS PER BASED AIRCRAFT
1999	119,007	369	323
2005	128,935	393	328
2010	137,698	413	333
2015	146,088	434	336

2020	154,990	457	339
FORECASTED ROG	1.27%	1.02%	0.24%

Source:
2000 FAA-TAF

2.4 REGRESSION ANALYSIS FORECAST OF AVIATION DEMAND

The regression analysis forecast of aviation demand utilizes data from several publications: *The Virginia Statistical Abstract* published by the Weldon-Cooper Center for Public Service at the University of Virginia, the *Virginia Electronic Labor Market Access (VELMA)* database managed by the Virginia Employment Commission, the *Geospatial and Statistical Data Center* at the University of Virginia, the *1990 Airport Master Plan Update* and the *Virginia Air Transportation System Plan (VATSP)*.

The regression analysis tested data from various geographic regions in the Northern Virginia area in order to determine what measurement best predicted future demand for aviation facilities at Manassas Regional Airport. Four geographic regions were tested 1) data for the City of Manassas, 2) data for Prince William County, 3) data for the Northern Virginia Regional Commission, and 4) data for the Virginia portion of the Washington, D.C.-Baltimore PMSA. For each of these four levels of measurement, both regression and multi-variate regression models were performed to determine the "fit" of the data. The statistical measurement of the "fit" of the data is termed the coefficient of determination and is expressed in statistical terms as r-squared (R^2). The general hypothesis was that operations at Manassas Regional Airport were dependent upon population, employment and income levels in Prince William County.

2.4.1 Operations

An R^2 value of 0.97 results from the multi-variate regression performed on population, employment and income levels for Prince William County which means that 98.5-percent of the variance in the historical operations can be explained by variance in the historical levels of population, employment and income in Prince William County.

While forecasts for employment and income are not readily available, using the last six years of data (1995-2000) results in a annualize rate of growth that "captures" yearly variations. Applying this annualized rate of growth to 2000 levels of data provides a reasonable determination of future employment levels and per capita income. Future population was determined from published population figures in the *Virginia Statistical Abstract* and extrapolated out to 2020 to normalize the data. Using these forecasts of the three demographic measurements and solving the regression equation presented in **Table 2.3** results in a reasonably accurate prediction of future operations if the predicted values of the demographic measurements are realized. The multi-variate regression equation predicts future operations to total 180,000 by 2020.

2.4.2 Based Aircraft

Regression analysis was performed on based aircraft as well. The historical based aircraft

correlated well with historic population levels in Prince William County. The R^2 value was 0.47 which means that approximately
68-percent of the variance in historical based aircraft can be explained by the variance in historic population levels. Using these forecasts and the projected population levels for Prince William County and solving the regression equation presented in **Table 2.3** results in a reasonably accurate prediction of future based aircraft if the predicted population in Prince William County is realized. The regression analysis predicts future based aircraft at Manassas Regional Airport to total 550 by 2020.

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TABLE 2.3
Regression Analysis Forecast of Aviation Demand at Manassas Regional Airport

	TOTAL OPERATIONS	BASED AIRCRAFT	OPERATIONS PER BASED AIRCRAFT
2000	136,650	343	398
2005	138,068	458	301
2010	146,802	485	303
2015	159,811	517	309
2020	180,021	550	327
FORECASTED ROG	1.39%	2.39%	-0.98%

Source:
Campbell & Paris Engineers, P.C. 2002

REGRESSION EQUATIONS:
OPERATIONS:
O = (-1.64P + -1.04E + 1.07C) + 407396
WHERE:
O = Future Operations
P = Projected Population
E = Projected Employment
C = Projected Per Capita Income

BASED AIRCRAFT:
BA = .0011P + 106.7
WHERE:
BA = Future Based Aircraft
P = Projected Population

NOTE:
2000 operations are from the 2000 FAA Airport Traffic Records for HEF

The results of the regression analysis for operations and based aircraft results in a decrease in operations per based aircraft from the reported 398 OPBA in the VATSP to 327 OPBA in 2020. This

OPBA is consistent with the statewide OPBA for general aviation airports with over 100 based aircraft (379). Furthermore, this OPBA is consistent with airports that have a majority of single-engine based aircraft.

2.5 RECOMMENDED FORECAST OF AVIATION DEMAND

Table 2.4 compares the three forecasts of aviation demand at Manassas Regional Airport. The three forecasts examine different aspects of the region that could influence the demand for aviation facilities at the airport. The recommended forecast for the purposes of determining facility requirements will be the previously

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TABLE 2.4

Comparison of Forecasted Demand for Aviation Facilities at Manassas Regional Airport

FORECAST YEAR	VATSP		FAA-TAF		REGRESSION ANALYSIS	
	TOTAL OPERATIONS	BASED AIRCRAFT	TOTAL OPERATIONS	BASED AIRCRAFT	TOTAL OPERATIONS	BASED AIRCRAFT
2000	136,650	315	119,007*	369*	136,650	343
2005	137,604	309	128,935	393	138,068	458
2010	147,585	321	137,698	413	146,802	485
2015	157,566	332	146,088	434	159,811	517
2020	168,298	344	154,990	457	180,021	550
FORECASTED ROG	1.05%	0.44%	1.27%	1.02%	1.39%	2.39%

NOTE:
*FAA TAF Base year is 1999

Source:
Campbell & Paris Engineers, P.C. 2002

established VATSP forecasts.

The based aircraft population at Manassas Regional Airport will remain predominantly the single-engine general aviation aircraft which is expected to account for approximately 75-percent of the based aircraft population by 2020. The remaining segments of the based aircraft population (multi-engine, turbo-prop/turbo-jet, and helicopter) are expected to represent between 7- and 10-percent of the based aircraft population. The largest of these remaining segments is the multi-engine piston based aircraft (10-percent) with helicopters expected to account for 8-percent and

turbo-prop/turbo-jet expected to account for 7-percent.

2.6 FORECASTED OPERATIONS MIX

2.6.1 Itinerant and Local Operations

A local operation is defined by the FAA as "arrivals and departures of aircraft which operate in the local traffic pattern or within sight of the tower and are known to be departing for or arriving from flights in local practice areas within a 20-mile radius of the airport, plus simulated instrument approaches or low passes executed by any aircraft." An itinerant operation is any other type of operation not included in the local definition. Because of the presence of several airports within a 20-nautical mile radius of Manassas (i.e., Warrenton-Fauquier and Dulles International), some local operations are conducted by transient aircraft which would require transient facilities at Manassas Regional Airport.

Typically, local operations are conducted by aircraft based at the airport while itinerant operations are conducted by transient and some based aircraft at the airport. The 2000Airport Traffic Records from the Air Traffic Control Tower indicate that approximately 79-percent of all operations at Manassas Regional Airport in 2000 were itinerant and 21-percent of all operations were local. However, the FAA ATCT reports "full stop taxi backs," or FSTBs, as an itinerant operation. An FSTB operation is when an aircraft touches down, rolls-out, taxiis off the runway and back up the taxiway to the approach end for another departure. Since FSTB operations are generally conducted by students and stay in the local traffic pattern, they could be considered local operations. According to the two-week tower strip data, pattern (including FSTBs) and touch-and-go activity accounted for approximately 50-percent of *total* operations recorded during the two-week period. Assuming that the remainder of the *total* operations during the two-weeks followed the 79-percent itinerant and 21-percent local split, then a revised itinerant/local operations mix can be determined. Using this methodology, the itinerant/local operations mix at Manassas Regional Airport is determined to be 40-percent itinerant and 60-percent local.

2.6.2 Operations by Type of Aircraft

Operations by type of aircraft were development using the trend data in the 2001 VATSP and other national FAA forecast reports. Overall, the growth in the turboprop and turbojet market is expected to continue and exceed the growth in all other fixed wing aircraft categories. Nationally, the Federal Aviation Administration expects annual aircraft utilization to increase through the forecast period with single-engine aircraft utilization rates increasing 1.0-percent to an average of 145 annual hours and multi-engine utilization rates increasing by an annual average of 0.3-percent to 159 annual hours. Turbo-prop utilization rates decreased by nine hours from 1997 to 1998 and are expected to increase slightly by 2011. The largest increase in aircraft utilization rates in 1998 was in the turbo-jet segment from 330 annual hours in 1997 to 367 annual hours. This segment is forecasted to continue a relatively high rate of growth of 2.6-percent to an average utilization of 512 annual hours by 2011.

Data collected during two weeks of aircraft activity at Manassas Regional Airport provides a useful tool in determining actual number of operations by type of aircraft. The type of aircraft was determined by entering
tail registration numbers into a public access database. Consistent with many general aviation airports, the single-engine aircraft population represented a majority (79-percent) of total operations

during the two week period.

The multi-engine aircraft population represented 6.8-percent while the turbo-prop population represented 1.3-percent and the turbo-jet population represented 2.9-percent of total operations. These percentages are consistent with the anticipated operations mix presented in the 1990 Master Plan for Manassas Regional Airport. When the operations mix for the two week period are compared with the operations mix in 1988 (based on a similar two week survey period), the relative percentage of operations by the traditional single engine general aviation aircraft has decreased from 86.0-percent of operations to approximately 79.0-percent of operations. Conversely, the turbo-jet operations has increased from 2.0-percent in 1988 to 3.0-percent of operations (see **Table 2.5**). Forecasted operations mix continue the historical trend of decreasing operations by single-engine aircraft (75-percent of total operations by 2020) and increasing operations by the other segments of the aircraft population, particularly turbo-prop and turbo-jet aircraft (7-percent of operations by 2020).

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TABLE 2.5
Historical and Current Operations Mix at Manassas Regional Airport

AIRCRAFT TYPE	1988 OPERATIONS (%)[1]	2000 OPERATIONS (%)[2]	% INCREASE/DECREASE
Single Engine Piston	107,500 (86.0%)	104.960 (79.0%)	**-2.4%**
Multi Engine Piston	7,500 (6.0%)	9,030 (6.8%)	**20.4%**
Turboprop	3,125 (2.5%)	1,730 (1.3%)	**-44.6%**
Turbojet	2,500 (2.0%)	3,850 (2.9%)	**54.0%**
Helicopter	4,375 (3.5%)	10,890 (8.2%)	**149%**
Totals:	125,000 (100.00%)	132,860	

Source:
[1] 1990 Master Plan Update
[2] Campbell & Paris Engineers, P.C. 2002

NOTE:
2000 Operations were determined by extrapolating number of recorded operations from the average operations per day during the two-week observation period (avg ops/day x 365).

2.6.3 Instrument Operations

The 1990 Airport Master Plan Update predicted that the amount of instrument activity at Manassas

Regional Airport would increase over the planning horizon because of several factors. The probable causes of this would be a more regulated airspace that would require aircraft to install necessary equipment in order to operate in
the airspace and to fly in instrument conditions and a general shift in the based aircraft population away from piston aircraft and toward corporate and business aircraft.

As predicted, instrument operations increased by 30-percent over the reported activity levels in 1988. Assuming that instrument operations remain 9.85-percent of total annual operations and that instrument meteorological conditions (IMC) govern flight rules at the historical rate of 9.6-percent, then approximately 1,608 instrument approaches, or 3,182 instrument operations, would occur at Manassas Regional Airport by 2020.

2.6.4 Charter Operations

Part 135 operations at Manassas Regional Airport should continue to be in charter operations out of the East Complex. The level of Part 135 activity at the airport has increase by 65-percent over the last 12 years from 1,500 operations in 1988 to 2,480 operations in 2000 which represents an annual rate of growth of

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TABLE 2.6
Part 135 Operations and Enplanement Forecasts

	HISTORIC			FORECAST		
Peaking Characteristic	1988	2000	2005	2010	2015	2020
Total Operations	125,000	136,650	137,604	147,241	157,566	168,298
Total Part 135 Operations	1,500	2,487	2,504	2,680	2,868	3,063
Percentage of Total Operations	1.20%	1.82%				
Part 135 Enplanements	1,500	3,109	3,130	3,350	3,585	3,829

Source:
2000 Airport Traffic Records, HEF FAA-ATCT
2000 VATSP
Campbell & Paris Engineers, P.C. 2002

approximately 4.3-percent. To determined future levels of charter activity it was assumed that charter operations would remain approximately 1.80-percent of total operations at the airport. Based on this methodology, Part 135 activity at the airport should increase to 3,070 operations by 2020 which represents an annualized rate of growth of 1.04-percent. Part 135 enplanements are assumed to continue to average between 2-3 passengers per departure as reported in the 1990 Master Plan Update which yields a total of 3,830 enplaned Part 135 passengers by 2020, or 10 passengers per

day.

2.6.5 Military Operations

Consistent with the 1990 Master Plan Update, the military operations at Manassas Regional Airport accounted for less than 0.5-percent of total annual operations in 2000. A total of 377 military operations occurred in 2000 (79.3-percent of which were itinerant in nature). Nationally, military operations at non-military airfields is expected to remain relatively stable reflecting a "no-growth" scenario. Similarly, there is no basis to expect military activity to increase at Manassas Regional Airport over the next 20 years, thus, the military activity levels are expected to remain below 500 operations a year (less than 0.5-percent of total operations) for the duration of the planning horizon.

2.7 PEAKING CHARACTERISTICS

2.7.1 Total Operations

The peak period of activity at general aviation airports typically coincides with periods of sustained "good" weather (visual meteorological conditions (VMC) prevail) which supports flight training activity, recreational flights as well as the typical compliment of corporate and business aviation activity. The weather analysis indicates that VFR conditions exist approximately 90.3-percent of the year or about 330 out of 365 days. The remainder of the year, instrument meteorological conditions (IMC) prevail. Instrument activity in 2000 accounted for approximately 9.85-percent of total operations. Since instrument operations can occur in either VMC or IMC conditions, a necessary parameter is the amount of time that IMC conditions prevail. The weather analysis presented in **Table 1.8** suggests that less than 10-percent of all instrument operations were conducted in IMC. With 13,462 instrument operations recorded in 2000 and instrument weather occurring 9.6-percent of the time, only 1,295 instrument operations occurred during the 35 days of IFR weather, or 37 IFR operations/IFR day. Based on this information, it would be reasonable to expect that at least 99-percent of annual operations would occur during the 330 VFR days, which would yield approximately 410 operations per average VFR day.

Traditional measurements of peak operational activity include the peak month, average day of the peak month and the peak hour of the average day. The Air Traffic Control Tower at Manassas Regional Airport provides an Airport Traffic Record for each month which details the number of operations by type (i.e., local versus itinerant) of operation and who is performing the operation (i.e., general aviation, air taxi, military, etc. . .).

According to the 2000 Airport Traffic Reports, the peak month of activity at Manassas Regional Airport occurred in July 2000 with a reported 14,576 operations. The peak day of the peak month was on July 8, 2000 with a reported 664 operations which accounted for 4.6-percent of the total monthly operations. The forecasted peaking characteristics at Manassas Regional Airport will help determine the level of required development for such facilities as tie-downs, hangars and fuel. Using the forecasted level of operations found in the 2000 VATSP and the percentage of operations the peak month, peak day and peak hour represented in 2000, the forecasted peaking characteristics for Manassas Regional Airport are presented in **Table 2.7.** This analysis assumes that the proportion of activity found in each peaking characteristics remains constant with a 1.04-percent annualized rate of growth for total operations.

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TABLE 2.7

Recommended Forecast of Peaking Characteristics for Manassas Regional Airport

	HISTORIC	FORECAST			
Peaking Characteristic	2000	2005	2010	2015	2020
Total Operations	136,650	137,604	147,585	157,566	168,298
Peak Month	14,576	14,678	15,742	16,807	17,952
Average Day	470	473	508	542	579
Peak Hour	52	53	56	60	64

Source:
2000 FAA Traffic Record
Campbell & Paris Engineers, P.C. 2002

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TABLE 2.8

Recommended Forecast of IFR Peaking Characteristics for Manassas Regional Airport

	HISTORIC	FORECAST			
Peaking Characteristic	2000	2005	2010	2015	2020
Total Operations	136,650	137,604	147,241	157,566	168,298
Total Instrument Operations	13,462	13,554	14,503	15,520	16,577
IFR Approaches in IMC	1,292	1,301	1,392	1,490	1,591
Total IFR Operations in IMC	2,585	2,602	2,785	2,980	3,183
Average Daily IFR Operations in IMC	74	74	80	85	91
Peak Hour IFR Operations in IMC	8	8	9	9	10

Source:
2000 VATSP
Campbell & Paris Engineers, P.C. 2002

2.7.2 Instrument Operations

The peak periods for instrument operations is important to the determination of any further instrumentation of the approaches to an airport. **Table 2.8** presents the forecasted peaking characteristics for instrument operations at Manassas Regional Airport. With a forecast of 3,180 instrument operations occurring during IMC in 2020, the average IFR day would have 91 instrument operations, or 10 instrument operations during the peak hour of the average day.

2.8 SCHEDULED SERVICE

While commercial air service has had a presence at Manassas in the past, both roadway and airport improvement projects promise to provide better connectivity between Manassas and Dulles and lessen the perceived travel time advantage. Major roadway projects in the Manassas-Prince William-Fairfax County region should reduce ground travel time between the Manassas area and Dulles International. The intersection improvement at Route 234 and Route 29 and the construction of a grade separated interchange between Route 28 and Route 29 and the construction of the Route 234 bypass should result in quicker travel times to Dulles for the population in the airport service area for Manassas Regional Airport.

In addition to the surface transportation improvements and the resulting decrease in ground travel time, projects included as part of the $3.4 billion Dulles Development should reduce airside and landside congestion and travel delays. The replacement of the “Mobile Lounges” with an underground rail system and the construction of an additional runway could increase the capacity of the airport and reduce delays. Additional projects included in the Dulles Development program that would reduce both airside and landside congestion are new terminal piers and several parking garages close to the main terminal building.

2.9 FORECASTED AUTOMOBILE TRAFFIC ACTIVITY

The forecasts of automobile traffic activity at Manassas Regional Airport considered the results of the 24-hour road counts, projected growth in VRE ridership at the Broad Run Station, projected growth in airport operations (including transient operations), and growth in the businesses and tenants located on the airport. The results of the forecast of automobile traffic activity are presented in **Table 2.9.**

The VRE average daily ridership for 2000 was approximately 9,800 riders system wide. Various capital improvement programs and operational improvements are scheduled to meet a forecasted ridership level of 16,000 daily riders by 2010 (4.8-percent annualized rate of growth). One capital improvement program recently completed was a doubling of parking capacity at the Broad Run station from 300 parking spaces to 600 parking spaces. Operational changes on the Manassas Line of the VRE include an increase in the use of “double-decker” trains to meet limited train storage capacity and increased ridership levels. The VRE expects a need to expand the existing train yard to allow for additional overnight train storage at the Broad Run station.

The VATSP annualized rate of growth in operations over the next twenty years is 1.05-percent (see **Table 2.1** and **Section 2.2.2**). The continued use of the airport by transient aircraft will also generate

more trips on airport roads as passengers are picked up and dropped off at the airport and individual tenants will continue to grow. As demand for aviation facilities continues to increase, the need for additional employees to handle aircraft (from aircraft fueling and maintenance to FBO office personnel) is also expected.

With all of these growth factors taken into consideration, it is expected that automobile traffic should eventually grow at an annualized rate of approximately 5-percent and then taper off to a more modest rate of

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TABLE 2.9
Forecast of Airport Related Automobile Traffic

COMPLEX	TOTAL ADT	VRE ADT	AIRPORT ADT
East	2,032	868	1,164
West	1,535	788	747
Total	**3,567**	**1,656**	**1,911**
FORECAST YEAR	TOTAL ADT	VRE ADT	AIRPORT ADT
2005	4,487	2,377	2,110
2010	5,742	3,413	2,329
2015	6,490	3,918	2,572
2020	7,339	4,499	2,840

Source:
Campbell & Paris Engineers, P.C. 2002

growth of 2-percent per year. The reason for the initial high rate of growth is because of the increased capacity at the Broad Run station which will allow more commuters to use the Broad Run station as opposed to other VRE stations (i.e., Old Town Manassas or Manassas Park stations). It is assumed that the additional 300 spaces would generate approximately 1,500 additional trips sometime in the 2005-2008 time frame (this trip generation accounts for “kiss and ride” drop-offs and pick-ups). As the parking facility is approaching capacity at the Broad Run Station, users of the VRE will again switch to other stations. This divergence in parking could result in the slower rate of growth of 2-percent per year which accounts for increases in aircraft operations and employment trends for airport tenants. Based on these assumptions, the forecasted automobile traffic at the airport is presented in Table 2.8. Based on an average day of operations, the airport should generate approximately 7,300 trips per day, or 16.0 trips per aircraft operation by 2020.

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TABLE 2.10

Summary Table of Forecasts Prepared for Manassas Regional Airport

FORECAST ELEMENT	2005	2010	2015	2020
Operations	137,604	147,585	157,566	168,298
Based Aircraft	309	321	332	344
Peak Month Operations	14,678	15,706	16,807	17,952
Average Day Peak Month Operations	473	507	542	579
Peak Hour Average Day Operations	53	56	60	64
IFR Operations	2,602	2,785	2,980	3,183
Average Day IFR Operations	74	80	85	91
Peak Hour IFR Operations	8	9	9	10
Part 135 Operations	2,504	2,680	2,868	3,063
Part 135 Passengers	3,130	3,350	3,585	3,829
Total Average Daily Automobile Traffic	4,487	5,742	6,490	7,339
VRE Average Daily Automobile Traffic	2,377	3,413	3,918	4,499
Airport Average Daily Automobile Traffic	2,110	2,329	2,572	2,840

Source:
Campbell & Paris Engineers, P.C. 2002

SECTION THREE:

DEMAND/CAPACITY ANALYSIS AND FACILITY REQUIREMENTS

With the forecasted aviation demand established for Manassas Regional Airport, a demand/capacity analysis was prepared to determine facilities necessary to accommodate the forecasted aviation activity. In order to accomplish this, each component of the airport has been evaluated for its ability to satisfy the existing and forecasted demand for facilities and services. In order to provide the recommended development plan with flexibility, facility requirements have been developed for both the VATSP forecasts and the higher growth regression forecasts prepared in Section Two. With the VATSP forecasting a low rate of growth in aviation activity, the recommended development plan for the airport identifies facility layouts that are flexible enough to accommodate based aircraft above those solely accounted for in the VATSP forecasts. The facility requirements for each component are identified by phase in an appropriate level of detail corresponding to the short-term (Years 0-5), mid-term (Years 6-10) and long-term (Years 11-20) planning horizons.

3.1 RUNWAY AND TAXIWAY SYSTEM CAPACITY

3.1.1 System Capacity

The airfield capacity at Manassas Regional Airport was determined by using the procedures and guidance found in FAA AC 150/5060-5 “Airport Capacity and Delay.” Generally, the capacity of an airport is a function of the number of runways, the orientation of the runways, type of aircraft using the runways, touch and go activity, location of taxiways and exit taxiways, and weather conditions. The annual service volume (ASV) of the airport has been determined to be approximately 355,000 annual operations which is consistent with the approved 1990 Airport Master Plan Update. Hourly capacity of the airfield is estimated at 197 operations during VMC (two runways in use) and 59 operations during IMC (single runway in use). This analysis assumes that the dual runway configuration is in use as much as 80-percent of the time. The demand/capacity information for the runway system at Manassas Regional Airport is presented in **Table 3.1.** In general, the runway capacity is sufficient to accommodate the forecasted operations throughout the planning period. The forecasted demand/capacity ratio is 47-percent by the end of the planning horizon

3.1.2 Exit Taxiway Requirements

According to an analysis of Air Traffic Control Tower flight strips from the Manassas ATCT, the aircraft mix

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TABLE 3.1

Parallel Runway System Capacity and Forecasted Demand/Capacity Ratio For Annual, VFR and

IFR Conditions

Year	System Capacity (Operations)	Annual Demand (Operations)	D/C Ratio	VFR Capacity (Ops/Hr)	VFR Demand (Ops/Hr)	VFR D/C Ratio	IFR Capacity (Ops/Hr)	IFR Demand (Ops/Hr)	IFR D/C Ratio
2001	355,000	136,650	38%	197	52	26%	59	8	14%
2005	355,000	137,604	39%	197	53	27%	59	8	14%
2010	355,000	147,585	42%	197	56	28%	59	9	15%
2015	355,000	157,566	44%	197	60	30%	59	9	15%
2020	355,000	168,298	47%	197	64	32%	59	10	17%

Source:
Campbell & Paris Engineers, P.C. 2002

utilizing Manassas Regional Airport is primarily the light single-engine and multi-engine Classification A and B aircraft. Classification C aircraft account for approximately 3-percent of aircraft operations at the airport in 2000. The forecasted fleet mix for the airport includes a larger percentage of Classification C aircraft (i.e., turbojets) but will not substantially alter the requirements for exit taxiway locations.

The existing exit taxiway locations for Runway 16R-34L were located as part of the reconstruction of the runway in 2000. These exit taxiway are located in proper positions to maximize the utilization of the exit taxiways by aircraft operating at the airport. As part of the reconstruction/rehabilitation of Runway 16L-34R, the existing exit taxiway locations are recommended to be relocated so that utilization rates are maximized for all types of aircraft using or forecasted to use the airport. Additionally, the relocated exit taxiways will optimize the use of the exit taxiways for either a 500-foot or 1,000-foot extension to the runway.

3.1.3 Parallel and Connecting Taxiway System Capacity

The runways at Manassas Regional Airport are served by two parallel taxiway systems with entrance and exit taxiways located to maximize the utility and safety of the runways. All four thresholds to the runways at the airport have aircraft holding bays. The provision of holding bays allows aircraft to “pull over” while allowing other aircraft to taxi by and access the departure end of the runway. The need for adequate bypass capability is most important when aircraft departing on either VFR or IFR flight plans are in the same queue for a particular runway. While the VFR pilot can wait in the queue for whatever time is necessary, the IFR pilot has to become airborne within a certain amount of time before the flight plan is cancelled, necessitating the re-filing of another flight plan which could cause an interruption in the operations of other aircraft.

An alternative to the construction of a holding bay is the construction of a by-pass taxiway which is essentially a “parallel” taxiway to the entrance taxiway at the threshold of a runway and provides the same capacity enhancement of a holding bay. As part of the reconstruction of Runway 16R-34L in

2000, a by-pass taxiway was constructed at the approach end to Runway 16R with a 176-foot centerline to centerline separation. The placement of the full length crossfield connector/by-pass taxiway should have a similar centerline to centerline separation as the bypass taxiway for Runway 16R-34L. The location of the full length crossfield connector/by-pass taxiway with this centerline-to-centerline separation would result in aircraft taxiing through the Glideslope Critical Area (GCA) necessitating the placement of holdmarkings on the taxiway pavement identifying the limits of the GCA.

3.1.4 Runway Length Analysis

The forecasted increase in the level of turbo-jet activity at the airport, coupled with the increasing demand for limited capacity at Washington-Dulles International Airport, makes the facilities at Manassas Regional Airport more attractive to potential corporate tenants. However, operations of potential corporate tenants could have payload restrictions if a runway extension of appropriate length is not provided at the airport. While any facility requirement is ultimately driven by demand, insufficient facilities detract from the ability of the airport to market the facility to potential corporate jet operators that require the full stage length capability of the most modern business jet aircraft types.

The required runway length at any airport is a function of temperature, altitude, runway gradient, weather conditions, stage lengths and all the performance capabilities of the critical aircraft at the airport. The physical characteristics considered in the runway length analysis at Manassas Regional Airport are identified in **Table 3.2.**

Two methodologies exist to determine a runway length that is sufficient enough to accommodate the types of aircraft operating at the airport. The first methodology, and typically used as an initial determination of runway length, is the FAA methodology developed for different groups of aircraft based on approach speed and size. These recommendations are prepared from a family of representative aircraft types within each group. The results of this type of analysis is also presented in **Table 3.2.**

Runway 16L-34R at Manassas Regional Airport is designed for large aircraft (60,000 pounds and greater gross weights). According to the FAA methodology, for the large aircraft group, the runway length at an airport should accommodate 75-percent of operations at a useful load (i.e. payload) of 60-percent. This criteria would include most general aviation turbine powered aircraft types including Lears, Gulfstreams and Cessna aircraft. The FAA analysis suggests that, for a stage length of 2,000 nautical miles (equal to the distance between Manassas and Los Angeles), the runway length should be, at a minimum, 5,400-feet in length.

Although the FAA methodology results in a generalized runway length based on certain groups of aircraft, the aircraft performance data in the FAA database is relatively dated and does not include some of the more modern ultra-long range aircraft types (i.e. Gulfstream G-VSP, Boeing Business Jet, Bombardier Challenger/Global Express). A more accurate determination of facility requirements is typically through a “critical aircraft” determination. A critical aircraft, for the purposes of runway length analysis, is defined as the most demanding aircraft expected to use the runway on a regular basis (i.e.

500 itinerant operations or more per year). The critical aircraft for Manassas Regional Airport for runway length determination is the Gulfstream V that is based in the East Complex.

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TABLE 3.2
FAA Airport Design Computer Program Runway Length Analysis

Given Information	
Airport Elevation	192-feet msl
Mean Daily Max. Temperature of the Hottest Month	87 F
Maximum Difference in Runway Centerline Elevation	Runway 16L-34R: 17-feet
Length of haul for airplanes more than 60,000 lbs.	2290 miles
Category	**Runway 16L-34R Suggested Runway Length** Wet Runway
Small Airplanes with approach speeds less than 30 kts	310'
Small airplanes with approach speeds less than 50 kts	820'
Small airplanes with less than 10 passenger seats	
75% of these small airplanes	2,530'
95% of these small airplanes	3,090'
100% of these small airplanes	3,670'
Small airplanes with 10 or more passenger seats	4,240'
Large airplanes of 60,000 pounds or less	
75% of these large airplanes at 60% useful load	5,360'
75% of these large airplanes at 90 % useful load	7,000'
100% of these large airplanes at 60% useful load	5,500'
100% of these large airplanes at 90% useful load	8,260'
Airplanes more than 60,000 pounds	8,130'

Source:
FAA Airport Design computer software, Version 4.2D
FAA AC 150/5235-4A "Runway Length Requirements for Airport Design" No Changes included

The published balanced runway length required at MTOW for the G-V on a standard day is 6,000-feet, which, increasing by 15-percent to accommodate for hot days, would be approximately 6,900-feet. Considering the G-V would not be typically operating at maximum takeoff weight, the runway length requirement would be less than the 6,900-foot length. Using published performance criteria from Gulfstream, a theoretical operating weight of an aircraft out of Manassas Regional Airport could be determined using the following:

Maximum Zero Fuel Weight		54,500 pounds
Maximum Payload		6,500 pounds
Fuel Requirement:		
Fuel burn rate @ 488 kts	480 gallons/hour	
Flight time from HEF to LAX @460 kts	5.0 hours	
30-minute reserve	5.5 hours	
Total gallons of fuel	2640	
Pounds per gallon of fuel	6.8	
Total weight of fuel	17,952	18,000
Typical Operating Weight of G-V at HEF		79,000

Sources:
Gulfstream web page (www.gulfstream.com)
AR Group webpage (www.ar-group.com)

Note: Trip time between KHEF and KLAX is rounded to the nearest whole hour

Thus, the theoretical operating weight of a G-V out of Manassas Regional Airport would be approximately 80,000 pounds, or 88-percent of MTOW which would require a runway length of 5,400-feet at a 10-degree flap setting at an ambient temperature of 30-degrees Celsius. Aircraft in general require a longer runway length for operations during wet and slippery conditions. FAA AC 150/5325-4A “Runway Length Requirements for Airport Design” states that the runway length derived from performance curves for a specific aircraft should be increased by 15-percent to account for poorer performance when a runway is wet and slippery. Increasing the 5,400-foot runway length by 15% would result in a recommended runway length of 6,200-feet.

Another way of understanding the benefit received by corporate aircraft operators currently based at the airport would be to examine the payload restrictions placed by the existing runway length of 5,700-feet. During wet and slippery conditions, the effective runway length at Manassas Regional Airport would be reduced to 5,000-feet (5,700/1.15). Assuming a flap setting of 10-degrees, the maximum takeoff weight of a G-V accommodated by a 5,000-foot runway would be approximately 77,000 pounds, or 3,000 pounds less of usable load (fuel and/or passengers/cargo). The provision of an additional 500-feet of runway length would allow a G-V (assuming the additional 3,000 pounds is

used for fuel load) to carry an additional 450 gallons of fuel which would equate into an extra 460-nautical mile range. Previous studies have documented that Runway 16L-34R can be extended to a total length of 6,700 feet without impacting Broad Run. While this is not recommended in the current planning horizon such a runway would allow a G-V to fly a 3,100 nautical mile stage length on a hot day (89 degrees).

While not included in the November 2001 FONSI, the environmental coordination conducted for the 1,000-foot extension provides a baseline for the lesser 500-foot runway extension.

3.1.5 Runway Width Analysis

The existing width of the runways at the airport (100-feet) satisfies the FAA criteria for aircraft with wingspans up to 118-feet (Group III) and approach speeds up to 166 knots (Group D) operating in visual, non precision and precision ILS environments. The existing runway width and runway orientation provides sufficient wind coverage (99.7-percent during all weather conditions and precision IFR weather). As the forecasted aviation demand does not include any regular aircraft operations by aircraft larger than D-III and adequate wind coverage with existing runway orientation, additional runway width for both runways is not recommended.

3.1.6 Runway Safety Area Analysis

The runway safety area analysis includes the following areas for a runway:

- ✈ Runway Safety Area
- ✈ Runway Object Free Area
- ✈ Runway Obstacle Free Zone

A review of these safety areas will identify areas that potentially require improvements to bring them into compliance with FAA standards outlined in FAA AC 150/5300-13.

Runway 16L-34R: The only safety areas not in compliance with FAA design standards is the existing runway safety area on the portion of Runway 16L-34R south of the bridge over Broad Run (see **Table 3.3**). A waiver was issued by the FAA in 1981 to 1) allow for a narrower runway safety area in order to meet environmental requirement of an “open infield” between the taxiway and runway and 2) reduce the amount of fill required for the runway extension. With Runway 16L-34R nearing the end of the design life and in need of reconstruction/rehabilitation, it is the goal of the FAA to bring the runway safety area into compliance with design standards in AC 150/5300-13.

The Runway Obstacle Free Zone is centered on the runway centerline and has a prescribed width and height depending on the most critical aircraft that uses the runway on a frequent basis. The OFZ is required to be free and clear of any parked aircraft or obstructions. The planned installation of an Approach Lighting System (ALS) for Runway 34R will require an inner-approach OFZ for Runway 34R. The planned ODALS will start 300-feet from the ultimate threshold for Runway 34R and extend for a total length of 1,500-feet. The inner-approach OFZ extends 200-feet beyond the last light in the ODALS which places portions of vegetation along Broad Run in the OFZ. This vegetation is not of sufficient height to create an obstruction to the inner-approach OFZ.

Runway 16R-34L: The safety areas for Runway 16R-34L are in compliance with FAA design standards and no safety area improvements are recommended or required.

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TABLE 3.3

Runway Safety Area Analysis

Runway Safety Area	FAA Requirement	Existing Runway 16L -34R	Ultimate Runway 16L-34R	FAA Requirement	Existing Runway 16R-34L	Ultimate Runway 16R-34L
Runway Safety Area						
Length Beyond RW End	1,000'	✦	✦	300'	✦	✦
Width	500'	⏮	✦	150'	✦	✦
Runway Object Free Area						
Length Beyond RW End	1,000'	✦	✦	300'	✦	✦
Width	800'	✦	✦	500'	✦	✦
Runway Obstacle Free Zone						
Length Beyond RW End	200'	✦	✦	200'	✦	✦
Width	400'	✦	✦	400'	✦	✦
Inner Approach OFZ - Runway 16L	50:1	✦	✦	50:1	---	---
Inner Approach OFZ - Runway 34R	50:1	---	⏮	50:1	---	---
Inner Approach OFZ - Runway 16R	50:1	---	---	50:1	---	---
Inner Approach OFZ - Runway 34L	50:1	---	---	50:1	---	---
Inner Transitional OFZ - Runway 16L	‘6:1	✦	✦	‘6:1	---	---
Inner Transitional OFZ - Runway 34R	‘6:1	---	---	‘6:1	---	---
Inner Transitional OFZ - Runway 16R	‘6:1	---	---	‘6:1	---	---

Inner Transitional OFZ - Runway 34L	‘6:1	---	---	‘6:1	---	---

Notes:
Runway 16L-34R designed for D-III aircraft, Runway 16R-34L designed for B-II aircraft with visibility minimums not lower than 3/4-mile.
Runway Safety Area from Broad Run Bridge south to Runway 34R is only 300-feet in width.

+ = satisfies FAA criteria
⏮ = does not satisfy FAA criteria
— = Not applicable

Sources:
FAA AC 150/5300-13
Campbell&Paris Engineers, P.C. 2002

3.1.7 Runway Protection Zones Analysis

Runways 16L and 16R: The runway protection zones (RPZs) on the north approach to the airport (Runway 16L and Runway 16R) are not anticipated to change during the planning horizon. The existing precision instrument approach to Runway 16L requires a RPZ geometry of 1,000-foot inner width, 2,500-foot length and
1,750-foot outer width. Runway 16R is not recommended to have any further instrumentation or runway lighting and will continue to provide non-precision approach capabilities with visibility minimums greater than 1-mile which requires a RPZ geometry of 500-foot inner width, 1,000-foot length and 700-foot outer width. The airport has adequate interest in property within the portion of the RPZs that are located off airport property. Through avigation easements and the Airport Overlay District in the City of Manassas Zoning Code, the airport has control over the type and intensity of development within the RPZs.

Runways 34L and 34R: The runway protection zone for Runway 34R is expected to change in response to the planned change in runway length and installation of an approach lighting system. While further instrumentation of the approaches to Runway 34R is not recommended because of the location of restricted airspace and military operation areas to the south, the potential extension to Runway 16L-34R and placement of an ODALS would require the relocation and widening of the associated RPZ. The existing non-precision approaches to Runway 34R accommodate visibility down to one mile and requires a RPZ geometry of 500-foot inner width, 1,700-foot length and 1,010-foot outer width, however, with a 1/4-mile visibility credit associated with the ODALS (if approved), the ultimate RPZ dimensions would change to 1,000-foot inner width, 1,700-foot length, and 1,510-foot outer width. Recent land acquisitions completed as part of the approved FAR Part 150 Noise Compatibility Program has resulted in the City having adequate property interest in land within the ultimate RPZ. For Runway 34L, the existing non-precision instrumentation requires a RPZ geometry of 500-foot inner width, 1000-foot length and 700-foot outer width. No further instrumentation, approach aids or runway length is recommended on Runway 34L. A portion of the existing runway protection zone (±12-acres) is located off airport property but does have an avigation easement (40:1) covering much of the off-airport portion of the RPZ. In accordance with recommendations in the Airport Master Plan, the City has identified this portion of land in the approved

5-year Airport Capital Improvement Program (ACIP) for purchase in fee simple. Until the property is owned in fee simple, the airport has control, through the avigation easement and the Airport Overlay District in the Prince William County Zoning Code; over the type and intensity of development within the RPZs

3.1.8 FAR Part 77 Analysis

The Federal Aviation Administration has defined five imaginary surfaces that surround airports receiving federal funding. The five imaginary surfaces are defined in FAR Part 77 and include the primary surface, approach surface, transitional surface, horizontal surface and conical surface. Each surface has different dimensional characteristics that are defined by visibility minimums and are required to be free of any obstructions to air navigation. An obstruction to air navigation is any natural or man-made object that penetrates any imaginary surface. It should be the goal of any airport to remove any identified obstruction to air navigation so that safe operation of aircraft can continue and operational minimums are not impacted.

The **primary surface** is a rectangular surface that is longitudinally centered on the runway centerline. The elevation of any point of the primary surface is equal to the elevation of the nearest point on the runway centerline. The width of the primary surface is dependent upon the type of approach existing and planned for the runway and the visibility minimums. For runways with a specially prepared hard surface, the primary surface extends 200-feet beyond the physical end of the runway.

Runway 16L-34R: With published minimums as low as 1/2-mile and a precision instrument approach capability, the existing primary surface for Runway 16L-34R has a width of 1,000-feet and a length of 6,100-feet (5,700-feet plus 200-feet off each runway end). With the planned extension of the runway by 500-feet in the short-term, the ultimate primary surface for Runway 16L-34R will increase to 6,600-feet (6,200-feet plus 200-feet off each runway end) in length and will continue to have a width of 1,000-feet. *The existing and ultimate primary surface at the airport for Runway 16L-34R appears to be free and clear of any obstructions.*

Runway 16R-34L: The primary surface for Runway 16R-34L is 500-feet in width as only non-precision instrument approaches are published for the runway. The total length of the existing primary surface for Runway 16R-34L is 4,100-feet (3,700-feet plus 200-feet off each end of the runway). *The existing primary surface at the airport for Runway 16R-34L appears to be free and clear of any obstructions.*

The **approach surface** is a trapezoidal shaped plane, longitudinally centered on the extended runway centerline and extends outward and upward from each end of the primary surface. The dimensions and slope of the approach surface are determined by the approach planned or available for the runway and visibility minimums.

Runway 16L-34R: As the primary surface for Runway 16L-34R is 1,000-feet in width, the inner width of the approach surfaces are also 1,000-feet in width. The precision instrument approach capability provided by the CAT I ILS results in the approach surface for Runway 16L having a 50:1 slope. The approach slope for Runway 16L extends for a horizontal distance of 10,000-feet at a

50:1 slope and at a 40:1 slope for an additional 40,000-feet. The outer width of the precision approach slope is 16,000-feet. The non-precision instrument approach on Runway 34R has a 34:1 slope and extends for a horizontal distance of 10,000-feet with an outer width of 3,500-feet. With the placement of the ODALS on Runway 34R and the potential 1/4-mile reduction in visibility minimums, the outer width of the approach surface for Runway 34R could change to 4,000-feet.

An area of natural (vegetative) obstructions off the approach end of Runway 34R penetrates the existing 34:1 non-precision approach surface. Approximately 36 acres of obstructions exist within the approach surface and are recommended for removal in the short term planning period (Years 0-5). The removal of the vegetative obstructions to Runway 34R will require coordination with City, County and State agencies as a portion of the obstructions are located within the Protection Area Site Analysis (PASA - conducted as part of the 2001 Environment Assessment) defined limits of the Resource Protection Area associated with Broad Run. Should Runway 16L-34R be extended by 1,000-feet, an additional 63-acres of obstructions would require removal, however, the additional areas of obstructions are outside the defined limits of the resource protection area and are located on airport controlled property. *The existing and ultimate approach surfaces for Runway 34R have vegetative obstructions that need to be removed. The latest photo-slopes for Runway 16L indicate minor penetrations to the existing and ultimate 50:1 precision approach surface. The city of Manassas is currently in the process of clearing these penetrations .*

Runway 16R-34L: The approach surfaces for Runway 16R and 34L at Manassas Regional Airport are non-precision with 34:1 approach slopes. The inner width of the non-precision approach surfaces for Runways 16R and 34L have inner widths of 500-feet and extend for a horizontal distance of 10,000-feet and have outer widths of 3,500-feet. *The existing and ultimate approach surfaces for Runway 16R-34L appear to be clear of obstructions.*

The **transitional surface** rises at a slope of one-foot vertically for every seven-feet of horizontal distance (7:1) as measured at 90-degree angles from the edge of the primary surface and extended runway centerline. The transitional surface continues at the 7:1 slope until intersecting the horizontal surface at an elevation of 150-feet above the established airport elevation (192-feet msl). *The only obstruction to the transitional surfaces at Manassas Regional Airport appears to be the existing FAA Air Traffic Control Tower which penetrates the FAR Part 77 Transitional Surface for Runway 16R-34L by approximately ±20-feet.*

The **horizontal surface** is a horizontal plane located 150-feet above the established airport elevation and is longitudinally centered on each runway. The perimeter of the horizontal surface is formed by swinging arcs of specified radii from the center of each end of the primary surface. The radii for the swinging arcs is 5,000-feet for all runways designated as visual or utility and 10,000-feet for all other runways. *The existing and ultimate horizontal surfaces for the airport appear to be clear of obstructions.*

The **conical surface** extends outward and upward from the periphery of the horizontal surface at a slope of one-foot vertical for every twenty-feet of horizontal distance (20:1). This conical surface

extends for a horizontal distance of 4,000-feet and has an ultimate elevation of 350-feet above the established airport elevation. *The existing and ultimate conical surfaces appear to be clear of obstructions.*

3.1.9 Runway and Taxiway Pavement Analysis

The recent reconstruction of Runway 16R-34L and the design efforts for Runway 16L-34R have provided pavement analysis for both runways and the associated taxiway systems.

Runway 16R-34L: Runway 16R-34L was constructed during the original airport development in 1964 and then strengthened with a simple overlay in 1971. The runway was reconstructed in 2000 and the pavement is in excellent condition.

Runway 16L-34R: Nondestructive tests conducted as part of the preliminary engineering for the reconstruction of Runway 16L-34R generally found the existing pavements in good structural condition with the exception of a couple of areas of concern. The good overall structural condition of the pavement can mainly be attributed to the existing cement treated base course which exists under all of the tested pavements. In most cases, the NDT found the in-situ strength of the CTB sufficient for that layer to be considered a fully functioning stabilized base. However, some localized weaknesses were evident on the runway, Taxiway Bravo, Taxiway B2, Taxiway Foxtrot and the hold apron on Taxiway Kilo. The preliminary design for the reconstruction of Runway 16L-34R generally includes 4-inches of bituminous over 5-inches of cement treated base course on top of the existing Runway 16L-34R pavement section, although some sections will require a thicker pavement section in order to bring existing grades to the required 0.8-percent over the last quarter of a runway designed for Category C/D aircraft.

3.2 NAVAIDS SYSTEM ANALYSIS

Since the 1990 Master Plan Update, several navigational aids have been implemented at the airport including a precision instrument landing system, an Automated Weather Observation System level III (AWOS-III), PAPI installation, and an Air Traffic Control Tower (ATCT). Subsequent FAA Flight Checks for the ILS have indicated roughness in the localizer signal which has resulted in the visibility minimums remaining at ≥3/4-mile instead of the ≥1/2-mile visibility minimums typically associated with a CAT I ILS. Since the ILS is a federal facility, coordination with the FAA Airways & Facilities Division should be taken in order to remove the course roughness and lower the visibility minimums for Runway 16L to the standard ≥1/2-mile.

With the continuing increase in the use of the facility by business aviation users, additional visual navigation aids should be considered in order to enhance the safety of operations. Specifically, supplemental windcones and an approach lighting system should be installed at the airport.

A supplemental windcone provides pilots with a “last minute” check of wind conditions on the runway as they may have changed since receiving weather information from either the on-field AWOS or lighted windcone. With the location of Manassas Regional Airport in close proximity to topographical features that could influence the wind patterns at the airport, it is recommended that all four approaches to the airport have a supplemental wind cone in the short-term (Years 0-5). Typically a

supplemental wind cone is sited in an area that is 500- to 1,000-feet down from the threshold and 250- to 450-feet off of the runway centerline.

The implementation of an ODALS will provide pilots on approach to Runway 34R with guidance and facilitate in the identification of the runway against other competing light sources. As further instrumentation of the runway is not practical because of restricted airspace and military airspace to the south, an approach lighting system is the most practical means to improve the safety of the approach to the runway. The installation of the ODALS is recommended in the mid-term (Years 6-10). While the installation of the ODALS would improve approaches from the south in the short-term, the ODALS is placed in the mid-term to allow sufficient time in the short-term (Years 0-5) for the planning, design and construction of the recommended 500-foot runway extension. Associated with the installation of the ODALS are dimensional changes for the RPZ, FAR Part 77 Approach Surface and Runway Obstacle Free Zone (OFZ). State and City funds would be required for the ODALS. FAA AIP funds are not anticipated unless the installation of the approach lighting system meets FAA APS-1 criteria.

3.3 AIR TRAFFIC CONTROL TOWER EVALUATION

The existing Manassas Regional Airport Air Traffic Control Tower was relocated from Centennial Airport in Colorado in 1990. The placement of the ATCT was determined in the 1990 Master Plan Update after considering multiple locations on the airport property. The existing location was chosen because of the eastern view provided to the controllers.

The existing ATCT site results in a relatively narrow apron depth of 200-feet which only accommodates seven (7) tie-down positions. The line of sight of a controller in a 58-foot tower height (equal to the tower cab height of the existing ATCT assuming the controller is 15-feet below the surveyed height of the ATCT) currently intersects the existing holding bay associated with Taxiway Bravo at 1-degree and the ultimate holding bay (location 6 on **Figure 3-1**) at 49-minutes.
To determine an appropriate site for a potential relocation of the ATCT, mandatory and non-mandatory siting requirements established by the FAA were used:

Mandatory Requirements

- A clear, unobstructed and direct view to each approach area, runway, taxiway and other operations areas requiring control must be available.
- The site must be able to accommodate required facilities (i.e., parking, access, tower building, etc.). Utilities must be provided.
- Height limitations imposed by FAR Part 77 must be adhered to unless deviations are absolutely necessary to satisfy other mandatory siting criteria.
- The tower must be sited so existing or planned electronic navigational facilities will not be impacted.

Non-Mandatory Requirements

- Depth perception of all surface areas to be controlled should be available. Perception is enhanced where the controller's line of site is perpendicular or oblique, not parallel, to the

aircraft movement areas and where the line of sight intersects the airport surface at a vertical angle greater than 35-minutes (0.58-degrees).

- ✈ The tower cab should be oriented to face north or, alternatively east, south or west in that order of preference. Avoid orientations that will place a view of the runway approach in line with a rising or setting sun.
- ✈ Visibility should not be impaired by direct or indirect external ight sources. Exterior noise should be at a minimum.

FIGURE 3-1
Areas of Manassas Regional Airport Analyzed for ATCT Line-of-Sight Requirements

- ✈ Access to a site should avoid crossing areas of aircraft operations and should function with planned expansion of airport facilities in the future.

As the existing tower is located in the West Complex and provides a clear and unobstructed view of the aircraft operating area, the search area for an appropriate new tower location focused on the West Complex. Available land for parking, administrative area and the tower base and cab totaled approximately 1/2-acre of land. The recommended location is approximately 380-feet to the west of the existing tower location on the opposite side of Observation Road. This would preserve as much airside access for apron operations as possible and move the tower far enough to the west to no longer be a FAR Part 77 Transitional Surface penetration. The line-of-sight criteria was analyzed by identifying both existing and planned critical aircraft movement areas on the airport. Eight locations were analyzed to see if the controller line-of-sight intersected these points above the 35-minute mandatory threshold (see **Table 3.4** and **Figure 3-1**). The eight locations included five threshold crossings (one for each existing threshold, plus the potential 1,000-foot relocated threshold for Runway 34R) and three aircraft movement areas. The most distant location from the ATCT was the

area near the existing Wakeman Drive/Observation Road intersection that could support additional airside apron development in the long-term. As can be seen in **Table 3.4**, the minimum height of the relocated ATCT is 52-feet agl. At the

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TABLE 3.4

Alternative Cab Heights Analyzed for Tower Line-of-Sight to Selected Areas of the Airport

Location	Number on Figure 3-1	Approximate Elevation	Distance from Proposed Tower Location	Required Cab Height (agl)
Threshold to Runway 16L	1	192.5	2,957	30.00
Threshold to Runway 16R	2	185.2	2,590	26.00
Threshold to Runway 34L	3	177.4	1,659	17.00
Threshold to Existing Runway 34R	4	177.6	3,748	38.00
Threshold to 6,700-foot Runway 34R	5	177.6	4,658	47.00
Taxiway Bravo Holding Bay	6	177.6	4,890	50.00
Apron in front of Aurora	7	195.3	4,491	46.00
"Northwest" Apron Development	8	190.0	5,113	52.00

Notes:
Northwest Apron Development assumed to be 190-feet msl
New threshold to 34R assumed to carry 0.0-percent slope from existing threshold

Source:
Campbell&Paris Engineers, P.C. 2002

proposed location of the ATCT, the transitional surface has an elevation of 105-feet agl. *Thus, it is recommended that in the mid-term planning period, the ATCT be reconstructed in the new location with a tower height between 52- and 105-feet agl.*

There are several benefits associated with the relocation of the ATCT by 380-feet to the west. The primary benefit is related to removing the ATCT from the airside and to the landside, thus creating more airside land for development. The relocation of the ATCT and the demolition of the existing 13,400-square foot building would allow for a 350-foot deep apron and create 33 more tie-down positions. Secondary benefits include the removal of a penetration to the FAR Part 77 Transitional Surface for Runway 16R-34L. While the existing ATCT is fixed by function and appropriately marked

as an obstruction, the removal of the ATCT would increase the safety of operations at the airport. The relocation of ATCT could mean possible "cost sharing" or contract
tower options. The Investment Reform Act of the 21st century (Air-21) allows the cost sharing program to share cost of air traffic modernization projects, under which airport/airline joint ventures may procure and install facilities and equipment in cooperation with the FAA.

It is recommended that the construction of a new tower be placed in the mid-term (Years 6-10) planning horizon. The forecasted increase in use of the airport by business aviation turbo-jets (i.e., Gulfstream V, BBJ), coupled with the expected 3.5-percent annual rate of growth in operations handled at the Dulles International Tower over by the planning horizon further qualifies the need for a replacement tower at the airport. Should a new tower not be constructed, all airspace issues would revert back to Dulles International Airport which would further increase the workload for Dulles controllers.

3.4 AIRCRAFT RESCUE AND FIREFIGHTING (ARFF) FACILITY

The FAA requirement that airports provide adequate Aircraft Rescue and Firefighting (ARFF) facilities is outlined in Federal Aviation Regulation (FAR) Part 139. The FAA issued a Notice of Proposed Rule Making (NPRM) in June 2000 that would substantially revise which airports would need to adhere to Part 139. As of the date of this report, Part 139 is applicable to land airports which serve any scheduled or unscheduled passenger operation conducted with aircraft having a seating capacity of more than 30 passengers. Should the NPRM take effect, this threshold would be reduced from 30 passengers to 10 passengers. While Manassas Regional Airport currently does not have scheduled commercial service with aircraft having 10 or more seats, the potential change in Part 139 would make the potential of Manassas Regional Airport having to adhere to Part 139 more probable. The type of fire extinguishing agents and equipment used to comply with FAA requirements is based on the size of the aircraft providing service to the airport. While Manassas Regional Airport does not meet the criteria for Part 139, the City has an intergovernmental agreement with Prince William County to provide emergency response services at the airport. Two scenarios were modeled to determine adequate ARFF facilities: scheduled operations at Manassas Regional Airport and continued general aviation operations with a higher mix of business aviation aircraft.

3.4.1 ARFF Requirements Should Scheduled Operations Occur

While the forecasts of future aviation activity does not specifically identify any future activity by commercial aircraft at Manassas Regional Airport, the possibility of some type of scheduled commercial service in the future has been acknowledged. Should commercial aircraft activity occur at the airport, the type of facilities would probably limit the aircraft to those identified as Index A (aircraft less than 90-feet in length) in FAA AC 150/5210-6C "Aircraft Fire and Rescue Facilities and Extinguishing Agents." The ARFF requirements for Index A is as follows:

- One vehicle carrying at least 500 pounds of sodium-based dry chemical or halon 1211; or
- One vehicle carrying at least 450 pounds of potassium-based dry chemical and water with a commensurate quantity of AFFF (Aqueous Film Forming Foam) to total 100 gallons, for simultaneous dry chemical and AFFF foam application

- Be able to respond to the mid-point of the furthest runway serving air carrier aircraft within 3 minutes.

3.4.2 ARFF Requirements for General Aviation Facilities

Should no commercial aircraft operations occur at Manassas Regional Airport to warrant the placement of a dedicated ARFF facility, FAA AC 150/5210-6C provides non-regulatory guidance for ARFF facilities at airports serving general aviation aircraft. For general aviation airports, the response index is based on annual operations and not on average daily departures. The FAA has established two response indices:

FIGURE 3-2
ARFF Locations Analyzed for Response Times

- Index 1: general aviation airports that have more than 1,825 annual departures of aircraft more than 30-feet in length but not more than 45-feet in length; and
- Index 2: general aviation airports that have more than 1,825 annual departures of aircraft more than 45-feet in length but not more than 60-feet in length.

With the forecasted operations by turbo-prop and turbo-jet aircraft (which are typically between 46-feet in length (King Air 350) and 96-feet in length (G-V)) forecasted to total ±12,500 operations by 2020,

Manassas Regional Airport falls into response Index 2 for general aviation airports. The primary firefighting agent can either be AFFF or Protein Foam with dry chemicals comprising the secondary firefighting agent. Only one response vehicle is required and should have a capacity of at least 190 gallons of water for foam production and
300 pounds for dry chemical agent storage.

3.4.3 ARFF Facility Location Analysis

The ARFF facility should be located so that an ARFF vehicle can reach the midpoint of the furthest runway within 3 minutes of an alarm. Radio communication equipment in the ARFF vehicle should include a standard two-way radio in order to communicate with other response vehicles and the ATCT. The most advantageous location of an ARFF facility would be in a location with direct access to the crossfield connector taxiways, which minimizes the need for turning movements and optimizes the responsiveness of ARFF vehicles. Assuming a standard response vehicle travel speed of 45-miles per hour (or 3,960-feet per minute), three alternative locations for the ARFF station were identified and are presented in **Figure 3-2.**

All locations analyzed had response times below3-minutes. Thus, the optimum location of anARFF facility is in a location that does not hinder future development of aviation facilities. *It is recommended that an ARFF facility be constructed in Location 1 during the mid-term (Years 6-10). This location would have to include traffic signalization for Wakeman Drive.*

3.5 EAST AND WEST COMPLEX FACILITIES ANALYSIS

The following section will present the recommended facility requirements based on the aviation activity forecasts presented in Section Two. Two sets of facility requirements are presented for each of the major facilities at the airport: hangars, aprons, and fuel farm. One set of facility requirements is based on the forecasts presented in the Virginia Air Transportation System Plan published by the Virginia Department of Aviation (DOAV) and a second set of facility requirements is based on the regression forecasts of aviation demand presented in **Table 2.3**. Each set of facility requirements will be presented for the next twenty years using short-term (Years 0-5), mid-term (Years 6-10) and long-term (Years 11-20). By presenting these two levels of facility requirements, flexibility is provided for the airport to meet localized demand in response to potential tenant inquiries or growth in based aircraft and operations greater than that accounted for by the VATSP.

Planning factors have been developed for all of the major aviation facilities at the airport and are presented in the following sections. Space requirements have been analyzed based on the size of the various aircraft types (single-engine, multi-engine, turbo-prop and turbo-jet, and helicopter) expected to use Manassas Regional Airport. Tie-down positions for based aircraft assume nested tie-down positions and power-in/power-out tie-down positions for transient aircraft. Similarly, hangar space requirements for storage and maintenance have been developed including associated office support space needs and automobile parking requirements. Fuel consumption associated with based and transient aircraft operations have been estimated using historical fuel consumption and operation levels at the airport.

3.5.1 T-Hangar Requirements

Airports within Northern Virginia have a shortfall of hangar spaces as evidenced by t-hangar waiting lists and how quickly hangars are fully occupied. In order to capitalize on the demand in the regional market, t-hangar facility requirements were based on providing 70-percent of forecasted single-engine and multi-engine based aircraft with a t-hangar unit. Providing t-hangars for 70-percent of the based population recognizes the increasing financial feasibility of having an aircraft in a t-hangar while limiting t-hangar space so that apron tie-downs are still utilized. With the Manassas area having cold winters with substantial snowfall and hot summer months typified by summer thunderstorm activity, providing hangars for 70-percent of the based single and multi-engine aircraft should match the historical demand of based aircraft owners and operators fairly well. It is recommended that t-hangar construction include units with 48-foot clear spans which will accommodate virtually all of the Group I aircraft.

VATSP Forecast Facility Requirements

Applying the 70-percent demand assumption to the reported 2000 based single- and multi-engine aircraft population (281) results in an apparent need for additional 12 t-hangar units in the short-term (see **Table 3.5**). By the end of the planning horizon, an additional 22 t-hangar units will need to be constructed in order to accommodate theVATSP forecasted demand for hangars.

Regression Forecast Facility Requirements

Acknowledging the presence of substantial regional demand for t-hangar facilities and the increasing popularity of Manassas Regional Airport, the regression forecast results in a greater demand for t-hangars at the airport. With the based single-engine and multi-engine population forecasted to grow to 411 aircraft by the end of the planning horizon, an additional 130 t-hangar units will need to be constructed during the planning period in order to accommodate both local and regional demand assuming 70-percent of the based single-engine and

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TABLE 3.5

Forecasted T-hangar Facility Requirements by Planning Year

Planning Years	% SEL/MEL of Total Based Aircraft	Existing T-Hangar Units (2000)	VATSP Forecasted SEL/MEL (Need)	Regression Forecasted SEL/MEL (Need)
0-5	79%	158	170 (+12)	253 (+95)
6-10	78%	158	175 (+17)	265 (+107)
11-15	76%	158	176 (+18)	275 (+117)
16-20	75%	158	180 (+22)	289 (+131)

Source:
Campbell and Paris Engineers, P.C. 2002

multi-engine aircraft will require hangar space. In the short-term (Years 0-5), an additional 95 t-hangar units will need to be constructed in order to accommodate local and regional demand (see **Table 3.5**).

3.5.2 Storage Hangar and Maintenance Requirements

The forecasted demand for storage and maintenance space results in an apparent market for an additional 10,000 to 40,000 square feet of hangar space at the airport. However, simply reserving space for a hangar of sufficient size to meet the forecasted demand would ignore market competition. Recognizing that multiple hangars could be constructed to meet the forecasted demand, the plan identifies facilities above and beyond the facility requirements.

Typically the owners and operators of larger and more expensive corporate turbo-prop, turbo-jet and helicopters prefer to store their aircraft in corporate hangars. Typical dimensions of these hangars are around 100-feet in depth and 150-200-feet in width (between 10,000 and 20,000-square feet). The larger corporate turbo-jets require door heights of approximately 30-feet in order to provide adequate tail clearances. In order to provide necessary wingtip clearances and enough capacity to store maintenance equipment and provide space to maneuver around the aircraft, space requirements for the aircraft were assumed to be two times the hangar space requirement. The space requirements for each type of aircraft is as follows:

- Single/Multi-engine aircraft (35-foot to 45-foot wingspan): 3,600 square feet each
- Turbo-prop (i.e., Beech King Air 350): 7,800 square feet each
- Turbo-jet (i.e., Gulfstream V): 7,800 square feet each
- Helicopter (i.e., Robinsons): 3,600 square feet each

Additionally, assumptions were used to determine the demand for storage space for the various aircraft groups. Using a similar approach as that used in the development of demand for t-hangar units, the following planning factors were used to forecast the demand for corporate hangar space:

- 10-percent of the based single-engine aircraft require corporate hangar space
- 40-percent of the based multi-engine aircraft require corporate hangar space
- 100-percent of the based turbo-props and turbo-jets require corporate hangar space
- 100-percent of based helicopters require corporate hangar space

Maintenance space requirements were based on the frequency of maintenance activities required for the different types of aircraft. The small and infrequently used recreational aircraft (typically the single-engine aircraft) may only require a few days of maintenance each year. The corporate and Part 135 turbo-prop and turbo-jets, however, may need several days of "cycle maintenance" each month. The assumptions used to generate the maintenance space requirements are presented below.

- Based single engine aircraft need maintenance space 5 days per year for annual inspection/routine maintenance
- Based multi-engine aircraft need maintenance space 12 days per year for annual inspections/routine maintenance/Part 135 (100 hour) maintenance.

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TABLE 3.6
Forecasted Storage/Maintenance Hangar Facility Requirements by Planning Year

Planning Years	2001 Existing Maintenance/Storage Hangars (sf)	VATSP Forecast (sf)	Regression Forecast (sf)
0-5	23,000	37,000 (+14,000)	55,000 (+32,000)
6-10	23,000	39,700 (+16,700)	60,200 (+37,200)
11-15	23,000	43,000 (+20,000)	66,500 (+43,500)
16-20	23,000	45,700 (+22,700)	72,500 (+49,500)

Source:
Campbell and Paris Engineers, P.C. 2002

- Based turbo-prop, business jets and helicopters need maintenance space 5 days per month for cycle maintenance/Part 135 (100 hour)/routine maintenance.
- All space requirements equal to 2 times the storage factors
- 80-percent of based aircraft will have maintenance performed off airport
- Based aircraft requirements are increased by 20-percent to accommodate transient demands
- Total square footage is increased by 20-percent to provide general office space.

VATSP Forecast Facility Requirements

Applying these planning factors to the VATSP forecasted demand of aviation results in the total need for approximately 37,000 square feet of maintenance/storage hangar space by the end of the short-term planning period. By the end of the planning horizon, local and regional demand would require approximately 9,000 square feet of additional maintenance/storage hangar space for a total of 46,000 square feet (see **Table 3.6**).

Regression Forecast Facility Requirements

With a more aggressive forecast of based aircraft, the regression model results in a need for more maintenance/storage hangar space than the VATSP forecast. Applying the planning factors to the regression forecasts of based aircraft results in the need for a total of 55,000 square feet of maintenance/storage space by the end of the short-term planning period which is ±32,000 square feet more than the existing maintenance/storage space at the airport. By the end of the planning horizon, local and regional demand would require approximately 37,500-square feet of additional maintenance/storage space than is available today (see **Table 3.6**).

3.5.3 Support Facility Analysis

Office and administrative space is typically required to support the storage and maintenance hangar functions. Typical hangar development projects at Manassas Regional Airport have provided administrative/office space immediately adjacent to the hangar itself and represent between 20- and30-percent of total hangar space. With the office and administrative space and hangar development, automobile parking requirements need to be evaluated to determine any potential deficits in parking spaces for employee and visitor parking. The automobile parking demand was developed based on the following planning factors:

- One space required for each 1,000 square feeet of storage and maintenance hangar space
- One space required for each 300 feet of office support space
- One space per peak hour operation
- One space per three apron tie-downs

Applying these planning factors to the existing hangar development results in no apparent need for additional automobile parking facilities in the short-term. While the airport has sufficient parking in total, the distribution of parking spaces results in relatively underutilized parking spaces (i.e., near the ATCT) that would be better utilized in other locations (i.e., near Aerographics). As additional facilities are constructed at the airport, appropriate levels of automobile parking should also be constructed adjacent to the office and hangar components. This would minimize walking distances for both employees and visitors and would promote a more efficient distribution of parking spaces.

3.5.4 Fuel Facilities and Storage

Fuel sales at Manassas Regional Airport in calendar year 2000 totaled 1.7 million gallons, of which, approximately 76-percent was AvGas and 24-percent was JetA. Fuel sales for calendar year 2001 (up to August) were on pace to equal the total for calendar year 2000. Average daily consumption of

fuel was 1,170 gallons of JetA and 3,670 gallons of AvGas. Assuming a 15-day demand for JetA and a 10-day demand for AvGas, the total fuel at the fuel farm on an average day would be 17,550 gallons of JetA (34-percent of capacity of JetA tanks) and 36,700 gallons of AvGas (122-percent of capacity of AvGas tanks).

The forecasted available capacity of the fuel farm at Manassas Regional Airport was determined by providing enough reserve fuel for a 15-day supply for Jet A and a 10-day supply for AvGas. The following planning assumptions were used in the determination of the future demand for fuel at the airport:

- 90-percent of based single-engine aircraft would purchase fuel at the airport;
- 50-percent of the based multi-engine aircraft would purchase fuel at the airport;
- 30-percent of based turbo-props/turbo-jets would purchase fuel at the airport;
- 90-percent of based helicopters would purchase fuel at the airport;
- Transient fuel demand is equal to 50-percent of based aircraft fuel demand
- Single-engine, multi-engine and helicopters require AVGas fuel
- Turbo-props and turbo-jets require Jet A fuel.

The original design of the fuel farm in 1990 included enough space for the fuel farm to expand beyond the current 5 tanks. The design indicates enough room to place two additional 15,000 gallon tanks for a total fuel farm capacity of 97,000 gallons. This assumes that tanks oriented horizontally are placed. Should the tanks be oriented vertically, a capacity greater than 97,000 gallons could be realized without having to expand the fuel farm.

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TABLE 3.7
Forecasted Fuel Farm Facility Requirements by Planning Year For 15-day JetA and 10-day AvGas Supply

Planning Years	2000 Fuel Farm Capacity (gallons)	VATSP Forecast (% Capacity)	Regression Forecast (% Capacity)
0-5	82,000	48,200 (59%)	72,900 (89%)
6-10	82,000	51,800 (63%)	81,300 (99%)
11-15	82,000	55,600 (68%)	90,900 (110%)
16-20	82,000	62,500 (76%)	99,500 (121%)

Source:
Campbell and Paris Engineers, P.C. 2002

VATSP Forecast Facility Requirements

Applying the planning assumptions to the VATSP forecasts, the demand for fuel at the airport would increase to approximately 63,000 gallons by 2020 which is approximately 77-percent of the existing capacity of the fuel
farm (82,000 gallons). The 15-day demand for Jet A fuel for turbo-prop and turbo-jet aircraft is expected to total 33,400 gallons by 2020 which is 64-percent of capacity. The 10-day demand for AvGas fuel for single-engine, multi-engine and helicopter aircraft is expected to total approximately 29,000 gallons which is 97-percent of capacity. *It is recommended that an additional 15,000 gallon AvGas fuel tanks be placed at the fuel farm in the long-term(Years 16-20) period.*

Regression Forecast Facility Requirements

Applying the planning assumptions to the regression forecasts results in a higher demand for fuel facilities than the VATSP forecasts. By the end of the planning horizon, the demand for fuel could be 115-percent of available capacity in 2000. The 10-day demand for AvGas could total 46,000 gallons which is 153-percent of available capacity (+16,000 gallons) while the 15-day demand for JetA fuel could total 53,000 gallons which is 102-percent of available capacity (+1,000 gallons). Assuming no capacity increases, the demand for AvGas will exceed capacity somewhere in the short-term (Years 0-5). It is recommended that an additional 15,000 gallon AvGas tank be constructed in the short-term with an additional 15,000 gallon AvGas fuel tank and 12,000 gallon JetA fuel take being placed at the airport in the long-term (Years 16-20).

The forecasted demand for fuel resulting in an additional 42,000 gallons of capacity, the capacity of the existing fuel farm will need to be increased A detailed planning analysis should be conducted when the demand for fuel reaches 80-percent of the capacity of the existing fuel farm capacity.

3.5.5 Aircraft Parking and Tie-Down Apron Requirements

A certain segment of the based aircraft population will require paved apron tie-downs versus storing their aircraft in a hangar unit. In order to determine the required apron tie-downs, the following planning assumptions were made:

- 30-percent of based single-engine aircraft will require a paved tie-down
- 30-percent of based multi-engine aircraft will require a paved tie-down
- Each based aircraft requiring a paved tie-down will need 450-square yards of apron

VATSP Forecast Facility Requirements

Using the forecast of based aircraft presented in Section Two, the total tie-down space required for all based aircraft will total ±39,000-square yards by 2020. While only a small percentage of based aircraft will require a paved tie-down area, virtually all transient aircraft will require a tie-down since they are aircraft not based at the airport. Transient aircraft tie-down requirements were determined by the following planning assumptions:

- Transient aircraft will account for approximately 40-percent of average day operations during the peak month (equivalent to local versus itinerant operations mix);

- Total "transient" average day operations are divided by 2 to determine total number of transient aircraft;
- Approximately 85-percent of transient aircraft will require a tie-down;
- Transient aircraft fleet mix assumed to equal fleet mix of based aircraft;
- Transient single-engine/multi-engine aircraft will require 600 sy each for power-in/power-out
- Transient turbo-prop, turbo-jet and helicopters will require 1,750 sy each for power-in/power-out.

Based on these assumptions, the transient aircraft will require an additional ±76,000 square yards of apron for a total apron requirement of ±115,000 square yards by 2020 for both based and transient aircraft. Typical demand/capacity guidance from the FAA states that when demand for a particular facility reaches 60- to 80-percent of the capacity, then the planning and design of capacity enhancing projects should begin. To accommodate for seasonal peaks, unexpected growth in either based aircraft or transient activity at the airport, or to accommodate any potential t-hangar deficits; the apron demand/capacity ratio should not exceed 80-percent. With the forecasted based aircraft and operations presented in the VATSP and the application of the above mentioned planning assumptions, the apron demand/capacity ratio will exceed 80-percent sometime in the long-term planning period (Years 16-20).

Regression Forecast Facility Requirements

With a more aggressive forecast of based aircraft, the regression forecast facility requirements for apron space are higher than the VATSP forecasts. The transient demand for apron tie-downs is approximately the same since the regression and VATSP operations forecasts are similar. By the end of the planning horizon, the apron requirement for based and transient aircraft will total approximately 144,500 square yards which is approximately 6,500 square yards more than the apron available in 2000. With the forecasted based aircraft and operations presented in the regression analysis, the apron demand/capacity ratio will exceed 80-percent sometime in the short-term planning period (Years 0-5).

3.5.6 Property Acquisition

The airport has identified several parcels of land for potential property acquisition. Some of the property acquisition is proposed so that the airport can have fee simple ownership of property located in the Runway 34L runway protection zone (RPZ). The purchase of this property would have the additional benefit of providing potential fill material for safety area improvements associated with Runway 16L-34R. Additional parcels of land (approximately ±36 acres) are identified for acquisition as these properties are within the 65 Ldn established as part of the established Part 150 study for the airport. A third area of property acquisition is a ±15 acre parcel of land located to the east of Wakeman Drive. This parcel of land is identified for non-airside dependent development and for a potential Aircraft Rescue and Firefighting (ARFF) station (see **Section 3.4.3**).

3.5.7 Other Facility Requirements

The events of September 11, 2001 have placed additional importance on the security of not only commercial service airports, but also general aviation airports. The Federal Aviation Administration and the National Security Council have (as of the publication date of this report) not finalized any security requirements for general aviation facilities. While the final FAA guidance on security at general aviation airports will likely require both administrative/operational measures (e.g., badging of employees) and physical measures (i.e., secure aprons), many of the traditional corporate aviation airports throughout the country (i.e., Teterboro, Morristown, John Wayne, etc.) already implement FAR Part 107 level security measures prior to September 11. While this is not necessarily recommended for Manassas, there are several security measures that could be taken proactively in order to provide owners and operators of aircraft at the airport with a high level of security.

The security improvements recommended for Manassas Regional Airport include the provision of complete perimeter fencing with 3-strand barbed wire. As of 2001, the airport has approximately 13,500-linear feet of perimeter fencing. To completely enclose the airport with perimeter fencing would require an additional 9,000-linear feet. Another security improvement is having restricted access to aprons through the placement of card readers at each gate and the badging of airport personnel.

3.6 SURFACE TRANSPORTATION ACCESS

An important surface transportation issue surrounds the use (both existing and forecasted) and the potential reconstruction of Observation Road from Wakeman Drive to the Piper Lane intersection. This section of Observation Road, as shown in **Section 1.7.7**, has a high percentage of morning and afternoon peak hour traffic associated with VRE commuters and provides a good "short-cut" for these commuters. The Traffic Analysis Report (see **Appendix B**) forecasted the future traffic levels on Observation Road and other internal and external roadways in the immediate vicinity of the airport. This report concludes that traffic levels on Observation Road will total 3,260 trips by 2020, which is a 65-percent increase over 2001 traffic levels. The cumulative impact of additional commuters and local surface transportation improvements on the airport access roads is show in Figure 3-3. Observation Road is scheduled to be released to the public roadway system as a result of use of the road by non-airport users (i.e., VRE commuters) and the probability of not receiving FAA funds for projects associated with the road.

Other surface transportation projects recommended for the airport include extended Wakeman Drive south of Geneva Aviation to provide access to the proposed t-hangar and aircraft maintenance hangar located south of the East Apron. A portion of Observation Road, when reconstructed, is planned to be relocated near the VRE station to provide adequate space for the planned Freedom Museum and associated apron space. Additionally, Observation Road south of the intersection of Piper Lane is recommended to be relocated further east so that the road is placed outside of the FEMA floodway as defined through the 2001 FEMA coordination efforts. A portion (approximately 700 lf) of Observation Road near the existing ATCT is also planned to be realigned in the mid term (Years 6-10) to allow for the relocation/replacement of an existing 14,000-square foot hangar and the relocation of the ATCT further west.

3.7 SUMMARY OF FACILITY REQUIREMENTS BY PHASE

Table 3.8 presents a summary of the recommended facility requirements to meet the VATSP forecasts of aviation demand by planning phase. **Table 3.9** presents a summary of the recommended facility requirements to meet the regression forecasts of aviation demand by planning phase.

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TABLE 3.8

Summary of Facility Requirements by Planning Year - VATSP Forecasts

Facility Requirements	Short-Term (Years 0-5)	Mid-Term (Years 6-10)	Long-Term (Years 11-20)
T-hangar units	12 units	10 units	
Maintenance Hangar		10,000 sf	
General Aviation ARFF Facility	ARFF Facility		
Runway 16L-34R Extension	500-feet		
Installation of ODALS	Supplemental WCs	ODALS	
Fuel Farm			15,000 Gallon AvGas
Perimeter Fencing	9,000 LF		
Air Traffic Control Tower		Relocate	
Piper Lane		Realign	
Wakeman Drive			Realign
Observation Road	Reconstruct		
Freedom Museum/Dulles Aviation	Construct		
Runway Protection Zone	Runway 34L		
Obstruction Clearing	Runway 34 R		

Source:
Campbell and Paris Engineers, P.C. 2001

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TABLE 3.9

Summary of Facility Requirements by Planning Year - Regression Forecasts

Facility Requirements	Short-Term (Years 0-5)	Mid-Term (Years 6-10)	Long-Term (Years 11-20)
T-hangar units	95 units	15 units	21 units
Maintenance Hangar	20,000 sf		10,000 sf
General Aviation ARFF Facility	ARFF Facility		
Runway 16L-34R Extension	500-feet		
Approach Aids	Supplemental WCs	ODALS	
Fuel Farm	15,000 Gallon AvGas		15,000 Gallon AvGas 12,000 Gallon Jet A
Apron Expansion		7,000 sy	
Security Fencing	9,000 LF		
Air Traffic Control Tower		Relocate	
Piper Lane		Realign	
Wakeman Drive			Realign
Observation Road	Reconstruct		
Freedom Museum/Dulles Aviation	Construct		
Runway Protection Zone	Runway 34L		
Obstruction Clearing	Runway 34 R		

Source:

Figure 3-3: Forecasted Traffic by Road Segment

SECTION FOUR:

ENVIRONMENTAL OVERVIEW

An important consideration in the development of aviation facilities is the potential impact to the natural and social environment in the vicinity of the airport. The Federal Aviation Administration identifies 20 impact categories that are required to be analyzed for potential impact associated with airport development. These 20 impact categories are identified in FAA Order 5050.4a "Environmental Handbook" and are listed below:

- Noise
- Compatible Land Use
- Social Impacts
- Induced Socio-Economic Impacts
- Air Quality
- Water Quality
- Section 4(f)
- Historic, Architectural, Archeological and Cultural Resources
- Biotic Communities
- Endangered and Threatened Species of Flora and Fauna
- Wetlands
- Floodplains
- Coastal Zone Management Program
- Coastal Barriers
- Wild and Scenic Rivers
- Farmland
- Energy Supply and Natural Resources

- Light Emissions
- Solid Waste Impacts
- Construction Impacts

Significant environmental coordination efforts have been accomplished at the airport since the completion of the 1990 Airport Master Plan Update. The following environmental overview will capitalize on these coordination efforts as the proposed development plan at the airport does not substantially deviate from the proposed development plan contained in the 1990 Master Plan Update. It should be noted that it is not the intent of this section to update environmental information included in the 2001 Environmental Assessment for the airport. As such, no significant coordination efforts were undertaken with regulatory agencies. Rather, the purpose of this chapter is to present preliminary environmental information for those projects that are included on the Airport Layout Plan but were not originally identified in the 1990 Airport Master Plan Update. A majority of the projects included on the Airport Layout Plan are within the limits of study of the 2001 Environmental Assessment. Special emphasis in the planning of facilities identified on the ALP was placed on the objective to develop a plan that will enable the required facilities to be constructed without the need to encroach upon additional wetlands, flood plain and archaeological resources already identified in the EA.

4.1 PREVIOUS ENVIRONMENTAL STUDIES

Two significant pieces of the environmental coordination effort were the 2001 Federal Emergency Management Agency (FEMA) Conditional Letter of Map Revision (CLOMR) and Letter of Map Revision (LOMR) determinations and the issuance of a Finding of No Significant Impact (FONSI) for the 2001 Environmental Assessment at the airport.

4.1.1 2001 Environmental Assessment

On November 23, 2001, the FAA issued a Finding of No Significant Impact (FONSI) for the Environmental Assessment for Manassas Regional Airport. The EA was completed as part of the overall planning effort for the airport and included the following projects:

- East side apron/hangar facilities expansion (north and south of the terminal area)
- East side aviation use facility development (i.e., helicopter)
- Completion of terminal area buildout (i.e., expanded automobile parking)
- West side apron/hangar facilities expansion (both north and south of the ATCT) including Observation Road realignment
- Additional Exit Taxiway Development (Runway 16L-34R)
- Complete 500-foot wide Runway safety Area south of Broad Run for Runway 16L-34R (with no modifications to the existing bridge structure)
- Removal of Vegetative Obstructions to the Existing Runway 34R non-precision Approach
- East-West by-Pass Taxiway Development (north-end)
- Internal access road between east and west facilities.

The "approval envelope" for Manassas Regional Airport generally includes the projects located north of Broad Run (with the exception of the Runway Safety Area improvements).

4.1.2 FEMA Coordination

The FEMA coordination effort was initiated for two reasons: 1) The planned reconstruction/rehabilitation of Runway 16L-34R and the associated runway safety area improvements and 2) because development located south of Broad Run was not included in the FONSI issued by the FAA for the 2001 Environmental Assessment. On February 12, 2002 and February 13, 2002, FEMA issued a CLOMR and LOMR respectively. The CLOMR and the LOMR issued by FEMA were based on updated hydraulic modeling using more detailed topographic information, site conditions (i.e., cul-de-sac of Observation Road near the southwest t-hangars), using a "split flow" modeling technique and corrected modeling of the taxiway and runway bridges associated with Runway 16L-34R. The following development items were included in the hydraulic modeling:

- ✈ All development items included in the 2001 Environmental Assessment
- ✈ Providing full Group III Taxiway Safety Areas (118-feet) for Taxiway Bravo - including the taxiway bridge over Broad Run
- ✈ Providing full Group III Runway Safety Areas (500-feet) for Runway 16L-34R, including the runway bridge over Broad Run
- ✈ Provide a 1,000-foot extension to Runway 16L-34R and Taxiway Bravo using full Group III design standards
- ✈ Construct a "southwest" partial parallel taxiway to Runway 16L-34R from existing Taxiway Kilo to ultimate threshold for Runway 34R.

The results of the hydraulic modeling concluded that minor changes to the published Base Flood Elevation (BFEs) for Broad Run would result from the proposed development (less than 3-feet). While some changes to the base flood elevations resulted from the FEMA study, no significant changes to the floodway as a result of the depicted development are expected. The FEMA study also found that if a ridge near Runway 34R south of Broad Run were lowered by several feet then the anticipated increase in the BFEs could be reduced or eliminated.

Because of the split-flow modeling, a side channel is depicted on the revised Flood Insurance Rate Map (FIRM). The side channel is located between Runway 16L-34R and Bristow Road to the west of the airport (approximately on the extended runway centerline of Runway 16R). This side channel parallels Runway 16L-34R and results from the limited ability of the runway and taxiway bridge culverts to accommodate floodwater. As floodwater "builds up" against the runway culvert, some water would use the side channel and eventually would "reconnect" with the Broad Run floodway.

While the FEMA analysis indicated no significant impacts to BFEs or the floodway associated with Broad Run as a result of the development included in the hydraulic model; additional local, state and federal environmental coordination will be required before development could occur for those development items not included in the 2001 FONSI.

4.1.3 Form "C" Environmental Coordination

The Environmental Evaluation Form "C" completed as part of the Route 234/Clover Hill/Wakeman Drive connection is based upon the guidance in Federal Aviation Administration (FAA) Order 5050.4A, "Airport Environmental Handbook". The project entails the construction of a 48-foot wide roadway (with a 110-foot wide right-of-way) connecting Wakeman Drive to the newly completed Route 234 Bypass. This connection has been planned for over 10 years and has been included in local comprehensive plans and the approved 1990 Airport Layout Plan. Additionally, this connection was included in the Master Plan Development Program included in the 2001 Environmental Assessment which received a FONSI from the FAA in November 2001. Although the project is county sponsored (no FAA or DOAV funds were used for the project) and actual construction on airport property will only encompass ±0.24-acres of previously disturbed land directly adjacent to Wakeman Drive, the FAA determined the project to be a "Federal Action." The resultant ALP update/change would then be required to have an acceptable federal environmental Finding as to any potential environmental impacts before the FAA could approve the connection of the road to airport property.

Generally, a Form C is to be used when a project cannot be categorically excluded (CATEX) from a formal environmental assessment, but when the environmental impacts of the proposed projects are expected to be minimal and a detailed EA would not be appropriate. Therefore, a Form C could be considered a "short EA" and satisfy the regulatory requirements of an EA. The proper completion of a Form C provides the FAA with enough information to determine whether a short EA will suffice or whether a detailed EA must be prepared. The FAA normally intends to use a Form C to support a Finding of No Significant Impact (FONSI).

Overall, the findings of the Form C Environmental Assessment suggest that no significant impacts are anticipated on airport property. While the project will impact some sensitive areas, all of these areas are located outside of the airport and City property. The pertinent findings of the Form C Environmental Assessment have been included in some of the sections of this Environmental Overview.

4.2 FAA IMPACT CATEGORIES

4.2.1 Noise

The City of Manassas has strived to minimize the amount of incompatible land-uses in the vicinity of the airport through pro-active planning. Evidence of this effort by the City is seen with the prevailance of industrial zoning to the north and east of the airport. The enactment of an Airport Overlay Protection District by the City of Manassas, the adoption of the FAR Part 150 Study in November 1994, pursuit of the recommended property acquisitions (±115 acres) and the cooperation of the County with their Comprehensive Plan goals and Safety Overlay District requirements, clearly demonstrate the City's intent and desire to maintain and promote compatible land uses within the vicinity of the airport. Through similar proactive planning and mitigation, the City/County and airport can continue to work together to maintain land use compatibility in the future.

As part of the 2001 Environmental Assessment, the noise contours generated in the 1994 Part 150 Study were re-examined in light of changing fleet mix and operations at the airport. When the Part 150 Study was conducted, no major changes were expected at the airport for the next five years, however, the study did consider a growth in business jet activity for the forecast period.

The most interesting result was the 1,000-foot runway extension actually showed no real change in the noise contours when compared to the noise contours prepared for the existing runway length. This is because takeoffs are louder than landings at Manassas and with the extended runway, the aircraft will have additional travel distance before they reach the residential areas. This additional distance will allow the aircraft to climb higher thus actually reducing the noise in some areas.

Since the noise contours were originally developed as part of the 1994 Part 150 study, it is recommended that updated noise contours be prepared as part of any future environmental coordination efforts associated with the proposed 500-foot extension to Runway 16L-34R.

4.2.2 Compatible Land Use

Both the City of Manassas and Prince William County have adopted Airport Impact Overlay Districts for parcels located under the established FAR Part 77 Surfaces. Coordination between the airport and the City and County governments will be required so that any change in the Part 77 surfaces would be reflected in the ordinances. With the establishment of these overlay districts, the City and County have implemented land-use controls for property located in the district. These overlay districts control both the type and height of development in the districts.

Additional environmental coordination resulting from the Form C Environmental Assessment concluded that the Route 234 Connection would not have any impacts on compatible land use in the vicinity of the airport. The Form C concluded that the proposed Route 234 Connection will not lead to any disruption of communities and will have no impact on any residences or businesses. Other than the impacts to the seven acres of forested land, there are no anticipated impacts to any of the area's natural resources. Furthermore, the project will not create any wildlife attractants on or near airport property.

4.2.3 Social Impacts

Aviation developments affects not only the environment but also the human surroundings. The principal social impacts considered with airport proposed actions include: relocation of residences and businesses; alteration of surface transportation patterns; disruption of established communities or planned developments; and significant changes in employment. The 2001 Environmental Assessment addressed the potential social impacts related to the development of aviation facilities a the airport.

The airport has completed the acquisition of the approximately 115 acres of property south of Broad Run that was identified in the 1994 Part 150 Study. Future property acquisition at the airport will be related to the purchasing in fee simple ownership land located within the sections of RPZs that are located off airport property. Alterations to surface transportation patterns will be limited to on-airport roadways (primarily the release of Observation Road to the public roadway system). The 2001 Environmental Assessment concluded that the projections of automobile traffic could be accommodated by the roads surrounding Manassas Regional Airport up to 2010. The recently completed Route 234 Bypass added a significant amount of capacity to accommodate surface transportation.

Additional environmental coordination resulting from the Form C Environmental Assessment concluded that the Route 234 Connection would actually improve traffic circulation in and around the airport. The proposed project would not result in the relocation of any businesses, homes or prime agricultural lands caused by this project. A more direct and efficient circulation of airport user automobile traffic would be provided which could reduce potential traffic delays. The 2001 Traffic Study prepared in conjunction with this report indicated that as much as 64-percent of automobile traffic using the connection would be non-airport user (i.e., commuter) traffic. The new bypass would also improve emergency vehicle access and response times to the airport.

4.2.4 Induced Socio-Economic Impacts

Increased airport activities are expected to require support facilities, product suppliers, and secondary/induced economic activity such as restaurants, offices, and warehouses etc. This increased activity could generate additional job opportunities in the region by the year 2015. Therefore, the proposed airport improvements are expected to create additional economic opportunities for the region.

4.2.5 Air Quality

The Draft 1997 Environmental Assessment included a 1,000-foot runway extension at the airport. Coordination with the Air Division of the Virginia Department of Environmental Quality, concluded with the determination by the DEQ that proposed development was in compliance with the General Conformity Rule for potential emissions and that little or no impact to air quality would occur as a result of the airport development program depicted in the Draft 1997 EA.

The DEQ reconfirmed their previous findings during the 2001 Coastal Zone Management Consistency Determination completed for the 2001 Environmental Assessment. As the proposed 500-foot runway extension is less than the 1,000 foot runway extension originally proposed in the 1997 EA, further detailed study of ambient air quality impact is not expected to be required.

4.2.6 Water Quality

The 2001 Environmental Assessment concluded that the proposed improvements at Manassas Regional Airport should not adversely impact water quality in the area. Construction methods will comply with Virginia Erosion and Sediment Control regulations to minimize erosion and siltation; and all design plans will be reviewed by local authorities. Trimming/topping of trees in the Broad Run Resource Protection Areas (RPAs) will reduce impacts to those regions protected by the Chesapeake Bay Local Assistance Department (CBLAD). After trimming/topping of trees in the RPAs is completed, ground cover will be replaced with compatible (i.e., low-growing and similar water filtration qualities as the trees) vegetation to insure that water quality is not degraded.

4.2.7 Section 4(f)

The 2001 Environmental Assessment had a finding of no impact on the parks, wildlife and historical sites in the area due to the proposed construction. As the proposed development plan depicted on the Airport Layout Plan is with the development envelope established in the 2001 Environmental Assessment, impacts to Section 4(f) lands are not expected.

The extension of Runway 16L-34R and the taxiway system (including safety areas and RPZ) will be constructed on airport-owned land. The land associated with the safety areas has previously been improved (i.e. graded) for the existing runway and taxiway while the RPZ is protected by the properties acquired through the Part 150 land acquisition process. As a result, the likelihood of Section 4(f) lands being impacted due to the extension of the runway and taxiway is minimal.

4.2.8 Historic, Architectural, Archeological and Cultural Resources

An Archaeological survey was completed on the airport site in 1994. Phase I of this survey recommended some further research on one of the potential archaeological sites next to the helicopter facilities on the West Complex. By reconfiguring the proposed facility, as shown on the 1990 ALP, impact to the historic resource (44PW729) will be avoided.

While the recommended use of this area as a helicopter facility has been changed to a planned use for hangar and air traffic control by the ALP Update; the impact to the identified historical property will be avoided. The limits of the planned area for an air traffic control tower and hangar building respected the original limits of the helicopter facility.

A phase-I Archaeological Survey conducted in support of additional environmental coordination for the Route 234 Connection concluded that no historically or culturally significant resources were within the project area. The Virginia Department of Historic Resources and the VMNH supported this finding. There are no anticipated impacts on any natural history resources within the project area.

4.2.9 Biotic Communities

The 2001 Environmental Assessment concluded that the proposed improvements will not involve any publicly owned wildlife or waterfowl refuge of local, state or national significance. A mussel survey was conducted to ensure that no living specimens of *Alasmidonta varicosa*, a state endangered species, were found in the area. The study confirmed that the area did not have any living specimen of this species of mussels.

A complete wetland delineation was completed for the airport property. Including the long term potential (runway, taxiway extension and additional crossing of Broad Run) a total impact of less than 0.02 acres is expected. Therefore, no impacts to state or federal listed endangered species habitats are expected due to the proposed improvement projects.

4.2.10 Endangered and Threatened Species of Flora and Fauna

The 2001 Environmental Assessment included coordination efforts with the Department of Games and Inland Fisheries. According to the Department of Games and Inland Fisheries no impact is expected on any federally listed species due to the proposed improvements. It was recommended that strict erosion and sediment control measures be taken to minimize impact to the overall stream habitat and water quality of Broad Run at and below airport property.

4.2.11 Wetlands

Minimal wetland loss(less than one acre) is expected due to the proposed improvements approved in the 2001 FONSI. As none of this impact is expected within the next five years, the EA did not suggest the establishment of a wetland mitigation program at this time. Any development beyond Phase One (Years 0-5) would require a new assessment using rules that are in place at that time. Appropriate mitigation measures would then be required for project specific impacts. Agency coordination efforts during the 2001 EA required a jurisdictional determination of wetlands at the airport. The previous JD from the USCOE was re-issued in June 2001 for wetlands on both sides of Broad Run and expires in June 2006. The five-year development program included in the EA does result in a small impact to a wetland associated with the outfall from a drainage pipe near the proposed West FBO Apron Expansion. Because of the unavoidable impact and the size of the wetland (approximately 0.02-acres), the USCOE has indicated that the wetland is eligible for a nationwide permit.

Additional environmental coordination resulting from the Form C Environmental Assessment concluded that the Route 234 Connection identified some wetland impact off airport property. The USCOE has indicated that 0.35 acres of wetlands and 914lf of streambed would be impacted by the roadway connection. No wetlands on the airport property will be impacted.

4.2.12 Floodplains

Since the publication of the 2001 Environmental Assessment, FEMA has issued a Conditional Letter of Map Revision (CLOMR) for the proposed development items outlined in **Section 4.1.2.** The extensive environmental coordination efforts associated with the FEMA study concluded that the ultimate buildout of the airport (including a 6,700-foot Runway 16L-34R and full runway and taxiway safety areas including the bridges) would not significantly impact the established floodplain or floodway for Broad Run.

Additional environmental coordination resulting from the Form C Environmental Assessment concluded that the Route 234 Connection would be located inside both the 100-year and 500-year floodplains. Construction will take place in the 100-year floodplains associated with both Cannon Branch and Broad Run. However, considering the planned finished elevations and the drainage systems considered in the roadway design, this project should have no adverse impact on the floodplains. Additionally, the proposed project will be located in the 500-year floodplain (as designated by FEMA), however this project is not considered a “critical action”.

4.2.13 Coastal Zone Management Program

Prince William County is a participant in the Virginia Coastal Resources Management Program (VCP). As a participant, all federal activities or federally licensed and permitted activities within Prince William County must be constructed in a manner consistent with the VCP. The program is a network that incorporates state permits and regulations as the enforceable policies of the program. The nine regulatory programs comprising the VCP are as follows: Fisheries Management; Subaqueous Lands Management; Wetlands Management; Dunes Management; Non-Point Source Pollution control; Point Source Pollution Control; Shoreline Sanitation; Air Pollution Control and Coastal Lands Management. Coordination with all these pertinent agencies was completed in 1997 EA and re-validated during the 2001 DEQ Consistency Certification review for the 2001 Environmental Assessment. Since the VCP

has no unique requirements of its own, and the project will comply with all of the permitting and programs included in the coastal program, there are no expected adverse impacts to any coastal zones.

Additional environmental coordination resulting from the Form C Environmental Assessment concluded that the Route 234 Connection would occur in the limits of Virginia Coastal Resources Management Program (VCP). The issuance of local and state development permits should ensure that the project will meet all the requirements of the VCP.

4.2.14 Coastal Barriers

The 2001 Environmental Assessment concluded that, based on the location of the airport, there are no coastal barrier impacts created by the proposed improvements of the facility.

4.2.15 Wild and Scenic Rivers

The 2001 Environmental Assessment concluded that, based on inspection of the USGS maps and guidance from the Commonwealth of Virginia's Department of Conservation and Recreation, the proposed improvements will not impact any streams on the National Park Service Nationwide Inventory, potential State Scenic Rivers or existing or potential State Scenic Byways.

4.2.16 Farmland

The 2001 Environmental Assessment included coordination with Prince William County Soil and Water Conservation Office. According to the wetland delineation and discussion with local Prince William Soil and Water Conservation office, five different types of prime farmland soil types maybe impacted by these proposed improvements. However, since the land is zoned for light industrial purposes, the Farmland Protection Policy Act (FPPA) has no jurisdiction. Therefore, no conversion or loss of prime farmland will occur due to the proposed improvements.

4.1.17 Energy Supply and Natural Resources

The current energy supply for the airport is handled by the City of Manassas. The 2001 Environmental Assessment concluded that, although the proposed improvements will lead to additional energy usage, the current power source is expected to be able to handle the additional demand. No changes in primary power supplies are anticipated and no adverse impacts to energy supplies or natural resources are foreseen.

4.2.18 Light Emissions

The 2001 Environmental Assessment concluded that new light emissions would be associated with the installation of a High Intensity Runway Lighting system for the extended runway 34R and accompanying taxiway. Although, the runway will easily be visible to approaching aircraft, the low elevation of the edge lights along with the natural buffer provided by the Broad Run corridor will make the additional lights almost indiscernible to the neighbors.

The proposed Omni-Directional Approach Lighting System (ODALS) for Runway 34R were not included in the 2001 Environmental Assessment, and as such, would need to be included in a future environmental analysis. However, with the airport owning property on the south side of Broad Run

(completed as part of the Part 150 land acquisition process), the impacts to residential areas are anticipated to be minimal.

4.2.19 Solid Waste Impacts

The 2001 Environmental Assessment concluded that no solid waste impacts are anticipated as a result of the proposed improvements to the airport. No landfills are located in the vicinity of the airport, however, future environmental analysis would need to study the wetland bank constructed southeast of the terminal building (north of Runway 16L-34R) as well as any other potential wetland banks proposed for the area.

4.2.20 Construction Impacts

Strict adherence to the strategies identified in the Virginia Erosion and Sediment Control Handbook will effectively minimize temporary impacts on the air, water and community environment during construction. The preliminary design does not identify any other environmental consequences due to construction activisties.

4.3 CONCLUSION

With the review envelope of the 2001 Environmental Assessment examining development north of Broad Run, certain development items shown on the ALP will require further environmental review and coordination with the FAA. Coordination with the FAA may identify development items on the ALP that could be considered categorically excluded by the FAA.

Specific projects that will require further environment review and coordination include:

- Proposed 500-foot extension to Runway 16L-34R
- Approach Lighting System for Runway 34R
- Localizer relocation onto extended centerline of Runway 16L.
- Development of facilities north of Wakeman Drive and south of Cannon Branch
- Relocation of Observation Road and Wakemen Drive
- Acquisition of land south of Broad Run in the West Complex

SECTION FIVE:

AIRPORT LAYOUT PLAN DRAWINGS

SECTION SIX:

SCHEDULES AND COST ESTIMATES

6.1 PROJECT DEVELOPMENT COSTS AND POTENTIAL FUNDING ALLOCATION

Project costs estimates using typical unit price data for similar construction have been prepared for each of the major facility requirements by phase as described in Section Three. The categorical detail presented in **Table 6.1** through **Table 6.6** present an indexing of the identified development

items and preliminary cost estimates. When demand warrants further refinement of the preliminary plan, more detailed and thorough cost estimates should be prepared.

Based on the total estimated development costs and analysis as to AIP eligibility, a potential funding allocation (i.e., FAA, DOAV, City of Manassas and others) is presented in **Table 6.2, Table 6.4** and **Table 6.6** for each phase of development assuming a maximum AIP funding of 90-percent throughout the 20-year planning horizon. Where only a portion of a proposed development item is considered eligible for AIP funding and DOAV funding, potential funding levels were estimated based on previous experience in receiving funding from these agencies.

The planned development at Manassas Regional Airport is clustered around three distinct items throughout the 20-year planning horizon: 1) hangar development, 2) support facilities and 3) surface transportation. With a well-developed airfield and taxiway system in place at the airport, development over the next twenty years includes significant landside development with a few major airside developments. The continued development of hangar facilities and the requisite aprons will facilitate the airport in accommodating the forecasted demand for aviation facilities. With the airport having already (as of Summer 2002) eclipsed the 20-year forecasted based general aviation aircraft reported in the Draft VATSP Update, the need for additional facilities beyond those called for in the VATSP is apparent. Because of this inconsistency with the published VATSP forecasts, coupled with specific inquiries into major facilities at the airport, the schedules and cost estimates have been developed to accommodate demand greater than that solely anticipated in the VATSP Update.

The largest phase of development is planned to be Phase III with Phases I and II accounting for approximately 30-percent of development costs each. Because of the magnitude of hangar and associated apron development (which are not typically included under federal or state grants), a decision has to be made by the sponsor and City to fund the development with City funds or enter into a public/private partnership. This funding decision is best made under the auspices of a Business Plan for the airport, which, as of Spring 2002, the airport is in the process of drafting. With this in mind, the total combined funding sources over the 20-year development plan is anticipated to be approximately 50-percent Federal, 14- percent State, 8- percent City and 28-percent public/private partnership.

6.1.1 Phase I (Years 0-5) Development Items

The reconstruction of Runway 16L-34R and the construction of new acute angle exit taxiways is, as of Summer 2002, in the final design stage and construction is expected to start in Fall 2002. Additional projects
scheduled for Phase I could be constructed in the earlier stage of Phase I development. The corporate hangar development on the Northeast Corporate Apron and the Northwest Corporate Apron area are two major Phase I (Years 0-5) development items in the advanced planning stage (see **Sheet 3** of the ALP set in **Section 5**). Table 6.1 summarizes the projects and quantities identified for Phase I development.

Total development costs for the items included in Phase I (Years 0-5) are expected to total approximately $21.9 million. Two projects in Phase I have substantial building elements included in

their costs (Northeast Corporate Apron Development (3 buildings) and West Complex FBO Hangar Relocation/Redevelopment (1 building)). Generally, costs associated with revenue generating building elements are not eligible for federal or state funding. Because of this, it is recommended that the City explore the possibility of using low-interest economic development loans through programs such as the Virginia Resource Agency (VRA) and IDA to help offset the lack of federal and state funding. Another alternative is potentially entering into a public/private partnership participate in some of the building elements.

The budgeted costs associated with the localizer relocation is based on several assumptions. First, the localizer would have to be built upon an embankment that would require approximately 80,000 cubic yards of fill to satisfy grading requirements for the localizer critical area. An alternative that would lower the cost estimate would be to place the localizer antenna array and shed on an elevated platform. Second, the localizer equipment and installation would not involve funding from FAA Airways and Facilities. Third, the requisite construction of an access road and electronic shelter for sensitive localizer equipment.

Should the City pursue a public/private partnership development to offset the federal, state and city share of development costs, the anticipated federal and state share in Phase I is approximately $13.0 million (59-percent) and $2.9 million (13-percent) respectively. With a total public/private partnership share of development costs totaling approximately $5.0 million (22-percent), the City share would total $2.4 million (11-percent) of the estimated Phase I development cost (see Table 6.2).

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TABLE 6.1

Development Items Identified for Phase I Construction

Project Number	Project	Quantity
I-1	Runway 16L-34R Exit Taxiway Construction	12,300 sy
I-2	Runway 16L-34R Extension	500-feet

I-3	T-Hangar Development	36 units
I-4	East Apron Expansion	35,000 sy
I-5	Northeast Corporate Hangar Development	38,500 sf
I-6	Northeast Corporate Apron Expansion	9,400 sy
I-7	Construction of Internal Connector Road	4,500 lf
I-8	Realignment of Observation Road	4,100 lf
I-9	West Complex FBO Relocation/Development	14,400 sf
I-10	West Apron Expansion	3,700 sy
I-11	Southwest Corporate Hangar Development	7 units
I-12	Southwest Apron Expansion	8,550 sy
I-13	Perimeter Fencing	26,400 lf
I-14	Localizer Relocation/Construction	1 localizer
I-15	Supplemental Windcones	4 windcones
I-16	Fuel farm expansion	12,000 gallon

Source:
Campbell and Paris Engineers, P.C. 2002

sy = square yards
sf = square feet
lf = linear feet

TABLE 6.2

Estimated Development Costs for Items Identified for Phase I Construction

Project Number(s) From Table 6.1	Project	Estimated Cost	Federal Share	State Share	Local Share	Other*
I-2	Runway 16L-34R Extension (500')	$3,600,000	$4,680,000	$416,000	$104,000	$0
I-4, I-3	East Apron Expansion and T-Hangars	$4,900,000	$2,800,000	$250,000	$1,750,000	$0

~~I-5, I-6~~	~~Northeast Corporate - Apron Expansion~~	~~$3,500,000~~	~~$0~~	~~$0~~	~~$0~~	~~$3,500,000~~
I-7	Internal Connector Road	$1,250,000	$0	$1,000,000	$250,000	$0
I-8	Realignment of Observation Road	$2,200,000	$1,980,000	$176,000	$44,000	$0
I-10	West Apron Expansion	$1,500,000	$810,000	$72,000	$18,000	$600,000
I-12	Southwest Apron Expansion	$1,700,000	$0	$640,000	$160,000	$900,000
I-14	Localizer Relocation	$650,000	$585,000	$52,000	$13,000	$0
---	Routine Maintenance	$75,000	$67,500	$6,000	$1,500	$0
I-13	Perimeter Fencing	$1,800,000	$1,620,000	$144,000	$36,000	$0
I-15	Supplemental Windcones	$40,000	$0	$32,000	$8,000	$0
I-16	Fuel Farm - 12,000 AvGAS	$180,000	$0	$0	$180,000	$0
---	Runway 34R Obstruction Removal	$370,000	$333,000	$29,600	$7,400	$0
---	Environmental Assessment	$200,000	$180,000	$16,000	$4,000	$0
	TOTAL PHASE ONE	$21,965,000	$13,055,500	$2,833,600	$2,575,900	$5,000,000

Source:
Campbell and Paris Engineers, P.C. 2002

*Other is considered as public/private partnership development

6.1.2 Phase II (Years 6-10) Development Items

Development items identified for construction in Phase II (Years 6-10) at Manassas Regional Airport include a continuation in the development of aprons, t-hangars and corporate hangars. Additional airport support facility development includes a new Air Traffic Control Tower (ATCT) in the West Complex and an Index 1 ARFF facility in the East Complex. Surface transportation related projects are continued from Phase I as a portion of Observation Road in the West Complex is realigned to support the planned West Apron expansion and ATCT relocation.

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TABLE 6.3
Development Items Identified for Phase II Construction

Project Number	Project	Quantity
II-1	East Apron T-Hangar Development	30 units

II-2	East Apron Expansion	13,300 sy
II-3	Business Aviation Terminal Parking Expansion	113 spaces
II-4	Airport Business Park Development	15,000 sf
II-5	ARFF Facility	4.6 acres
II-6	Northeast Corporate Apron Expansion	2,600 sy
II-7	Freedom Museum Development	7.5 acres
II-8	Northwest Corporate Apron Development	30,000 sy
II-9	Realignment of Observation Road	700 lf
II-10	West Apron Expansion	14,500 sy
II-11	West Apron Corporate Hangar Development	24,000 sf
II-12	ATCT Relocation and Support Facilities	32,000 sf
II-13	Southwest T-Hangar Development	24 units
II-14	Extension of Wakeman Drive South of Geneva Aviation	765 lf
II-15	West Complex Aviation School Development	14,000 sf
II-16	West Complex FBO Apron Expansion	7,100 sy
II-17	West Complex FBO Hangar Redevelopment	18,000 sf
II-18	Perimeter Fencing	2,300 lf
II-19	ODALS - Runway 34R	5 light unit
II-20	West Complex FBO Automobile Parking Reconstruction	91 spaces

Source:
Campbell and Paris Engineers, P.C. 2002

sy = square yards
sf = square feet
lf = linear feet

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TABLE 6.4
Estimated Development Costs for Items Identified for Phase II Construction

Project	Project	Estimated	Federal	State	Local	Other*

Number(s) From Table 6.3		Cost	Share	Share	Share	
II-1, II-2	East Apron Expansion and T-Hangars	$3,300,000	$0	$1,640,000	$1,660,000	$0
II-3	Business Aviation Terminal Parking Expansion	$800,000	$0	$640,000	$160,000	$0
II-6	Northeast Corporate Apron Expansion	$2,100,000	$0	$0	$0	$2,100,000
II-7	Northwest Corporate Apron Development	$2,450,000	$2,205,000	$196,000	$49,000	$0
II-9	Realignment of Observation Road	$500,000	$450,000	$40,000	$10,000	$0
II-10, II-11	West Apron Expansion and Corporate Hangar Development	$4,400,000	$2,550,000	$240,000	$60,000	$1,650,000
II-12	ATCT Relocation and Support Facilities	$900,000	$810,000	$72,000	$18,000	$0
II-13	Southwest T-Hangar Development	$2,100,000	$0	$1,025,000	$1,075,000	$0
II-14	Extension of Wakemen Drive South of Geneva Aviation	$1,000,000	$900,000	$80,000	$20,000	$0
II-16, II-17	West Complex FBO Apron Expansion and Hangar Redevelopment	$2,700,000	$1,565,000	$140,000	$40,000	$955,000
---	Master Plan Update	$200,000	$180,000	$16,000	$4,000	$0
II-5	ARFF Facility	$1,500,000	$0	$1,200,000	$300,000	$0
---	Routine Maintenance	$75,000	$67,500	$6,000	$1,500	$0
II-18	Perimeter Fencing	$350,000	$315,000	$28,000	$7,000	$0
II-19	ODALS	$300,000	$270,000	$24,000	$6,000	$0
---	Part 150 Noise Study Update	$150,000	$135,000	$12,000	$3,000	$0
	TOTAL PHASE TWO	$22,825,000	$9,447,500	$5,359,000	$3,413,500	$4,705,000

Source:
Campbell and Paris Engineers, P.C. 2002

*Other is considered as public/private partnership development

Total development costs for the items included in Phase II (Years 6-10) are expected to total approximately $22.5 million. Similar to Phase I development items, three development items in Phase II have substantial building elements included in the cost. Development associated with the Colgan Apron Expansion (1 building), West Apron Expansion (2 buildings) and the Dulles Aviation Apron Expansion (1 building) are expected to total approximately $9.2 million with approximately $4.7 million in public/private partnership development. The federal and state share of the estimated development cost in Phase II is approximately $9.2 million (41-percent) and $5.3 million (24-percent) respectively. With an additional $4.7 million (21-percent) in public/private partnership development, the estimated City is approximately $3.4 million (15-percent) of the Phase II development cost (see **Table 6.4**).

The cost associated with the relocation of the ATCT does not include any costs associated with the construction of the tower. The cost include site preparation and the development of an automobile parking facility. The Freedom Museum Apron Development does not include any building elements as the building is planned to be constructed by a third-party in a build/lease-back structure.

6.1.3 Phase III (Years 11-20) Development Items

Similar to the first two phases of development, the third phase of development at the airport includes the development of aprons, t-hangars and corporate hangars. Surface transportation projects will continue to be a major item of development as the realignment of Wakeman Drive near the Aurora hangar will provide additional airside development space. A 2,500-foot partial parallel taxiway to Runway 16L-34R is planned for construction that will provide additional taxiway capacity and eliminate the need for aircraft to cross Runway 16L-34R to gain access to the threshold of Runway 34R.

Total development costs for the items included in Phase III (Years 11-20) are expected to total approximately $30.6 million. The largest share (approximately $15.9 million) of the total development cost is the planned midfield aircraft maintenance apron and hangar development. This planned development includes 46,000 square yards of apron and 163,000 square feet of hangar space. Federal and state participation could be expected for certain common use airfield elements (i.e., taxilanes etc. .) but not to the exclusive use facilities (i.e, areas under lease hold). With this in mind, the anticipated federal share is approximately $6.5 million, state share approximately $580,000, City share approximately $150,000 and public/private partnership share development cost in Phase III is $15.5 million (51-percent) and $2.4 million (7-percent) respectively. With an additional $12.1 million (41-percent) in public/private partnership development, the estimated City share is approximately $600,000 (2-percent) of the Phase III development cost (see **Table 6.6**).

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TABLE 6.5

Development Items Identified for Phase III Construction

Project Number	Project	Quantity
III-1	East Apron Expansion	46,000 sy
III-2	Aircraft Maintenance Hangar	163,000 sf
III-3	Business Aviation Terminal Parking Expansion	228 spaces
III-4	Northeast Corporate Hangar Development	15,000 sf
III-6	West Apron Expansion	24,000 sy
III-7	Phase III West Apron Corporate Hangar Development	54,000 sf
III-8	Taxiway Lima Construction	2,500 lf
III-9	Extension of Wakeman Drive South of Geneva Aviation	1,200 lf
III-10	Realignment of Wakeman Drive North of Aurora	2,200 lf
III-11	By-Pass Taxiway Construction between Runway 16L and Runway 16R	650 lf
III-12	Fuel Farm Expansion	27,000 gallons
III-13	West Apron Corporate Hangar Automobile Parking	175 spaces

Source:
Campbell and Paris Engineers, P.C. 2002

sy = square yards
sf = square feet
lf = linear feet

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TABLE 6.6

Estimated Development Costs for Items Identified for Phase III Construction

Project	Project	Estimated	Federal	State	Local	Other*

Number(s) From Table 6.5		Cost	Share	Share	Share	
III-3	Business Aviation Terminal Parking Expansion	$950,000	$0	$760,000	$190,000	$0
III-1, III-2	Aircraft Maintenance Apron and Hangar	$15,900,000	$6,500,000	$580,000	$150,000	$8,670,000
III-4	Northeast Corporate Hangar Development	$2,100,000	$1,000,000	$90,000	$30,000	$980,000
III-6, III-7, III-13	West Apron, Hangar and Parking Development	$6,500,000	$3,700,000	$330,000	$70,000	$2,400,000
III-8	Taxiway Lima Construction	$2,900,000	$2,610,000	$232,000	$58,000	$0
III-11	By-Pass Taxiway Construction	$800,000	$720,000	$64,000	$16,000	$0
III-9	Extension of Wakeman Drive South of Geneva Aviation	$600,000	$540,000	$48,000	$12,000	$0
III-12	Fuel Farm Expansion	$350,000	$0	$0	$350,000	$0
---	Master Plan Update	$200,000	$180,000	$16,000	$4,000	$0
---	Environmental Assessment	$200,000	$180,000	$16,000	$4,000	$0
---	Routine Maintenance	$100,000	$90,000	$8,000	$2,000	$0
	TOTAL PHASE THREE	$30,600,000	$15,520,000	$2,144,000	$886,000	$12,050,000

Source:
Campbell and Paris Engineers, P.C. 2002

*Other is considered as public/private partnership development

6.2 CONCLUSION

While the total development cost for the 20-year development plan at Manassas Regional Airport is estimated at $75.1 million, a considerable amount (30%) of development costs are associated with revenue generating development. This results in a good portion of the development costs associated with the preferred development plan coming from either public and private or purely private financing vehicles. Typically the FAA does not participate in any revenue generating projects or any landside improvements associated with airport development. It is recommended that the airport take advantage of any private financing vehicles for the continued development of the airport.

A sound business plan for the airport would need to be updated to assess the cost-benefit of developing non-AIP eligible projects with City funds or entering a public/private partnership. Regardless of the funding strategy employed, the substantial amount of public and private financing requires that all parties involved in the management and development of the airport understand the

economic importance of the airport to the region. Additional jobs, added regional income, and the provision of adequate transportation facilities for both businesses and tourists allow the region to prosper economically. Without the presence of the airport, businesses in the Manassas region would have to find alternative means for corporate travel. The continued provision of business/general aviation facilities in both the East and West Complexes will allow the airport to serve the Manassas region well into the 21st century.

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TABLE 6.7

Total Estimated Development Costs for Phases I, II and III

Phase	Estimated Cost	Federal Share	State Share	Local Share	Other*
Phase I	$21,965,000	$13,055,500	$2,833,600	$2,575,900	$5,000,000
Phase II	$22,625,000	$9,177,500	$5,335,000	$3,407,500	$4,705,000
Phase III	$30,600,000	$15,520,000	$2,144,000	$886,000	$12,050,000
TOTAL	$75,190,000	$37,753,000	$10,312,600	$6,869,400	$21,755,000

Source:
Campbell and Paris Engineers, P.C. 2002

*Other is considered as public/private partnership development