SECTION 2
AVIATION DEMAND FORECASTS

2.0 INTRODUCTION

Aviation demand forecasts serve as a basis for determining the type, size, and timing of airport facilities that will be required to accommodate future Airport operations. Consistent with airport planning practices, forecasts are presented for 5-, 10- and 20-year intervals. The forecasts for DMW were derived from previous forecasts prepared for recent environmental documents, as well as a review of fuel sales at DMW. Other factors affecting aviation demand also considered include trends in the aviation industry, including national and local, the potential effects of the Nation's focus on improving air transportation security, and national and local socioeconomic conditions.

2.1 FACTORS AFFECTING AVIATION DEMAND

Several factors were evaluated in developing the aviation demand forecasts for DMW, including: local and national trends in general aviation; the potential effects of the nation's focus on improving air transportation security; the status of DMW as a reliever airport; and, local and national socioeconomic conditions, including population and income.

2.1.1 Trends in General Aviation

General Aviation (GA) is an important component of both the aviation industry and national economy. GA is defined as all aircraft operations other than those performed by scheduled airlines and the military. The Federal Aviation Administration (FAA) *National Plan of Integrated Airport Systems, 2005-2009* (NPIAS), notes that GA airports are home to 39.6 percent of the nation's GA fleet. NPIAS forecasts for GA activity for the US indicate an increase from 35.5 million operations in 2004 to 43.4 million operations by 2015. According to the NPIAS, the national GA fleet is projected to increase at an average rate of 1.7 percent per year.

The demand for new GA aircraft and services slowed in response to the downturn in the US economy, even prior to the tragic events of September 11, 2001. During 2001, although the shipments of jet aircraft declined, the events of September 11, 2001 appear to have sparked increased activity in certain sectors of the aviation industry. For example, there was a marked increase in fractional (time-share) and corporate jet aircraft ownership. The recent growth of the on-demand charter industry is a major factor in the purchases of new business jet aircraft as reported in 2001, 2002, and 2003 by aircraft manufacturers such as Gulfstream, Cessna, and Raytheon.

In 2002, although GA aircraft shipments as a whole declined again, the strongest part of the GA market was in the business/corporate segment of the industry. Many regional and reliever GA airports, including DMW, witnessed an increase in corporate aviation activity almost immediately after September 11th. According to *Airport Business*, most of the increased corporate aircraft activity at GA airports was and continues to be attributed to the extraordinary passenger screening and baggage security measures established at commercial service airports.

This increased corporate and fractional share activity coincides with national forecasts. FAA projections of national general aviation activity indicate that a moderate level of growth can be anticipated over the next 10 to 20 years. Data from the FAA, the National Business Aviation Association, and others indicate that the fastest growing segment of the GA fleet is jet aircraft, indicating the importance of business utilization of aircraft. **Table 2.1-1** highlights the anticipated changes in the national fleet.

TABLE 2.1-1
HISTORIC AND PROJECTED US ACTIVE GENERAL AVIATION FLEET MIX

Aircraft Type	1999 (Actual)	2005 (Estimated)	2016 (Projection)
Single-engine piston	150,886	144,150	148,000
Multi-engine piston	21,038	17,645	17,235
Turboprop	5,679	7,300	8,400
Jet	7,120	8,425	15,900
Rotorcraft	7,448	6,890	7,915
Sport Aircraft	NA	7,700	15,410
Other	6,765	6,150	5,830
Total	219,464	219,780	240,070

Source: FAA Aerospace Forecasts, Fiscal Years 2003-2014.

Typical aviation forecasts for GA facilities assume "unconstrained" conditions. Although the forecasts for this Master Plan Update assume that conditions at DMW are also unconstrained, they were performed with the consideration that the fallout from September 11th could have long-term effects on aviation demand. Other effects on aviation demand at DMW include the surrounding airspace. As stated in Section 1 of this Master Plan update, DMW is located within Class E airspace that surrounds the airport for a diameter of six nautical miles. Also, it is just northwest of the Washington D.C. Metropolitan Air Defense Identification Zone (ADIZ), which has significantly reduced the limits of the previously unrestricted airspace outside of the Class E airspace surrounding DMW. The ADIZ is an area of airspace where the ready identification, location, and control of aircraft are required in the interests of National Security. Specifically, the ADIZ is that airspace, from the surface up to 18,000 feet MSL within the outer boundary of the Washington DC Tri-Area Class B airspace. Also as stated in Section 1, a longstanding Temporary Flight Restriction (TFR) was implemented enlarging P-40 and R-4009, the restricted areas around Camp David, to ten (10) nautical miles when the president is visiting. At all other times, flight operations in P-40 and R-4009 are prohibited within five nautical miles (up from 2.5 miles) unless authorized by Air Traffic Control (ATC).

2.1.2 Reliever Airports

In efforts to alleviate congestion that occurs at scheduled service airports, the FAA has identified a system of general aviation airports called "relievers." FAA designated reliever airports have the function of mitigating congestion at a commercial service airport (e.g., Baltimore/Washington International Airport) and providing more general aviation access to the overall community. The FAA encourages development, which must meet certain standards, of reliever facilities to provide pilots with an attractive alternative to congested air carrier airports. The FAA NPIAS designates DMW as

one of the nation's 278 reliever airports. Specifically, it is a reliever airport for Baltimore/Washington International. Relievers are an important part of the national air transportation system and, with a national average of 219 based aircraft at each reliever airport, they account for 29 percent of the nation's general aviation fleet of aircraft.

2.1.3 Socioeconomic Factors

Population

Population and income are two of the most important socioeconomic factors affecting aviation activity. According to the 2000 U.S. Census, Carroll County's population in 2000 was 150,897, an increase of 18% from 1990. The county's population is projected to grow at a relatively steady rate until 2020 (see **Table 2.1-2**). Census data indicates that growth in Carroll County has historically outpaced the State of Maryland.

TABLE 2.1-2
POPULATION GROWTH-CARROLL COUNTY, MARYLAND

Year	Carroll County Population	Percent Change	State of Maryland	Percent Change
1970	69,006	-	3,922,399	-
1980	96,356	28.3	4,216,975	6.9
1990	123,372	21.8	4,781,468	11.8
2000	150,897	18.2	5,296,486	9.7
2010*	179,700	16.0	5,856,100	9.5
2020*	191,900	6.3	6,225,000	5.9

Sources: United States Census Bureau, US Census (2000).
*Note: Population is estimated for 2010 and 2020

Income

The 2000 U.S. Census provides median household income statistics. Carroll County's median income per household is $60,021. In comparison, the 2000 income per household for the State of Maryland was $52,850 per year. Carroll County's median household income rate-of-growth has outpaced the State of Maryland from 1970 until present.

TABLE 2.1-3
MEDIAN HOUSEHOLD INCOME GROWTH-CARROLL COUNTY, MARYLAND

Year	Carroll County Median Household Income	Percent Change	State of Maryland Median Household Income	Percent Change
1970	$9,017	-	$10,101	-
1980	$21,358	58	$20,281	50
1990	$42,853	50	$39,386	49
2000	$60,021	29	$52,850	25
2010*	N/A	-	N/A	-
2020*	N/A	-	N/A	-

Sources: United States Census Bureau, US Census (2000).
*Note: Income estimates for 2010 and 2020 are not available.

2.2 PREVIOUS AVIATION FORECASTS FOR DMW

2.2.1 Forecasts / Final Environmental Assessment (December 2002)

Forecasts were developed as part of the *Final Environmental Assessment* (EA) *for the Five Year Capital Improvement Plan (CIP) Technical Report* (December 2002). These forecasts detail a statistical summary of based aircraft, fleet mix, and yearly operations for near and long-term activity projection that may be indicative of regional trends affecting the type and volume of future air traffic at DMW.

TABLE 2.2-1
2000-2010 AVIATION FORECASTS COMPARISONS

Year	TAF	MASP	Master Plan	FAA Form 5010
2000	150,450	127,600	97,250	154,690
2005	150,450	137,700	112,739	-
2010	150,450	160,500	130,695	-

Source: Final Environmental Assessment for the Five-Year Capital Improvement Plan Technical Report, December 2002.

In this case, the DMW forecast includes actual annual operations and the operational fleet-mix for GA traffic for the base year of 2000 and a projection to year 2010. It was estimated that 127,600 GA operations occurred during 2000, which is projected to increase to 160,500 by the year 2010. At the request of FAA, these forecasts were utilized as a baseline for generating the forecast for the 2005-2025 planning period of this Master Plan Update. Therefore, the forecasts discussed later in this Master Plan Update closely mirror the forecasts included in the EA and ultimately approved by the FAA in December 2003.

2.2.2 Recent Aviation Activity at DMW

In order to develop a forecast of based aircraft and operations at DMW over the next 20 years, it is necessary to understand the current and previous levels of activity via fuel sales. Fuel sales at DMW are an accurate indicator of current demand. It is also useful to compare the actual history of aviation fuel sales at DMW to the levels of activity projected in the various aviation forecasts described earlier.

GA operations at DMW currently consist of flight training (both fixed wing and helicopter), air taxi, corporate travel, personal travel, medical (helicopter) transport, state police, military, and recreation.

As shown in **Tables 2.2-2 and Table 2.2-3,** Jet A fuel sales at DMW increased tenfold in four years from 32,424 gallons in 2000 to 347,184 gallons in 2004. AvGas sales declined significantly along that same time frame, dropping from 103,351 gallons in 2000 to 61,682 in 2004. It is probable that the events of September 11th 2001 attributed to a decrease in fuel sales that year.

TABLE 2.2-2
CARROLL COUNTY FUEL SALES

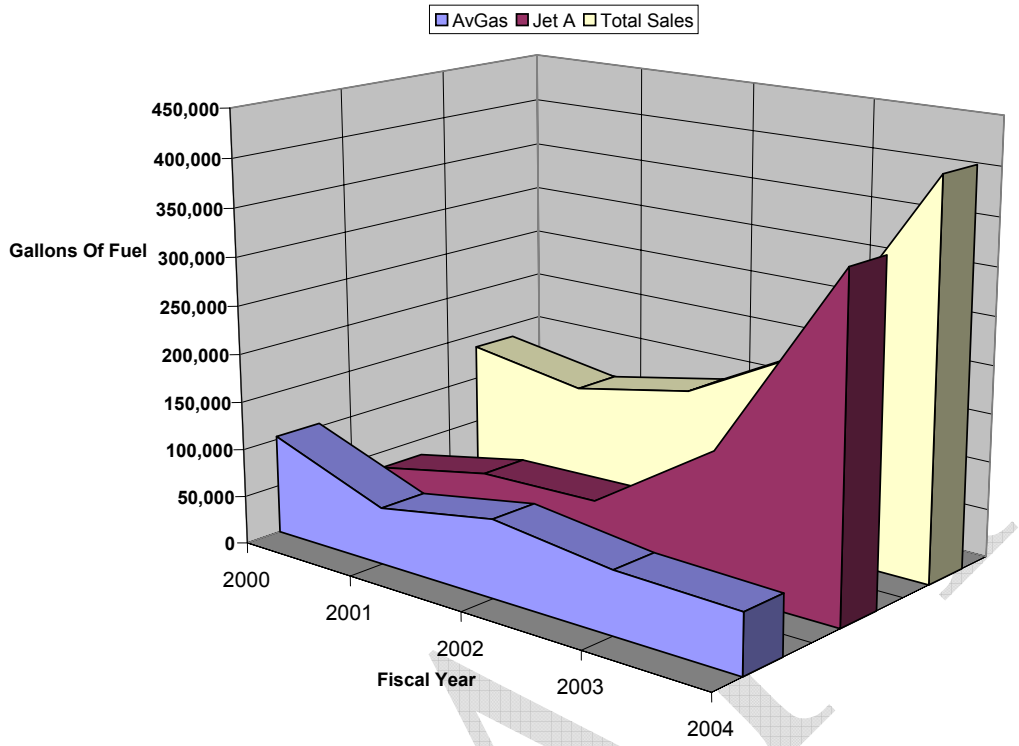

TABLE 2.2-3
CARROLL COUNTY FISCAL YEAR FUEL SALES (GALLONS)

Fiscal Year	2000	2001	2002	2003	2004
AvGas	103,351	58,747	80,657	65,187	61,682
Jet A	32,424	57,121	60,069	143,163	347,184
Total Sales	135,775	115,868	140,726	208,350	408,866

Note: All Totals Include WestAir Aviation Corp. (FBO) Sales & EBT Purchases.
Source: Carroll County Government

2.3 AVIATION DEMAND FORECASTS

Factors influencing the future number and mix of based aircraft at DMW are analyzed in this subsection, together with a forecast of all general aviation operations. These aviation forecasts will ultimately provide the most relevant information for determining future facility requirements at the Airport, such as apron and hangar needs over the 20-year study period.

2.3.1 Assumptions

The following assumptions were incorporated into the forecasting rationale:

- The national economy will continue to have a sustained low to moderate growth level;

- Aircraft operating costs, particularly fuel, will not increase at an extraordinary rate over time, although there may be periodic spikes due to unforeseen events;

- Certain security-related measures will be implemented nationally at airports that may make owning, housing or piloting an aircraft at a GA facility more costly;

- The majority of aircraft that relocated to DMW as a result of the security upgrades implemented nationally since late 2001 will remain;

- The population of Carroll County will grow as determined in the socioeconomic forecast, with household income levels sufficient to support continued local government investment in the Airport; and

- The number of charter and corporate jet operations will increase as a percentage of total annual operations at DMW throughout the planning period.

2.3.2 Based Aircraft

The forecast of based aircraft shown in **Table 2.3-1** was developed using revised FAA forecasts and recent aviation trends, with consideration of the fleet mix to include turboprop aircraft. This forecast was then extrapolated through the final forecast year (2025). Population growth is an indicator of economic conditions, such as income, which are also growth factors for aviation. As suggested earlier, the number of pilots and based aircraft tends to grow as the population in an area grows.

TABLE 2.3-1
FORECAST OF BASED AIRCRAFT

	2005	2010	2015	2025
Carroll County Population				
Base Population	169,500	179,700	187,050	194,150
Based Aircraft	131	143	151	171
Persons Per Based Aircraft	1,400	1,256	1,239	1,135

Source: Final Environmental Assessment for the Five Year Capital Improvement Plan Technical Report, December 2002; Maryland Department of Planning, Historical and Projected Total Population for Maryland's Jurisdictions – Historic Data From Census 1970-2000, Projections through 2030.

Economic factors noted in the introduction to this section may slow the rate of change in based aircraft at DMW; however, successful marketing by the County and/ or the FBOs or development of additional T- or Corporate hangars may accelerate the addition of based aircraft over time.

2.3.3 Based Aircraft Fleet Mix

Historically, the fleet mix at DMW has been predominately single engine piston-type aircraft. The low growth rate of the national economy, coupled with the moderate to high population growth rate projected for Carroll County (in comparison to Statewide growth), suggests that fleet mix growth similar to the national trends can be anticipated at DMW. These forecasts, like the national trends, contain the primary assumption that the based jet category will experience much greater percentage

growth than other types of aircraft. Current based aircraft statistics for DMW were compiled from the most recent FAA Airport Data Form 5010 dated July 1, 2005. **Table 2.3-2** indicates the projected fleet-mix for the forecast of based aircraft (Baseline Growth) through the year 2025.

TABLE 2.3-2
DMW BASED AIRCRAFT FLEET MIX

YEAR	Single Engine Piston	Multi-Engine Piston	Turbo Jet	Turbo-Prop	Rotor (Helicopter)	TOTAL
2005	**110**	**11**	**4**	**4**	**2**	**131**
2006	110	11	4	4	2	131
2007	111	12	4	4	2	133
2008	112	12	8	5	2	139
2009	113	12	8	5	2	140
2010	**114**	**13**	**9**	**5**	**2**	**143**
2011	114	13	9	5	2	143
2012	115	14	9	6	2	145
2013	116	14	10	6	2	148
2014	117	15	10	6	2	150
2015	**117**	**15**	**10**	**7**	**2**	**151**
2016	118	16	11	7	2	154
2017	118	16	11	7	2	154
2018	119	16	11	8	2	156
2019	119	17	12	8	2	158
2020	**120**	**17**	**12**	**9**	**2**	**160**
2021	120	18	13	9	2	162
2022	120	18	13	10	2	163
2023	121	19	14	10	2	166
2024	121	19	14	11	2	167
2025	**122**	**20**	**15**	**12**	**2**	**171**

Source: Year 2005 – FAA Form 5010 effective 07/01/05. All other years – URS Corporation (2005)

2.3.4 Annual Aircraft Operations

An aircraft operation is defined as a takeoff or a landing performed by an aircraft. Annual aircraft operations are the total of the landings and takeoffs throughout the year. For general aviation, non-towered airports such as DMW, the volume of operations usually has a direct relationship to the number of based aircraft. Utilizing the estimates of historical operations per based aircraft at DMW, **Table 2.3-3** was developed for forecasts of annual operations through 2025.

TABLE 2.3-3
ANNUAL OPERATIONS FORECAST

YEAR	Local 75%	Itinerant 25%	TOTAL
2005	**84,554**	**28,185**	**112,739**
2006	87,090	29,031	116,121
2007	89,703	29,902	119,605
2008	92,394	30,799	123,193
2009	95,166	31,723	126,889
2010	**98,022**	**32,674**	**130,695**
2011	100,962	33,654	134,616
2012	103,991	34,664	138,655
2013	107,110	35,704	142,814
2014	110,324	36,775	147,099
2015	**113,634**	**37,878**	**151,512**
2016	117,042	39,015	156,057
2017	120,554	40,185	160,739
2018	124,170	41,391	165,561
2019	127,896	42,632	170,528
2020	**131,733**	**43,911**	**175,644**
2021	135,684	45,229	180,913
2022	139,755	46,585	186,340
2023	143,948	47,983	191,931
2024	148,266	49,423	197,689
2025	**152,714**	**50,905**	**203,619**

Sources: Based Aircraft from Table 2.3-1, DMW FBO (2005), URS Corporation (2005).

In forecasting the need for aircraft facilities such as hangars, aircraft parking, and fuel storage, it is helpful to determine the split between local and itinerant aircraft activity. Local operations are flight activities that remain in the local area or traffic pattern, such as flight training and touch-and-go practice. Itinerant operations have a specific origin or destination other than DMW. The forecast of local and itinerant operations shown in **Table 2.3-3** assumes that aircraft based at DMW performs the majority of local operations and transient aircraft performs the itinerant operations.

2.3.5 Peak Demand

In order to properly plan for future improvements for certain facilities including but not limited to apron space, hangars, other airfield development, and space requirements for a new terminal building size, aviation activity during peak periods must be quantified and projected. The periods that will be used in developing facility requirements are the peak month, average day of the peak month (i.e., design day), busy day, and design hour operations. As defined and detailed in both FAA Advisory Circulars 150/5060-5, *Airport Capacity and Delay* and 150/5360-7, *Planning and Design Considerations For Airport Building Development*, the following information is critical when determining the "worst case" scenario used in planning for facilities with fixed capacities, such as the transient aircraft apron or vehicle parking:

- Peak Month – The calendar month when peak operations occur.

- Design Day – The average day in the peak month. The number of peak month operations divided by the number of days in the month.

- Busy Day – The busy day of a typical week in a peak month.

- Design Hour – The peak hour within the design day.

Using historical fuel sales records from January 2001 through May 2004, it was determined that the peak month for operations at DMW occurs in June. FAA-accepted planning methods state that operations during the peak month are typically 10 to 15 percent greater than the average month. Fifteen percent was used in **Table 2.3-4** to determine the number of operations in the peak month, which was then divided by 30 to yield the number of operations in the design day. The busy day was determined by increasing the number of operations in the design day by 15 percent. The peak hour at DMW assumes that flight operations occur sixteen hours per day, and thus is the design day divided by 16, with an additional increase of 15 percent.

TABLE 2.3-4
PEAK DEMAND FORECAST

Operations	2005	2010	2015	2020	2025
Total Annual	112,739	130,695	151,512	175,644	203,619
Avg. Month	9,394	10,891	12,626	14,637	16,968
Peak Month	10,803	12,524	14,519	16,832	19,513
Design Day	360	417	484	561	650
Busy Day	414	480	557	645	747
Peak Hour	30	35	40	46	54

Source: URS Corporation (2005)
Total Annual: Sum of 350 OPBA Plus Itinerant
Avg. Month: Total Annual Divided By 12
Peak Month: Avg. Month Plus 15 Percent
Busy Day: Design Day Plus 15 Percent
Design Day: Peak Month Divided By 30
Peak Hour: 16-Hour Division of Busy Day Plus 15 Percent
Note: Fuel Sales were approximately 24 percent higher during the peak month than the average month. FAA-accepted planning methods state the peak month is typically 10-15 percent greater. Due to the demonstrated fuel sales (which include a runway closing hardship), this forecast uses the higher percentage (15percent).

2.3.6 Instrument Approaches

Forecasts of annual instrument approaches provide guidance in determining an airport's requirements for navigational aid facilities. An instrument approach is defined by the FAA as "an approach to an airport with intent to land in accordance with an Instrument Flight Rules (IFR) flight plan." When IFR conditions previously defined in Section 1 fall below the best approach minimums currently available at DMW (i.e.- less than a 400-foot ceiling or 1 mile visibility) it is assumed that the runway essentially is closed and no operations take place.

At present, there is no daily record of instrument approaches at DMW. Based on historical data presented in Section 1, it can be assumed that IFR conditions exist at DMW 7.7 percent of the year. **Table 2.3-6** presents the instrument approach forecasts.

TABLE 2.3-6
INSTRUMENT APPROACH (LANDINGS) FORECAST

YEAR	2005	2010	2015	2020	2025
Total Annual Operations	112,739	130,695	151,512	175,644	203,619
Instrument Approaches	8,680	10,063	11,666	13,524	15,678

Source: URS Corporation (2005)

2.3.7 Summary of Aviation Forecasts

The projected totals for Based Aircraft, Annual Operations and Peak Hour Demand at DMW are summarized in **Table 2.3-7**. These projections are for the short-term (year 2010), mid-term (year 2015), and long-term (year 2025) preferred forecast, which is calculated to reflect the previously stated assumptions in the 20-year forecast for Carroll County.

TABLE 2.3-7
SUMMARY OF AVIATION FORECASTS

	2005	2010	2015	2025
Total Based Aircraft	**131**	**143**	**151**	**171**
Single Engine	110	114	117	122
Multi Engine	11	13	15	20
Jet Engine	4	9	10	15
Turbo-Prop	4	5	7	12
Rotor	2	2	2	2
Other	0	0	0	0
Total Annual Aircraft Operations	**112,739**	**130,695**	**151,512**	**203,619**
Local	84,554	98,022	113,634	152,714
Itinerant	28,185	32,674	37,878	50,905
Air Taxi	500	625	875	1500
Military	90	95	100	105
Peak Operations Demand	***112,739***	***130,695***	***151,512***	***203,619***
Peak Month	10,803	12,524	14,519	19,513
Design Day	360	417	484	650
Busy Day	414	480	557	747
Design (Peak) Hour	30	35	40	54

Source: URS Corporation (2005).

2.3.8 Determination of Design Aircraft and Airport Reference Code (ARC)

Design Aircraft and the ARC are typically determined by the characteristics of the most demanding aircraft to utilize an airport. Typically, these aircrafts will be housed at the airport or expected to perform approximately 500 operations per year. The design aircraft for DMW is the Gulfstream V (G-

V), which is a **C-III** aircraft. The "C" refers to the aircraft approach category. This is a grouping of aircraft based on 1.3 times their stall speed in the landing configuration at the certified maximum flap setting and maximum landing weight at standard atmospheric conditions. A category "C" Aircraft has an approach speed between 121 to 140 knots. The numeric portion of the ARC refers to the airplane design group. This is a grouping of aircraft based on wingspan. A group three (III) aircraft has a wingspan between 79 to 117 feet. The ARC determines the design characteristics of an airport. These include but are not limited to runway/ taxiway separation, runway length and width, taxiway width, and the runway object free area length beyond the runway end. An additional discussion of the Airport Reference Code is included in Section 3 of this Master Plan.