## SECTION 3
## FACILITY REQUIREMENTS

### *3.0 INTRODUCTION*

To properly plan for the future of DMW it is necessary to identify the specific types and quantities of airside and landside facilities needed to adequately serve projected aviation demand. It is important to note that facility requirements identified in this section are based on the amount, type, and size of facilities that would be necessary at the projected demand levels of aviation activity presented in **Section 2**. Therefore, these facility requirements should be refined and adjusted based upon project-specific needs and actual activity levels that occur throughout the planning period.

This section uses the results of the Aviation Forecast section and established planning criteria to determine specific airside and landside facility requirements. Airside development includes runways, taxiways, navigational aids, pavement marking, lighting and signage. The landside includes aircraft parking aprons, hangar development, public terminals, access, automobile parking, and other facilities.

Since the preparation of the January 1986 Master Plan, new FAA planning and design standards have been issued. On September 9, 1989, the FAA issued Advisory Circular 150/5300-13, *Airport Design*. The current edition of this document at the time of this writing was Change 11, which was used in reviewing existing airport conditions and in developing the facility requirements.

Alternatives for providing these facilities will be evaluated in the **Section 4** of this Master Plan Update. The alternatives evaluation will help determine the most functional and efficient means for implementing further development at the Airport.

### *3.1 AIRFIELD FACILITY REQUIREMENTS*

Airfield facilities include airport elements that are related to the arrival, departure, and ground movement of aircraft. These facilities are comprised of the following items:

- Runways;
- Taxiways;
- Airfield Marking, Lighting, and Signage; and,
- Navigation and Approach Aids

The FAA has established criteria to size and design airside facilities. As stated in the previous section, the selection of the appropriate FAA design standards is based upon the ARC. Planning for future aircraft use is especially important because design standards are used to plan separation distances between facilities that could be costly to relocate later.

#### *3.1.1 AIRPORT REFERENCE CODE*

DMW is an Approach Category C, ADG II, or ARC C-II, Airport.

The FAA recommends designing airport functional elements to meet the requirements of the most demanding ARC for that airport. The term “most demanding” applies to the group of aircraft (or individual aircraft) that performs more than 500 annual operations at the facility. There are existing tenants at DMW who will be upgrading their facilities to accommodate a future based aircraft in Approach Category C. The specific Approach Category C aircraft that would base at DMW is a Grumman Gulfstream V (G-V). Other aircraft in this category include, but are not limited to, the Boeing Business Jet (BBJ), the Gates Learjet 24/25/54, the Grumman Gulfstream III, the Hawker 121, and the Fokker F-28 aircraft. All have maximum takeoff weights greater than 12,500 pounds. These aircraft are in ADG III. As a result, it is recommended that design standards for the proposed development at DMW conform to an ARC of C-III. **Table 3.1-1** below indicates the required separations standards for ARC C-III criteria as contained in FAA Advisory Circular 150/5300-13.

**TABLE 3.1-1**
**ARC C-III STANDARDS**

| Design Item | C-III Criteria |
|---|---|
| Runway-taxiway separation for runways with not lower than ¾ mile approach visibility minimums | 400-feet |
| Runway-taxiway separation for runways with lower than ¾ mile approach visibility minimums | 400-feet |
| Taxiway-Taxilane separation standards | 152-feet |
| Taxiway Wingtip Clearance | 34-feet |
| Taxilane Wingtip Clearance | 22-feet |
| Runway Width | 100-feet |
| Runway safety area dimensions (width x length beyond runway end) | 500-feet x 1,000-feet |
| Blast Pad Dimensions (length x width) | 200-feet x 140-feet |
| Runway Protection Zone Size (Length x inner width x outer width) | Lower than ¾ mile 2,500’x1,000’x1,750’ |
| Taxiway Width | 50-feet |
| Taxiway Safety Area Width | 118-feet |
| Taxiway Object Free Area Width | 186-feet |
| Radius of Taxiway Turn | 100-feet |
| Length of Lead-in Fillet | 150-feet |
| Fillet Radius for Tracking centerline | 55-feet |

.Source: FAA Advisory Circular 150/5300-13.

The following airside elements describe the facilities necessary to accommodate forecasted aviation demand throughout the 20-year planning period.

### *3.1.2 RUNWAYS*

The existing airfield includes one runway: Runway 16-34, which is 5,100 feet long by 100 feet wide. The adequacy of this existing runway was analyzed from a number of perspectives including airfield capacity, runway orientation, runway length, runway width, and pavement strength. In addition, runway clearance and safety standards applicable to the airfield system were determined. From this information, requirements for runway improvements were determined for the airport.

#### *3.1.2.1 Airfield Capacity*

The current unconstrained ASV at DMW is calculated to be 235,000 operations. ASV is defined as the overall annual capacity of a runway. Currently, DMW experiences approximately 113,000 annual operations, or 48 percent of the ASV for Runway 16-34 in its current configuration. FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport System*, indicates that improvements should be considered when operations reach 60 percent of the airfield's annual capacity. *The same document recommends that improvements be in place when activity reaches 80 percent of the ASV*.

Based on the forecast of annual operations for DMW as described in the previous section, the runway would reach the 60 percent capacity threshold by the year 2013 (approximately 143,000 annual operations) and 80 percent of the ASV by 2025, which is the end of the planning period. It is likely that Runway 16-34 will be able to accommodate the project activity at DMW over the 20-year planning period. However, when activity reaches 60 percent ASV level, consideration should be given to increasing the capacity of Runway 16-34. Improvements such as additional exit taxiways, and upgrading navigational aids can increase the ASV for certain runways. Should unforeseen events create a level of annual activity well in excess of the forecasts, then a second runway should be considered.

#### *3.1.2.2 Runway Orientation*

FAA Advisory Circular 150/5300-13 recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for any aircraft currently using or forecast to use the airport on a regular basis. For DMW, the 95 percent wind coverage is computed on the basis of crosswinds not exceeding 16 knots.

**Table 3.1-2** presents the wind coverage for DMW. As shown in the table, the wind coverage at DMW meets the necessary 16-knot requirement for the proposed C-III design aircraft solely with a runway in the configuration of 16-34. Thus, no additional runways would be required due to the wind factors at DMW.

**TABLE 3.1-2**
**RUNWAY 16-34 WIND COVERAGE**

| Crosswind Knots | All Weather | VFR | IFR[1] | IFR[2] | IFR[3] |
|---|---|---|---|---|---|
| 10.5 | 93.32 | 93.64 | 89.22 | 93.33 | 96.42 |
| 13 | 96.66 | 96.94 | 93.52 | 96.30 | 98.05 |
| ***16*** | ***99.26*** | ***99.34*** | ***98.38*** | ***99.30*** | ***99.52*** |
| 20 | 99.84 | 99.87 | 99.60 | 99.83 | 99.91 |

Sources: NOAA National Climatic Data Center (2005) and URS Corporation (2005).
Notes: Station: Baltimore, Maryland (*closest station to DMW*); Period: 1995-2004; Total Number of Observations: 79,165
[1]Includes weather observations during times when the ceiling height is greater than or equal to 200 feet but less than 1,000 feet, and/or horizontal visibility is greater than or equal to 0.5 miles but less than 3 miles.
[2]Includes weather observations during times when the ceiling height is greater than or equal to 200 feet but less than 400 feet, and/or horizontal visibility is greater than or equal to 0.5 miles but less than 1 mile.
[3]Includes weather observations during times when the ceiling height less than 200 feet and/or horizontal visibility is less than ½ mile.

### *3.1.2.3 Runway Length*

The procedures for determining runway length requirements are referenced in FAA Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design.* Table 1-1 of the FAA Advisory Circular notes that runway length requirements for design aircraft with maximum certificated takeoff weights of 60,000 pounds or more should be determined either by using Chapter 4 of the AC or the airplane manufacturer's website. The Gulfstream V specifications at www.gulfstream.com calculates runway length based on the following assumptions:

- Maximum takeoff weight = 91,000 pounds;
- Runway elevation is at sea level; and
- A Standard Day Temperature (SDT) of 59° F.

The specifications for the G-V design aircraft indicate that a runway length of 5,910 feet is required for an aircraft operating at these parameters. Using this data, the mean daily maximum temperature of the hottest month is 89° F. Applying the temperature and airport elevation requirements to the runway length curves in Chapter 3 of the Advisory Circular also yields a runway length requirement of 6,400 feet.

Finally, the FAA Southern Region's Regional Guidance Letter RGL 00-1, *Standard Development of "Business Jet" Aircraft*, also could be used as a basis for determining the appropriate runway length for an airport expected to serve business jet aircraft. The RGL recognizes that there are an increasing number of business jets in the national fleet mix that fly to and from general aviation airports in lieu of the commercial service airports. Many of these general aviation airports do not have facilities adequate to accommodate business jets. The RGL lists development standards to accommodate business jet aircraft, including a minimum runway length of 6,400 feet at general aviation airports that serve as designated relievers to commercial service airports. As stated in **Section 1** of this Master Plan, DMW is a designated reliever to BWI.

Therefore, it is recommended that a runway length of 6,400 feet be provided at DMW in the immediate future (within the 5-year planning period). Furthermore, it is recommended that the runway be grooved to accommodate jet aircraft operations.

#### *3.1.2.4 Runway Width*

Runway width requirements are determined by ADG standards. The runway width is currently and would remain 100 feet for a runway serving C-III aircraft with a maximum certificated takeoff weight less than or equal to 150,000 pounds.

#### *3.1.2.5 Runway Pavement Strength*

The most important feature of airfield pavement is the ability to withstand repeated use by aircraft of significant weight. Pavement strength requirements are related to three primary factors: the weight of aircraft anticipated to use the airport; the landing gear type; and, the number of aircraft operations. The current edition of the Airport Facility Directory indicates that existing Runway 16-34 at DMW is rated at 22,000 pounds for single wheel loading. Based on forecasted demand, the pavement strength of the existing runway is not adequate. To accommodate the aircraft forecast to use the airport during the planning period, a pavement strength of 91,000 pounds dual wheel gear loading is recommended for the runway.

#### *3.1.2.6 Runway Clearance and Safety Standards*

The primary reference for FAA runway clearance and safety standards is the aforementioned FAA Advisory Circular 150/5300-13. The following standards would apply to DMW.

**Runway Safety Area:** The RSA is defined by the FAA as "a surface surrounding the runway that is prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." A RSA must be a cleared and graded area that shall have no potentially hazardous ruts, humps, or depressions; drained by grading or storm sewers to prevent water accumulation; capable, under dry conditions, of supporting aircraft rescue and fire fighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft; and free of objects, except for objects that need to be constructed in the RSA because of their function. Those objects should be frangible no higher than 3 inches above grade.

Based on the above ARC C-III criteria, the RSA dimensions would be 500 feet in width for the full 6,400-foot length of the runway plus 1,000 feet beyond each end.

**Runway Object Free Area:** The ROFA is also centered on the runway. The OFA requires the clearing of above ground objects protruding above the RSA edge elevation. However, it is allowable to place objects required for air navigation or aircraft ground maneuvering purposes in the OFA. The OFA for a C-III runway is 800 feet wide for the full 6,400-foot length of the runway plus 1,000 feet beyond each end.

**Obstacle Free Zone:** The OFZ precludes taxiing and parked airplanes and other object penetrations, except for frangible visual navigation aids that need to be located in the OFZ because of their function. The OFZ for the runway at DMW is comprised of four elements: the runway OFZ, the inner-approach OFZ, the inner-transitional OFZ, and the precision OFZ. An explanation of each is found below.

The **Runway OFZ** consists of the airspace above a surface centered on the runway. The runway OFZ for the proposed runway is 400 feet wide to accommodate large aircraft.

The **Inner-approach OFZ** is applicable only to the end of the proposed runway that would include an approach lighting system. It begins 200 feet from the runway threshold at the same elevation as the threshold and is 400 feet wide. It rises at a slope of 50 feet horizontal to 1 foot vertical (50:1) and extends 200 feet beyond the last light unit in the approach lighting system.

The **Inner-transitional OFZ** is along the sides of the runway OFZ and the inner-approach OFZ. It applies only to those runways with lower than ¾-mile approach visibility minimums. The inner-transitional OFZ for the runway at DMW rises vertically, based on the most demanding wingspan of the aircraft using the runway as well as the runway threshold elevation, at a slope of 6 feet horizontal to 1 foot vertical (6:1) to a height of 150 feet above the established airport elevation.

The **Precision OFZ (POFZ)** is centered on the runway, begins at the runway threshold, and extends into the approach at a width of 800 feet and a length of 200 feet, all at the runway threshold elevation. It applies only when there is a vertically guided approach; the reported ceiling is below 250 feet and/or visibility is less than ¾-mile, and an aircraft is on final approach within 2 miles of the runway threshold. When the POFZ is in effect, the wing of an aircraft holding on a taxiway for runway clearance may penetrate the POFZ, but the fuselage and/or tail may not.

**Runway Protection Zone:** The function of the RPZ is to protect people and property on the ground by clearing the RPZ of incompatible objects and activities. The Airport sponsor preferably exercises control of the RPZ through the acquisition of sufficient property interests. Residences, places of public assembly, and fuel storage facilities are prohibited within the RPZ. Other uses are permitted provided they are located outside the ROFA, do not interfere with navigational aids, and are not a wildlife attractant. While an automobile parking facility may be considered a place of public assembly, it is permitted within the RPZ provided it meets the above conditions.

The RPZ is trapezoidal in shape, and its dimensions for a particular runway end are a function of the type of aircraft and approach visibility minimum associated with that runway end. Unless declared distances are used, the RPZ begins 200 feet beyond the end of the runway usable for takeoff and landing. Declared distances are not used for Runway 16-34 at DMW.

The existing RPZ for both Runway 16 and Runway 34 is based on an approach visibility minimum of not lower than one mile for approach categories C and D. On each end, the RPZ begins 200 feet from the runway threshold at a width of 500 feet, or 250 feet on each side of the extended centerline, and continues 1,700 feet outward, ending at a width of 1,010 feet, or 505 feet on each side of the centerline.

The proposed RPZ would have a non-precision instrument approach with not lower than ¾-mile approach visibility minimums for Runway 34, and a precision instrument approach with visibility minimums lower than ¾-mile on the Runway 16 end. For Runway 34, the RPZ for the non-precision approach would begin 200 feet from the runway threshold at a width of 1,000 feet centered on the runway, and would extend for a length of 1,700 feet into the approach, ending at a final width of 1,510 feet. The Runway 16 precision RPZ would begin 200 feet from the threshold at a width of 1,000 feet, centered on the runway, and extend 2,500 feet into the approach, ending at a final width of 1,750 feet.

**Imaginary Surfaces**: FAR Part 77, *Objects Affecting Navigable Airspace*, defines surfaces that must be kept clear of obstructions, including the primary surface, the horizontal surface, the approach surface, and the transitional surface. **Table 3.1-3** describes the imaginary surfaces that should be cleared for the runway at DMW. The imaginary surface criteria for a non-precision instrument runway apply for each end of existing Runway 16-34. The non-precision and precision instrument runway criteria would apply to the future Runway 34 and Runway 16 ends, respectively.

**TABLE 3.1-3**
**IMAGINARY SURFACE DIMENSIONS**

| Category | Non-Precision Instrument Runway w/ Visibility Minimums As Low As ¾-mile | Precision Instrument Runway |
|---|---|---|
| Width of Primary Surface and Approach Surface Width at Inner End | 1,000 feet | 1,000 feet |
| Radius of Horizontal Surface | 10,000 feet | 10,000 feet |
| Approach Surface Width at End | 4,000 feet | 16,000 feet |
| Approach Surface Length | 10,000 feet | 50,000 feet |
| Approach Slope | 34:1 | 50:1 for Inner 10,000 feet<br>40:1 for Additional 40,000 Feet |
| Transitional Surface Slope | 7:1 | 7:1 |

Source: FAR Part 77, *Objects Affecting Navigable Airspace*

**Runway-Taxiway Separation Standards**: Separation standards indicate the distance that various facilities such as taxiways, aprons, and other operational areas must be located from runways. These standards ensure that aircraft can safely operate on both areas simultaneously while reducing the potential for collision. These standards also ensure that no part of an aircraft on a taxiway penetrates the RSA or OFZ. The runway-to-taxiway separation for existing Runway 16-34 is 300 feet and applies to a C-II runway with not lower than ¾-mile approach visibility minimums. The runway-to-taxiway separation standard for a C-III runway is 400 feet for all visibility minima.

### 3.1.3 *TAXIWAYS*

Taxiways are needed to accommodate the movement of aircraft from parking aprons to runways and vice versa. In order to provide for the efficient movement of aircraft, it is desirable to have a parallel taxiway and several exit taxiways associated with each runway. Existing parallel Taxiway A is 35 feet wide and meets ADG II standards. There are four exit taxiways B through E, and two additional taxiways connect Taxiway A to the apron. The exit and connector taxiways are approximately 40 feet wide at their narrowest point due to fillet geometry, and thus exceed ADG II standards.

The taxiway width is 50 feet for taxiways serving aircraft in ADG III with wheelbases less than 60 feet. The proposed configuration would include a parallel taxiway and four exit taxiways placed at various locations along the runway, and each taxiway would be 50 feet wide. Additionally, a minimum of two 50-foot wide connector taxiways are recommended between the parallel taxiway and the apron.

### 3.1.4 *HOLD APRONS*

The purpose of hold aprons is to provide space for one aircraft to pass another in order to reach the runway end. This reduces airfield delays when one aircraft is conducting engine run-ups or is being held for ATC reasons. Currently, the hold apron on the north end of the parallel taxiway adjacent to

Runway 16 is of sufficient size to accommodate an ADG I aircraft while allowing ADG II aircraft to pass by on the parallel taxiway. The hold apron adjacent to Runway 34 is much larger and accommodates ADG II aircraft while allowing other ADG II aircraft to pass by.

It is recommended that a new hold apron be constructed on each end of the runway. Each apron would be of sufficient size to accommodate one ADG III aircraft while allowing another ADG III aircraft to pass by on the parallel taxiway.

### *3.1.5 AIRFIELD MARKING, LIGHTING, AND SIGNAGE*

To facilitate the safe movement of aircraft, airports are marked, lighted, and signed to assist pilot navigation and ground maneuvering. A description is found below.

#### *3.1.5.1 Airfield Marking*

FAA Advisory Circular 150/5340-1J, *Standards for Airport Markings*, provides the standards necessary to design an airport's markings. Currently at DMW, pavement markings on each end of Runway 16-34 meet standards for non-precision instrument markings. To meet precision instrument marking standards, it is recommended that touchdown zone markings be added to the Runway 16 end.

The parallel, exit, and connector taxiways would be marked with yellow centerline stripes to provide pilots with a visual reference as they steer their aircraft along the pavement. The apron parking areas would also be marked with the centerline markings to indicate the alignment of taxilanes within these areas. All taxiway and taxilane centerline markings would be six inches wide. Intermediate holding position markings would be installed in each hold apron to allow an aircraft on the apron to hold for another aircraft passing by on the parallel taxiway. These markings should be 93 feet from the parallel taxiway centerline in order to accommodate ADG III aircraft. Finally, holding position markings would be painted along each taxiway that connects to the runway to indicate where aircraft should hold prior to entering the runway itself. The holding position markings should be installed 250 feet from the runway centerline to meet C-III standards for a precision instrument runway.

#### *3.1.5.2 Runway and Taxiway Lighting*

FAA Advisory Circular 150/5340-30, *Design and Installation Details for Airport Visual Aids*, provides the standards for runway and taxiway edge lighting systems. Edge lights are used to outline usable operational areas of an airport during periods of darkness and low visibility weather conditions. Existing Runway 16-34 is equipped with MIRL. It is recommended that High Intensity Runway Lighting (HIRL) be installed, as this system is standard for runways with precision instrument approaches. Similar to the existing MIRL system, lenses for the HIRL would be white all along the proposed runway, except for the last half of the runway length, where they would be split white and yellow to indicate the "caution zone". In the caution zone, the runway lens is yellow in the direction facing the instrument approach threshold and white in the opposite direction. Given that each end of the proposed 6,400-foot runway would have a published instrument approach procedure, the last 3,250 feet of each end would be lighted accordingly to indicate the “caution zone”.

The existing taxiway system is equipped with MITL. These lights are blue all along the length of the taxiways. This system would be replicated along the proposed taxiways.

#### *3.1.5.3 Airfield Signage*

Requirements for an airfield sign system are found in FAA Advisory Circular 150/5340-18D, *Standards for Airport Sign Systems*. An airfield sign system is a component for the surface movement of aircraft on the airfield that is necessary for the safe and efficient operation of the airport. A sign system should accomplish the following: provide the pilot with the ability to easily determine the designation or name of any taxiway on which the aircraft is located; readily identify routes toward a desired destination; indicate mandatory holding positions; and, identify boundaries for approach areas, ILS critical areas, and RSAs or OFZ. Additionally, RDR signs are used to provide distance remaining information to pilots on the runway during takeoff and landing operations.

The following types of airfield guidance signs are required: holding position signs to denote entrances to a runway or critical area; ILS critical area signs to denote the boundary to the ILS critical area; runway exit signs located prior to a runway/taxiway intersection on the side of the runway where the aircraft is expected to exit; destination signs to indicate the general direction to a runway, taxiway, or apron/ramp area; and, RDR signs to provide distance remaining information to pilots during takeoff and landing operations. The existing signage system at DMW includes all signs noted above.

### 3.1.6 NAVIGATION AIDS AND APPROACH PROCEDURES

Electronic and visual guidance to arriving and departing aircraft enhance safety and capacity of the airfield. Such facilities are vital to the operational capability and reliability of the airport. Additionally, there are several economy approach aids that visually assist the pilot during final approach to the runway. A description of each type of facility proposed for DMW is found below.

#### *3.1.6.1 Category I Instrument Landing System*

A new procedure would be established to include a precision Category I ILS approach to the Runway 16 end in accordance with wind conditions.

Requirements for a typical Category I ILS include a localizer antenna; glide slope antenna, and High Intensity Runway Lighting. The localizer provides lateral guidance information to the aircraft, indicating whether it is to the right, left, or aligned on the approach course. Vertical guidance to indicate whether the aircraft is above, below, or on the proper descent angle for the runway is provided by the glide slope. Additionally, distance information indicating the aircraft’s approximate distance from the landing threshold can be provided indirectly by the ILS outer, middle, or inner markers, and directly by the use of Distance Measuring Equipment (DME).

The best available approach minimums for a Category I ILS with the equipment above include a decision height of 200 feet above the touchdown elevation, and a horizontal visibility of ¾-mile. An approach light system, such as a Medium Intensity Approach Light System with Runway Alignment Indicator Lights (MALSR) can also be installed as part of the ILS. The installation of a MALSR would reduce the horizontal visibility minimum down to ½-mile. The MALSR consists of a threshold light bar and seven light bars, each consisting of five steady burning lights, located on the extended runway centerline. The first light bar is located 200 feet from the landing threshold, with additional bars installed at 200-foot intervals out to 1,400 feet from the threshold. Two additional 5-light bars are located at 1,000 feet from the runway threshold. Beyond the steady burning lights is a series of five sequenced flashing lights that begin at a light station 1,600 feet from the threshold and extend at 200-foot intervals out to an ultimate distance of 2,400 feet from the threshold. Each interval consists of a single flashing light that flashes at the rate of twice per second.

#### *3.1.6.2 Non-Precision Instrument Approach Procedures*

It is recommended that the RNAV(GPS) procedures for both ends of Runway 16-34 be maintained. The Runway 34 VOR approach as well as the VOR-A approach should also be maintained.

Additionally, the WAAS is an extremely accurate navigation system developed for civil aviation. WAAS provides service for all classes of aircraft in all flight operations - including en route navigation, airport departures, and airport arrivals. This includes precision landing approaches in all weather conditions at all locations throughout the US National Airspace System (NAS). The position accuracy is less than 10 feet. A WAAS approach is available as part of the RNAV(GPS) approach to Runway 16, and should be considered for Runway 34.

### *3.1.7 Economy Approach Navigation Aids*

The existing REIL on Runway 16-34 should be maintained. Additionally, there is an existing 2-box PAPI located on each end of Runway 16-34. The FAA awarded a grant in spring 2006 to upgrade the 2-box PAPI to a 4-box PAPI to accommodate the existing jet aircraft operations.

### *3.1.8 Supplemental Wind Cones*

The MAA provided a supplemental wind cone for each end of the runway in early 2005, although they have not yet been installed. It is recommended that the supplemental wind cones be installed according to the criteria listed in FAA Advisory Circular 150/5340-30, *Design and Installation Details for Airport Visual Aids.* Depending on the location, a red obstruction light may be required for one or both of the wind cones for identification as an obstruction to the FAR Part 77 transitional surface.

### *3.1.9 Automated Weather Observation System*

The existing AWOS-III at DMW should be maintained.

### 3.1.10 *Rotating Beacon*

The existing rotating beacon is functioning as intended and should be maintained.

### 3.1.11 *Airport Traffic Control Tower*

DMW is a non-towered airport. As such, it is the responsibility of all pilots to conform with established aircraft operating procedures while airborne and on the ground. Pilots operating in the DMW environment communicate on the CTAF of 122.7 MHz. With the absence of an Airport Traffic Control Tower (ATCT), pilots use the CTAF to receive information on runway usage and known traffic in the area.

DMW currently accommodates a large and varied amount of activity. Aircraft activity is forecast to be approximately 113,000 operations in 2005, and is estimated to increase to approximately 204,000 annual operations at the end of the 20-year planning period. Also, DMW is an FAA-designated reliever airport for BWI. The FAA recommended greater use of reliever airports as an alternate to other congested facilities. Improved usage of DMW as an alternate to BWI would require an improved level of service and reliability. Other general aviation airports in Maryland with similar operational levels as DMW include Easton (ESN) and Frederick Municipal (FDK). An ATCT is currently being constructed at ESN and the feasibility of an ATCT is being studied at FDK.

It is not known at this time if DMW would be eligible for a new ATCT, nor is it known if such a facility would be staffed either by the FAA or by a private firm through the FAA Contract Tower Control Program. There currently are 229 contract towers around the US.

## 3.2 LANDSIDE FACILITY REQUIREMENTS

In addition to the airfield system, the development of landside elements must be evaluated in order to accommodate projected aviation demand. Landside facilities include aircraft parking aprons, hangar storage facilities, general aviation terminal buildings, vehicular access, and automobile parking areas. Currently, the east side of DMW contains all landside facilities. Operational statistics necessary for the development of landside facilities are taken from **Section 2**.

### 3.2.1 *Aircraft Parking Aprons*

A large apron reserved for aircraft parking is located east of parallel Taxiway A and north of the existing corporate hangars. The size of the apron is approximately 24,700 square yards and accommodates 56 ADG I general aviation aircraft. It is estimated that based aircraft owners lease 29 of these spaces. An additional 12,800 square yard apron accommodates 4 larger transient aircraft, including corporate jets. Total existing apron space is 37,500 square yards including space for parking positions and circulation along the taxilanes. The following sections describe the transient and based aircraft apron requirements for the 20-year planning period.

#### *3.2.1.1 Transient Apron*

The summary of aviation forecasts was presented in **Section 2** of this Master Plan Update, including operations by transient aircraft. **Table 3.2-1** depicts the transient aircraft operations and fleet mix for the 20-year planning period.

**TABLE 3.2-1**
**TRANSIENT OPERATIONS AND FLEET MIX**

| Operations | 2005 | 2010 | 2015 | 2020 | 2025 |
|---|---|---|---|---|---|
| Total Annual Operations | 112,739 | 130,695 | 151,512 | 175,644 | 203,619 |
| Daily Transient Aircraft (1) | 62 | 72 | 83 | 97 | 112 |
| Transient Aircraft on Apron (2) | 43 | 50 | 58 | 68 | 78 |
| Transient Aircraft Types (3) | | | | | |
| Single Engine Piston | 17 | 20 | 23 | 27 | 31 |
| Multi-Engine Piston | 13 | 15 | 17 | 20 | 23 |
| Turbojet | 9 | 10 | 12 | 14 | 16 |
| Turboprop | 3 | 4 | 5 | 6 | 6 |
| Rotorcraft | 1 | 1 | 1 | 1 | 2 |

Source: URS Corporation (2005).
(1) Assumes 30 percent of total busy day operations are by transient aircraft, with each transient aircraft performing 2 operations.
(2) Assumes 70 percent of total transient aircraft on apron at the same time.
(3) Transient Mix: Single Engine = 40 percent; Multi-engine = 30 percent; Turbojet = 20 percent; Turboprop = 8 percent; Rotorcraft = 2 percent

Planning allocations for these aircraft types were 500 square yards for single engine piston aircraft, 700 square yards for multi-engine piston aircraft, 900 square yards for both corporate jet and turboprop aircraft, and 1,000 square yards for rotorcraft. These allocations include space for the parking positions and circulation. It is assumed that transient aircraft currently use approximately 24,700 of the available 37,500 square yards of the existing apron. **Table 3.2-2** presents the transient apron requirements for the 20-year planning period.

**TABLE 3.2-2**
**TRANSIENT AIRCRAFT APRON REQUIREMENTS**

| Apron Requirements | 2005 | 2010 | 2015 | 2020 | 2025 |
|---|---|---|---|---|---|
| Transient Aircraft Types | | | | | |
| Single Engine Piston | 17 | 20 | 23 | 27 | 31 |
| Multi-Engine Piston | 13 | 15 | 17 | 20 | 23 |
| Turbojet | 9 | 10 | 12 | 14 | 16 |
| Turboprop | 3 | 4 | 5 | 6 | 6 |
| Rotorcraft | 1 | 1 | 1 | 1 | 2 |
| Transient Aircraft Apron Required (sy) (1) | | | | | |
| Single Engine Piston | 8,500 | 10,000 | 11,500 | 13,500 | 15,500 |
| Multi-Engine Piston | 9,100 | 10,500 | 11,900 | 14,000 | 16,100 |
| Turbojet | 8,100 | 9,000 | 10,800 | 12,600 | 14,400 |
| Turboprop | 2,700 | 3,600 | 4,500 | 5,400 | 5,400 |
| Rotorcraft | 1,000 | 1,000 | 1,000 | 1,000 | 2,000 |
| Total Apron Required | 29,400 | 34,100 | 39,700 | 46,500 | 53,400 |
| Existing Apron | 24,700 | 24,700 | 24,700 | 24,700 | 24,700 |
| Deficiency | 4,700 | 9,400 | 15,000 | 21,800 | 28,700 |

Source: URS Corporation(2005).
(1) Parking Position Size: Single Engine = 500 sy; Multi-Engine = 700 sy; Jet = 900 sy; Rotorcraft = 1,000 sy

### *3.2.1.2 Based Aircraft Apron*

Approximately 30 based aircraft are stored on the existing aircraft parking apron at DMW. At similar facilities to DMW, aircraft that are routinely parked on an apron consist of single engine piston and small multi-engine piston type aircraft. Larger aircraft such as turboprops and jets are normally stored in hangars, if available. As the number of available hangar units increases in the future, a portion of the projected increase in based aircraft will be stored in hangars, and a portion will require space on the parking apron. Since the number and type of based aircraft using the apron can vary over time, it is not generally possible to predict the precise amount of apron space needed for the 20-year period. However, generally accepted planning standards can be used to project the amount of based aircraft parking apron that would be needed to satisfy demand through the planning period.

Based upon an analysis of forecasts and assumptions at other general aviation facilities similar to DMW, a ratio of based aircraft tiedown demands versus hangar demands was developed. **Table 3.2-3** presents the number of based aircraft for the 20-year planning period, and **Table 3.2-4** provides the split between hangar space and apron tiedown space.

**TABLE 3.2-3**
**BASED AIRCRAFT FLEET MIX**

| Aircraft Type | 2005 | 2010 | 2015 | 2020 | 2025 |
|---|---|---|---|---|---|
| Single Engine Piston | 110 | 114 | 117 | 120 | 122 |
| Multi Engine Piston | 11 | 13 | 15 | 17 | 20 |
| Turbojet | 4 | 9 | 10 | 12 | 15 |
| Turboprop | 4 | 5 | 7 | 9 | 12 |
| Rotorcraft (Helicopter) | 2 | 2 | 2 | 2 | 2 |
| **Total** | **131** | **143** | **151** | **160** | **171** |

Source: URS Corporation (2005).

**TABLE 3.2-4**
**BASED AIRCRAFT FACILITIES USAGE**

| Aircraft Type | Conventional Hangar | T-Hangar | Apron | Total |
|---|---|---|---|---|
| Single Engine Piston | 0% | 85% | 15% | 100% |
| Multi Engine Piston | 0% | 90% | 10% | 100% |
| Turbojet | 100% | 0% | 0% | 100% |
| Turboprop | 100% | 0% | 0% | 100% |
| Rotorcraft (Helicopter) | 90% | 0% | 10% | 100% |

Source: URS Corporation (2005).

Utilizing the based aircraft fleet mix in **Table 3.2-3** and the usage in **Table 3.2-4**, a determination of based aircraft tiedown requirements was forecasted for demand levels anticipated during the planning period. It is important to note that the usage referenced in **Table 3.2-4** assume that some portion of the existing 29 aircraft currently parked on the apron would be stored in t-hangars if units were available. Given these parameters and assumptions, **Table 3.2-5** presents the forecasted based aircraft tiedown area requirements for the 20-year planning period. As shown in the table, it is anticipated that the amount of apron space currently allocated for based aircraft, including the apron space constructed in 2003 and 2004, is adequate for the planning period.

**TABLE 3.2-5**
**BASED AIRCRAFT TIE-DOWN DEMAND**

| Aircraft Types | 2005 | 2010 | 2015 | 2020 | 2025 |
|---|---|---|---|---|---|
| Single Engine Piston | | | | | |
| Tiedown Positions | 16 | 17 | 18 | 18 | 18 |
| Multi Engine Piston | | | | | |
| Tiedown Positions | 1 | 1 | 2 | 2 | 2 |
| Total Tiedown Positions | | | | | |
| Required | 17 | 18 | 20 | 20 | 20 |
| Existing | 29 | 29 | 29 | 29 | 29 |
| Deficiency | None | None | None | None | None |

Source: URS Corporation (2005).

### *3.2.2 HANGAR DEVELOPMENT*

Currently there are 131 based aircraft at DMW. Growth in the number of based aircraft is projected throughout the planning period. Corporate jet aircraft including two Gulfstream IVs are currently based at DMW. There is an interest in locating larger jets at DMW including the Gulfstream V. A constraint to accommodating additional corporate and other general aviation aircraft at DMW is the current need for additional hangar facilities.

Typical use of hangar space varies across the country as a function of local climate conditions, airport security, and owner preferences. The percentage of based aircraft that are stored in hangars normally ranges from approximately 30 percent in states with moderate climates to over 80 percent in states subject to extreme weather conditions. The percentage of owners desiring hangar space usually varies by type of aircraft. It is assumed that a greater percentage of owners of high-performance aircraft will desire hangar space as compared to owners of low performance aircraft. National trends over the decade have shown an increase in hangar demand for all types of aircraft, however. Measuring demand for hangar space is not an exact science and the percentage of based aircraft that are housed in hangars greatly depends upon the availability of hangar space as much as the desire.

Based upon an analysis of existing storage trends at DMW, most of the based aircraft are stored in hangars. At the time of this writing, 102 of the 131 current based aircraft at DMW (approximately 77 percent) are stored in the existing T-hangars or corporate hangars. The remaining based aircraft are parked on the existing tiedown apron. Of the 102 aircraft currently stored in hangars, 92 aircraft are stored in the 6 nested T-hangar buildings, and 10 are stored in the 7 conventional, or corporate hangars. Note that approximately 10 of the existing 82 T-hangar units contain more than 1 aircraft. Of the 6 current T-hangar buildings, 3 were constructed in 1979 and are beginning to show signs of age and deterioration. The County is considering if these will be demolished over the next few years. Therefore, for this analysis, it is assumed that the estimated 45 aircraft that are housed in the 3 buildings to be demolished will be displaced.

The based aircraft facilities usage that was previously presented in **Table 3.2-4** was used to project the required number of T-hangar units and corporate hangar buildings for the 20-year planning period. Also, it is known that there are 10 aircraft in the 7 existing corporate hangars. This same aircraft-to-hangar ratio was used to determine the number of corporate hangar buildings required. These projections are included in **Table 3.2-6**. It should be noted that the table refers to only 42 available T-hangar spaces, since 42 units in the buildings constructed in 1979 would be demolished.

**TABLE 3.2-6**
**BASED AIRCRAFT HANGAR REQUIREMENTS**

| Hangar Types | 2005 | 2010 | 2015 | 2020 | 2025 |
|---|---|---|---|---|---|
| T-Hangar Units | | | | | |
| Single Engine Piston | 94 | 97 | 99 | 102 | 104 |
| Multi-Engine Piston | 10 | 12 | 14 | 15 | 18 |
| Required | 104 | 109 | 113 | 117 | 122 |
| Existing | 42 | 42 | 42 | 42 | 42 |
| Deficiency | 62 | 67 | 71 | 75 | 80 |
| Conventional Hangar Space | | | | | |
| Turbojet | 4 | 9 | 10 | 12 | 15 |
| Turboprop | 4 | 5 | 7 | 9 | 12 |
| Rotorcraft (Helicopter) | 2 | 2 | 2 | 2 | 2 |
| Total Aircraft | 10 | 16 | 19 | 23 | 29 |
| Required Corporate Hangars | 7 | 11 | 13 | 16 | 20 |
| Existing | 7 | 7 | 7 | 7 | 7 |
| Deficiency | None | 4 | 6 | 9 | 13 |

Source: URS Corporation (2006).

### *3.2.3 GENERAL AVIATION TERMINAL AREA*

General aviation passengers, both based and transient, currently use an FBO or meet at a predetermined location on the airport. There is no centralized public use general aviation passenger terminal facility at DMW. It is recommended that consideration be given to construction of a general aviation terminal, as a modern and functional terminal would provide a positive impression for visitors of Carroll County and the outlying region.

Public use conference rooms to facilitate business activities could be provided in a terminal facility. Office space for airport management and tenants as well as a pilot's lounge also could be incorporated. A snack bar or larger type eating facility could be operated by management contract. The approximate facility requirements for a general aviation terminal building and automobile parking are identified below.

#### *3.2.3.1 Terminal Building*

The size of a general aviation terminal building can vary greatly depending upon its uses and need for public space for aviation and non-aviation activity. Other determining factors are whether a FBO, municipal employees, or a combination of both operates the airport. There are a limited number of criteria that can assist in the planning and programming of terminal facilities at GA airports and each situation should involve a customized process to determine the extent of the terminal facilities.

However, in a generic sense, there are some metrics that can help determine the required overall size for such facilities. For example, it is acceptable to plan for terminal space based upon the current and project peak hour operations and passengers. Total peak hour operations at DMW are forecasted to range from 30 in 2005 to 54 at the end of the 20-year planning period. For planning purposes, arrivals and departures are assumed to be equal. A gross area of 120 square feet per peak hour operation was considered adequate to accommodate the peak hour pilots and passengers, regardless of whether the operations are by based aircraft or transients. This area was used in developing the total terminal building requirements presented in **Table 3.2-7**.

**TABLE 3.2-7**
**TERMINAL BUILDING REQUIREMENTS**

| Year | Peak Hour Operations | Area Required (s.f.) |
|---|---|---|
| 2005 | 30 | 3,600 |
| 2010 | 35 | 4,200 |
| 2015 | 40 | 4,800 |
| 2020 | 46 | 5,520 |
| 2025 | 54 | 6,480 |

Source: URS Corporation (2005).

#### *3.2.3.2 Terminal Automobile Parking Requirements*

Public automobile parking for a general aviation public terminal was calculated using a factor of 2.5 parking spaces per peak hour operation. **Table 3.2-8** presents the automobile space requirements for the general aviation terminal facility.

**TABLE 3.2-8**
**TERMINAL BUILDING AUTOMOBILE PARKING REQUIREMENTS**

| | 2005 | 2010 | 2015 | 2020 | 2025 |
|---|---|---|---|---|---|
| Annual Operations | 112,739 | 130,695 | 151,512 | 175,644 | 203,619 |
| Peak Hour Operations | 30 | 35 | 40 | 46 | 54 |
| Terminal Parking Spaces Required | 75 | 88 | 100 | 115 | 135 |

Source: URS Corporation (2005).

### *3.2.4 Fixed Base Operator*

A FBO typically is defined as a business operating from a fixed location at an airport that offers services including flight training, fuel sales, aircraft sales and maintenance, vendor services, and charter services. A new FBO at DMW would be located adjacent to the terminal building and would provide 24,000 square feet of space for the services noted above. Included in this area would be 21,600 square feet of hangar space for aircraft storage and maintenance, along with 2,400 square feet for offices, pilots lounge, and other public uses. This square footage is based on similar services offered at other general aviation airports that were analyzed as part of this study.

### 3.2.5 *OTHER AUTOMOBILE PARKING*

Additional parking spaces are required for users of the airport other than those who would use the services and amenities at the terminal. These would include, but not be limited to, spaces for conventional and T-hangar renters and their guests, visitors to the FBO, and employees of the maintenance facility. Currently there are approximately 40 spaces available at DMW for all users of the Airport. **Table 3.2-9** presents the parking requirements for the 20-year planning period. It should be noted that a ratio of 0.75 spaces per 1,000 annual operations was used in deriving future public automobile parking requirements.

**TABLE 3.2-9**
**ADDITIONAL AUTOMOBILE PARKING REQUIREMENTS**

| | 2005 | 2010 | 2015 | 2020 | 2025 |
|---|---|---|---|---|---|
| Annual Operations | 112,739 | 130,695 | 151,512 | 175,644 | 203,619 |
| Public Parking Spaces | | | | | |
| Required | 85 | 98 | 114 | 132 | 153 |
| Existing | 40 | 40 | 40 | 40 | 40 |
| Deficiency | 45 | 58 | 74 | 92 | 113 |

Source: URS Corporation (2005).

### 3.2.6 *AIRPORT ACCESS*

Access to DMW is provided via Airport Drive. This road leads into Maryland Route 97, which in turn provides access to the City of Westminster. Additionally, Maryland Route 140 intersects Route 97 approximately 1 mile south of the Route 97 / Airport Road interchange. Route 140 is the primary route connecting Carroll County to points southeast, including Baltimore. Route 97 provides access to Washington, D.C. to the south and Pennsylvania to the north.

Current roadway improvements in the vicinity of DMW include modifications to existing bridge structures on Route 140. Other regional roadway improvements under consideration for future design and construction include, but are not limited to, the following:

- Additional travel lanes on Route 97 between the Route 140 intersection and Bachmans Valley Road; and,

- Installation of a traffic signal at the Route 97 / Old Meadow Branch Road intersection.

Carroll County recently purchased acreage northeast of and adjacent to DMW for future airport development. Access to this development could be provided by the extension of Business Parkway North to the new parcel. Combined with roadway improvements underway or under consideration, the regional access to DMW is sufficient for the planning period.

### *3.2.7 SUPPORT FACILITIES*

Certain facilities do not fall logically under the categories of airfield or landside facilities. Such airport elements include airport maintenance, fuel storage facilities, and airport perimeter fencing.

#### *3.2.7.1 Aviation Fuel Storage Facilities*

Aircraft fuel storage is provided by 4 12,000-gallon tanks, 1 for 100-LL and 3 for Jet-A aircraft fuel.

Fuel farm capacity requirements vary depending on individual replenishment cycles and distribution policies. Although the airport sponsor can provide fuel farm areas, the actual construction, maintenance, and liability could be the responsibility of the individual fueling operator. Areas must be quantified as part of the master planning process.

Fuel farm requirements at DMW are based on historical fuel demand rates for Jet A and 100 LL fuel. The average monthly demand for both 100 LL and Jet A is presented in **Table 3.2-10**.

**TABLE 3.2-10**
**ANNUAL FUEL SALES**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|
| Total Fuel Sales (gal) | 135,775 | 115,868 | 140,726 | 208,350 | 408,866 | 618,180 | 574,125 |
| 100 LL | | | | | | | |
| Gallons Sold | 103,351 | 58,747 | 80,657 | 65,187 | 61,682 | 54,900 | 66,812 |
| Avg. Gallons Per Mo. | 8,613 | 4,896 | 6,721 | 5,432 | 5,140 | 4,575 | 5,567 |
| Percentage of Total | 76 | 51 | 57 | 31 | 15 | 9 | 12 |
| Jet A | | | | | | | |
| Gallons Sold | 32,424 | 57,121 | 60,069 | 143,163 | 347,184 | 563,280 | 507,313 |
| Avg. Gallons Per Month | 2,702 | 4,760 | 5,006 | 11,930 | 28,932 | 46,940 | 42,276 |
| Percentage of Total | 24 | 49 | 43 | 69 | 85 | 91 | 88 |

Source: DMW (2007).

It is recommended that one additional 12,000-gallon Jet-A fuel tank be programmed for procurement by the end of the planning period. Alternately, when the additional tank is required, the County may choose to remove the 3 existing 12,000-gallon tanks and install 3 50,000-gallon tank to provide the needed fuel capacity. It is not expected that an additional 12,000-gallon 100-LL tank would be required during the planning period.

#### *3.2.7.2 Airport Maintenance Equipment Facility*

As the Airport sponsor, Carroll County is responsible for general airport maintenance, ranging from grass mowing in summers to snow removal in winters. A 4,000-square foot airport maintenance facility was recently constructed.

#### *3.2.7.3 Airport Perimeter Fencing*

Historically, the FAA has preferred the enclosure of all airfield space through the installation of fencing. This would prevent unrestrained access to the airfield for vehicles, pedestrians, and wildlife. The most widely used method of controlling vehicular, pedestrian, and wildlife access is through appropriately located perimeter fencing. Chain-link fencing currently exists around the entire perimeter of the airport, with gates as necessary to control the flow of vehicular and pedestrian traffic onto the airside. It is recommended that the fencing and gates be maintained, and additional fencing and gates be installed, as needed, to support the airport development.

## *3.3 SUMMARY OF FACILITY REQUIREMENTS*

This section has presented the facility requirements for the continued development of DMW. Facility requirements listed herein were predicated on forecast aviation demand. It should be emphasized that demonstrated demand rather than a particular forecast time frame should be used for recommending additional facilities. Recommendations contained herein are intended to optimize the operational efficiency, effectiveness, flexibility, and safety of the Airport. **Table 3.3-10** presents a summary of the facility requirements presented in this section

The next step in this process would be to analyze alternatives that could accommodate the identified facility requirements. The next section will provide this analysis and recommend the best alternative for the future development of the Airport.

**TABLE 3.3-10**

**FACILITY REQUIREMENTS SUMMARY**

| Item | 2005 | 2010 | 2015 | 2020 | 2025 |
|---|---|---|---|---|---|
| Based Aircraft Apron | | | | | |
| Tiedown Positions Required | 17 | 18 | 20 | 20 | 20 |
| Tiedown Positions Existing | 29 | 29 | 29 | 29 | 29 |
| Deficiency | None | None | None | None | None |
| Transient Aircraft Apron | | | | | |
| Required (sy) | 29,400 | 34,100 | 39,700 | 46,500 | 53,400 |
| Existing (sy) | 24,700 | 24,700 | 24,700 | 24,700 | 24,700 |
| Deficiency (sy) | 4,700 | 9,400 | 15,000 | 21,800 | 28,700 |
| T-Hangars | | | | | |
| Required Units | 104 | 109 | 113 | 117 | 122 |
| Existing Units | 42 | 42 | 42 | 42 | 42 |
| Deficiency | 62 | 67 | 71 | 75 | 80 |
| Conventional Hangars | | | | | |
| Required Number | 7 | 11 | 13 | 16 | 20 |
| Existing Number | 7 | 7 | 7 | 7 | 7 |
| Deficiency | None | 4 | 6 | 9 | 13 |
| Terminal Building | | | | | |
| Required (sf) | 3,600 | 4,200 | 4,800 | 5,520 | 6,480 |
| Existing (sf) | 0 | 0 | 0 | 0 | 0 |
| Deficiency | 3,600 | 4,200 | 4,800 | 5,520 | 6,480 |
| Terminal Auto Parking | | | | | |
| Required Spaces | 75 | 88 | 100 | 115 | 135 |
| Existing Spaces | 0 | 0 | 0 | 0 | 0 |
| Deficiency | 75 | 88 | 100 | 115 | 135 |
| Public Automobile Parking Spaces | | | | | |
| Required Spaces | 85 | 98 | 114 | 132 | 153 |
| Existing Spaces | 40 | 40 | 40 | 40 | 40 |
| Deficiency | 45 | 58 | 74 | 92 | 113 |

Source: URS Corporation (2006).