Chapter 3 – Facility Requirements

3.1 Introduction

A flexible master plan should consider an airport's current and short-term requirements and carefully examine long-term needs to systematically develop the airport in an efficient and cost-effective manner. In doing so, airport planning typically addresses the following three fundamental questions:

1) What enhancements to existing facilities or additional facilities are needed to allow the airport to accommodate present-day aviation demand and to maintain existing airport level of service requirements?
2) What additional facilities are needed to bring the airport into compliance with current FAA standards?
3) What additional facilities are needed to accommodate forecasted aviation demand?

This chapter discusses a phased approach to facilities improvements and development at the Independence Municipal Airport (IMA) over the 20-year planning period. It should be noted that this chapter is for planning purposes only and neither the city of Independence, the Iowa DOT, nor the FAA are obligating themselves to fund any of the projects called for within.

The improvements outlined on the following pages represent the development that is required not only to meet identified levels of demand but that also simultaneously yields a safe, efficient, unconstrained, and attractive public facility. To assess the viability of providing for the facility enhancements noted herein, the Master Plan Update will take into consideration environmental factors in **Chapter 4: Environmental Overview** and the cost of development and the availability of funding sources in **Chapter 5: Capital Improvements Program**.

Unless specifically recommended for upgrade or replacement, it is an underlying assumption that as existing navigational aids, airfield signage and lighting systems, and pavement markings age and become more difficult to maintain, they would be replaced when appropriate. Similarly, when pavement conditions deteriorate to an unacceptable level, the pavement should be rehabilitated or reconstructed. It is recommended that when the Pavement Condition Index (PCI) is above 70 (fair condition or better), preventative pavement maintenance is performed. When maintenance efforts and costs become excessive and the PCI decreases to 70 or less, the pavement should undergo major rehabilitation or reconstruction as appropriate. These maintenance costs will be programmed into the Airport Capital Improvement Program.

3.2 Airport Role and Aviation Services

As mentioned in **Chapter 1: Inventory**, one task of this Airport Master Plan Update is to determine the future functional role of the IMA with respect to the FAA's 2013-2017 National Plan of Integrated Airport Systems (NPIAS) and the Iowa DOT's 2010-2030 Aviation System Plan (IASP). Per the NPIAS, the general aviation airport classification is broken down into National, Regional, Local, and Basic airports based on the functions they provide. Per the NIPAS, the IMA is categorized as a Local General Aviation airport which supplements local communities by providing access to local and regional markets. The IASP further classifies airports based on their ability to support various types of aircraft and aviation services. Publicly-owned airports are classified into

one of the following five service roles: Commercial, Enhanced, General, Basis, and Local. Per the IASP, the IMA is classified as an Enhanced Service airport.

With its primary runway measuring 5,500 feet in length, other facilities, and the services provided through Walter Aviation, the IMA can accommodate a full range of general aviation activity including most business jets. As such the current NPIAS and IASP role classifications for the IMA are expected to remain as such for the foreseeable future.

As summarized in **Chapter 1: Inventory, Table 1-2**, the IMA provides a variety of aviation services. Of the fifteen service target needs recommended by the IASP, the IMA provides thirteen. The IASP recommends the IMA provide two additional services to fully meet its Enhanced Service airport classification: based aircraft rental and charter service. Through Walter Aviation, there are aircraft based at the IMA that are available for rent so the IASP should be updated to reflect this. With regard to charter service, Walter Aviation is currently in the process of applying for a Part 135 air charter certificate from the FAA.

3.3 Communications and Weather Reporting

To improve communications with air traffic controllers, the IASP recommends that a Remote Communications Outlet (RCO) be installed at the IMA. An RCO is communication system that provides a direct telephone link between the pilot (while the aircraft is on the ground or in the air) via an antenna on the ground and air traffic control specialists at a Flight Service Station (FSS) anywhere in the U.S. Essentially, an RCO extends the service range of the FSS. Installation of an RCO similar to the one depicted in **Exhibit 3-1** will be included in the 20-year ACIP.

For weather reporting, the existing AWOS-3, light primary wind cone, and the two lighted supplemental wind cones meet current and long-term weather reporting needs for the IMA.

Exhibit 3-1. Typical RCO

Source: Snyder & Associates, Inc.

3.4 Airfield Capacity

An airfield capacity analysis is conducted to determine the theoretical capacity, in terms of the number of aircraft operations the airfield can accommodate based on a number of factors. From the analysis, current or potential airfield facility deficiencies impacting airport operational capacity can be identified. Airfield capacity for the IMA was evaluated utilizing the methodology contained in FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*. There are a number of techniques for assessing airfield capacity. For the IMA Master Plan Update, the assessment will utilize Annual Service Volume (ASV).

An airfield's capacity as expressed in terms of its ASV is defined as the maximum number of operations (i.e. aircraft arrivals, departures, and touch-and-go's) that can take place on the runway system over a one-year period. An estimate of capacity is influenced by many factors, including the airfield's configuration, the operational flow/utilization of the runway system, the location of exit

taxiway from the runway, the types of aircraft using the airfield (fleet mix), wind and weather characteristics, and airspace constraints.

Two general rules of thumb pertaining to airport capacity thresholds are that when the level of operations reach 60 percent of the ASV, it is prudent to begin planning for future capacity enhancement such as taxiway and runway improvements (up to and including a parallel runway); and at 80 percent of the ASV, construction of those enhancements/facilities should begin. While these general rules apply, capacity enhancements involving significant runway enhancements typically also must meet cost benefit thresholds and environmental approvals prior to moving forward.

Preliminary planning values indicate the IMA single runway configuration currently provides an ASV of 230,000 annual operations. Over the forecast period, aircraft operations at the IMA are forecasted to increase to 13,000 annually. Because this forecasted demand represents less than six percent of the ASV, no additional airfield capacity enhancements are required to meet current or forecasted aviation demand. For reference, some of the busiest general aviation airports in 2012 experienced between 250,000 and 300,000 operations according to the FAA's Air Traffic Activity Data System (ATADS).

3.5 Instrument Approach Procedures

As noted in **Chapter 1: Inventory, Section 1.17**, there are three instrument approach procedures (IAPs) available at the IMA to aid pilots in landing their aircraft when weather conditions are poor. A copy of each approach procedures is included in **Appendix A**. These procedures and the landing minimums afforded by each are summarized in **Table 3-1.** As shown in this table, the four different approach types – listed in order of least to most precise – are S-18, Circling, LNAV, and LP.

Table 3-1. Current Instrument Approach Procedures at the IMA

Approach Type	Approach Procedure		
	RNAV (GPS) 18	RNAV (GPS) 36	NDB 18
S-18	n/a	n/a	800-1
Circling	600-1	600-1	800-1
LNAV	400-1	400-1	n/a
LP	400-1	n/a	n/a

Source: AirNav www.airnav.com. At or before reaching these minimums, the pilot must be able to see the runway. If not, the pilot would not be able to land safely and would need to execute a missed approach.

The S-18 is a straight-in approach to Runway 18 using the NDB. A straight-in approach is when the final approach is begun without first having executed a procedure turn. The S-18 approach allows landings to be conducted when the clouds are as low as 800 feet above the ground and the visibility is down to one statute mile from the runway end (800-1). The Circling approach is an alternative to the S-18 straight-in approach where a turn is required as part of the approach procedure. The pilot can execute the approach (including a turn towards the desired runway) and land to Runway 18 using either the NDB or the RNAV (GPS) or land to Runway 36 using the RNAV (GPS) procedure. As

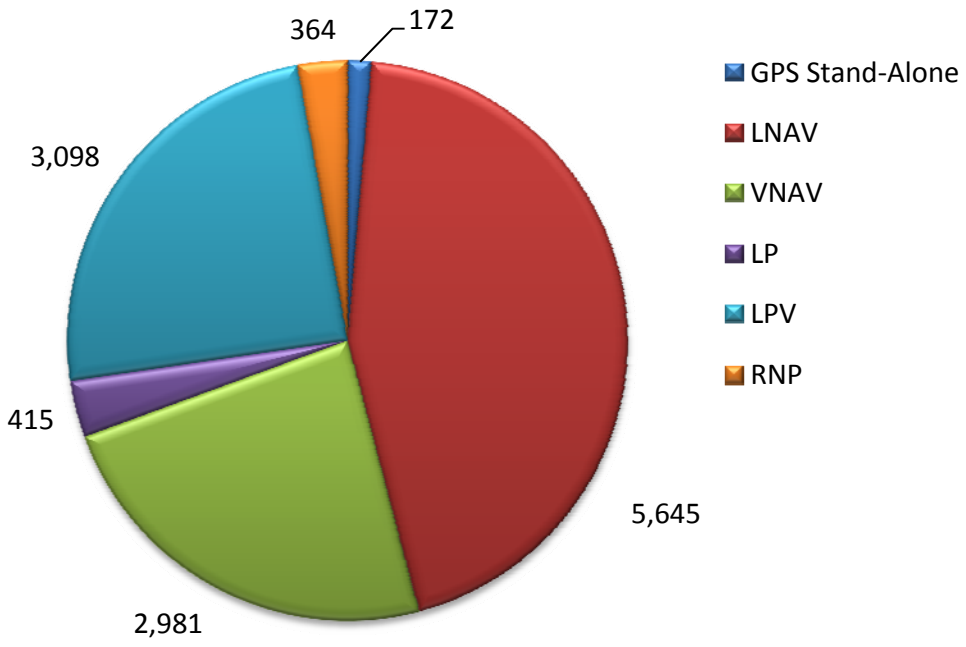
conveyed in the table, the RNAV (GPS) approach procedures afford better (lower) approach minima (600-1) than the NDB approach (800-1), which is typical.

Whereas the S-18 and Circling approaches using the NDB have been around for decades, the LNAV and LP approaches are the newest types. Because the design of these approach types is based on RNAV (GPS), they are the most precise and offer the best (lowest) minima of 400-1. These two approach types are best explained best in relation to the two other types of RNAV (GPS) approach types available. In order from least to most precise, the four RNAV (GPS) types of approaches that are currently available to pilots (without the need for specialize training) at qualifying airports are listed as follows and explained in the following paragraphs:

- Lateral Navigation (LNAV),
- Lateral Navigation/Vertical Navigation (LNAV/VNAV),
- Localizer Performance with Vertical Guidance (LPV), and
- Localizer Performance (LP).

Of these four procedures, the LNAV are the most prevalent at airports across the U.S. due to the fact that they are the oldest type having been developed solely on the GPS (before the WAAS was available). Courtesy of the FAA, **Exhibit 3-2** conveys the number of GPS and WAAS-based procedure currently available. As shown, the LNAV procedure type is the most prevalent followed by VNAV and LPV. The LP procedure type represents three percent of the total number of satellite-based procedures. Over the next several years the number of GPS Stand-Alone procedures will continue to decrease as they are replaced by RNAV procedures.

Exhibit 3-2. Types of Satellite-based Approach Procedures in the U.S.



Source: FAA (IFP) Inventory Summary, Pub. Cycle 3/7/2013

Lateral Navigation (LNAV). This approach type uses the GPS and/or the WAAS for lateral navigation only – there is no vertical course guidance for a controlled descent to the runway. Even so, upon reaching the final approach fix (a specific point in air) the pilot can descend to a specified altitude (called the Minimum Descent Altitude or MDA) using the barometric altimeter in the aircraft. As a consequence, LNAV approach types are the least precise of the four RNAV (GPS) approaches and therefore usually do not allow the pilot to descent to as low of an altitude above the runway as could be achieved with other approach types. Typically, LNAV procedures achieve a minimum descent altitude (MDA) of 400 feet above the runway. This is the case with both RNAV (GPS) approach procedures at the IMA.

Lateral Navigation/Vertical Navigation (LNAV/VNAV). This is a more precise approach type than the LNAV for it not only provides lateral guidance from the GPS and/or the WAAS (just as the LNAV procedure does), but also vertical guidance provided by either the barometric altimeter or WAAS. Aircraft that do not use WAAS for the vertical guidance portion must have VNAV-capable altimeters, which are typically part of a flight management system (FMS). When the pilot flies an LNAV/VNAV approach lateral and vertical guidance is provided to fly a controlled descent, a safer maneuver, to the runway. As such the MDA on these approaches are usually 350 feet above the runway. The IMA's approach procedures do not provide the LNAV/VNAV approach type.

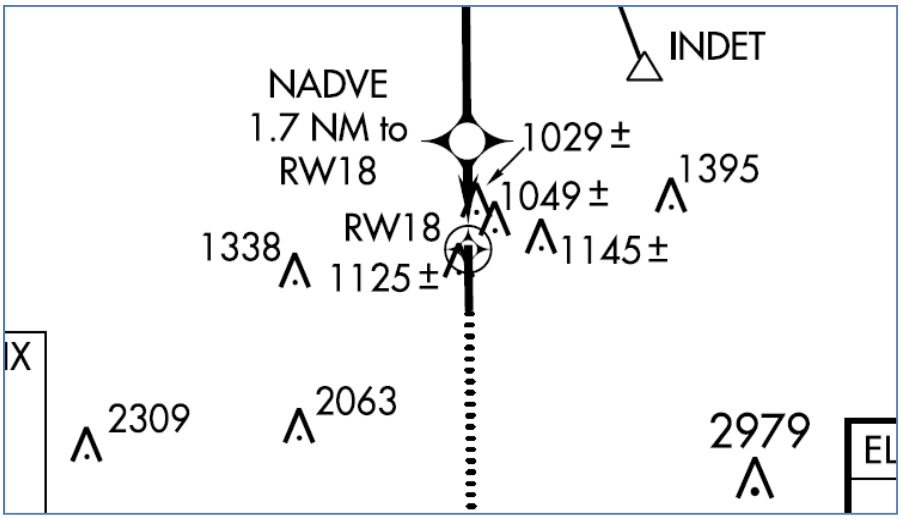
Localizer Performance with Vertical Guidance (LPV). These are the highest precision, WAAS-enabled approach procedure types that are currently available without specialized aircrew training requirements (as is needed for the Required Navigation Performance (RNP) procedure). Although LPV procedures have no requirement for ground-based transmitters at an airport, the landing minima afforded by the LPV procedure type are similar to those in an Instrument Landing System (ILS), that is a decision height as low as 200 feet above the ground (although 250 feet would not be unexpected) and visibility as low as one half statute mile (200-1/2). If a qualifying airport is capable of publishing a LPV procedure that provides these minimums (which are the lowest available from the WAAS), it is dubbed as a LPV-200 procedure. The LPV approach type is not provided by the IMA's approach procedures.

Localizer Performance (LP). In the event the LPV procedure type cannot be provided due to terrain or obstructions, the slightly less precise LP procedure may be an option. This new approach type takes advantage of the lateral guidance and small position errors allowed by WAAS and effectively providing lateral guidance equivalent to the localizer antenna (a component of the ILS). And because the LP procedure has a narrower obstacle clearance surface that the one used to design an LPV procedure, it provides greater potential for avoiding obstructions in the approach corridor that would otherwise drive the minima to be higher. At the IMA, a LP procedure is available to Runway 18.

Since an LP approach type is provided at the IMA, and this is the default approach type when a LPV approach type is not possible, it could be assumed that the FAA attempted previously to develop a more precise LPV approach type but was unsuccessful. As the terrain surrounding the IMA would not appear to be the controlling factor, there must be an obstruction that is preventing the LPV approach. The other possible scenario is that the aeronautical survey was not conducted to meet LPV requirements (horizontal and vertical guidance) but perhaps to meet LP and LNAV requirements (horizontal guidance only) – the LP and LNAV survey data could not support the development of an LPV approach.

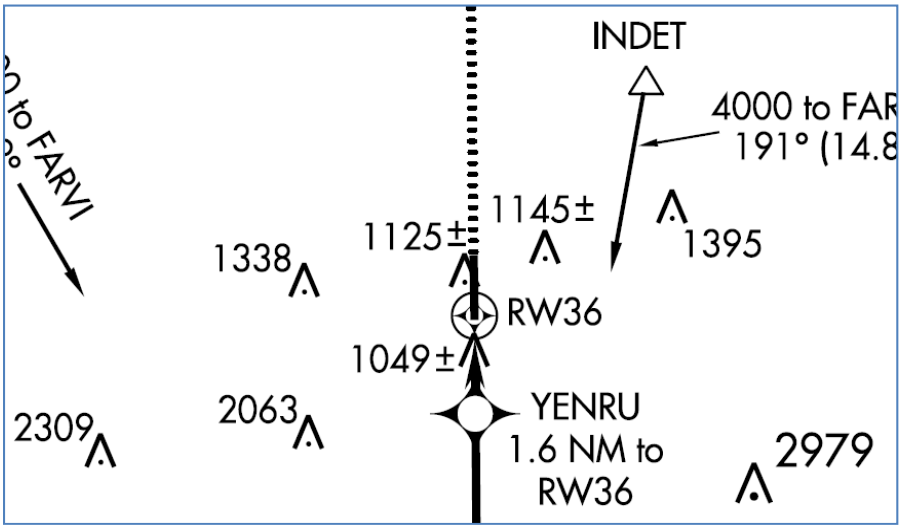
While the FAA 5010 Form lists no close-in obstructions, there are several tall structures depicted on the RNAV (GPS) RWY 18 and RNAV (GPS) RWY 36 approach procedure charts. The portion of these charts depicting tall structures near the airport are depicted in **Exhibits 3-3 and 3-4**. Of most concern are those objects that are very near the runway and located along the approach path.

Exhibit 3-3. Portion of RNAV (GPS) RWY 18 Approach Chart



Source: AirNav, www.airnav.com. Effective 04 APR 2013 to 02 MAY 2013

Exhibit 3-4. Portion of RNAV (GPS) RWY 36 Approach Chart



Source: AirNav, www.airnav.com. Effective 04 APR 2013 to 02 MAY 2013

As part of this Airport Master Plan Update, an Aeronautical Survey and Airport Airspace Analysis of Runway 18-36 is being conducted to validate these and other objects. This survey and its related work will support the FAA's development of a LPV approach type to Runways 18 and 36.

Assuming it is possible to mitigate the all tall objects so they are not impactful, an ultimate LPV approach type with minimum of 200-1/2 could be achievable from an airspace perspective. However, in lowering visibility minimums to "as low as 1/2 statute mile", the physical separation between Runway 18-36 and its parallel taxiway would need to be increased from 300 feet to 400 feet to meet FAA standards of ARC C-II, lower than 3/4 statute mile . This would either require relocating the runway to the west or relocating the taxiway, terminal apron, hangars and other facilities to the east. To reconfigure the airport to gain a quarter-mile boost in visibility minimum is not cost effective to say the least. Therefore, to set expectations, a LPV approach type with minimums of 300-3/4 would be more likely which would still greatly enhance the usability of the IMA and the safety of aircraft operations.

3.6 NAVAIDS and Visual Aids

As mentioned in **Chapter 1, Inventory**, the NDB air navigation aid has been under a worldwide phase out for some time as GPS-based navigation and approach procedure availability becomes the norm. Located on airport property, the Wapsie NDB is the basis of the NDB RWY 18 approach procedure which is used extensively for flight training and also serves as a backup to the RNAV (GPS) RWY 18 IAP. Despite the redundancy the NDB provides at the IMA, the FAA may in the future decommission the Wapsie NDB. Until such conversations are initiated by the FAA, it is assumed that the FAA-owned Wapsie NDB and is associated approach procedure will remain.

Installed as part of the Runway 18-36 reconstruction/extension project, each approach end of the runway is equipped with a two-box PAPI system. With the longer runway, the airport has attracted additional jet aircraft traffic and as such, the two-box PAPI system should be expanded to a four-box PAPI system which is designed for jet aircraft operations. The other visual aids (rotating beacon, REILs, and runway edge/threshold lighting) are in very good condition and replacement of these systems is not expected during the 20-year planning period.

3.7 Primary Runway

FAA Advisory Circular (AC) 150/5325-4B, *Runway Length for Airport Design*, was used to determine if the current length of Runway 18-36 is sufficient to accommodate present-day and forecasted aviation demand. The use of this AC is mandatory for airport projects expected to receive Federal funding. Within this AC, the methodology presented in Chapter 3: *Runway Lengths for Airplanes within a Maximum Certificated Takeoff Weight of More than 12,500 Pounds (5,670 Kg) Up To and Including 60,000 Pounds (27,200 Kg),* shall be used to determine the runway length. The five steps outlined in this chapter are discussed in detail as follows:

Step 1. Identify the list of critical design airplanes that will conduct at least 500 annual itinerant operations at the airport. Based on the information provided in **Chapter 2, Forecast, Table 2-12**, there are at least 500 annual itinerant operations conducted by ARC B-II aircraft which predominately include twin-engine turboprop and light to small business jet aircraft.

Step 2. Identify the airplanes that will require the longest runway lengths at maximum certified takeoff weight (MTOW). When the MTOW of the critical design airplane is 60,000 pounds or less, runway length requirements are determined according to a family of aircraft having similar performance characteristics and operating weights. As mentioned previously in **Chapter 2, Forecast**, there are a variety of itinerant aircraft in the ARC B-II category that have certified

maximum takeoff weights less than 60,000 pounds that regularly use (and are expected to continue to use) Runway 18-36. Examples of these itinerant aircraft are:

- Beechcraft King Air 350, a corporate turboprop aircraft with a MTOW of 15,000 pounds.
- Cessna Citation II (Model 550) and Ultra (Model 560) which is depicted in **Exhibit 3-5**. These are light corporate jets with MTOWs of 15,100 pounds.
- Raytheon Beechjet 400, a light corporate jet with a MTOW of 15,780 pounds.
- Dassault Falcon 50, a mid-size corporate jet with a MTOW of 37,478 pounds.

Exhibit 3-5. Cessna Citation Ultra at the IMA

Source: Walter Aviation, Inc. Photo date unknown.

Step 3. Determine the method that will be used for establishing the recommended runway length. Chapter 3 of AC 150/5325-4B identifies two separate groups of aircraft according to their performance capabilities and what percent of the total aircraft fleet encompassed in the grouping. The two groups are "Airplanes that Make Up 75 Percent of the Fleet" and the "Remaining 25 Airplanes that Make Up 100 Percent of the Fleet." Aircraft within the "75 percent" group include the Cessna Citation II, Cessna Citation Ultra, and the Dassault Falcon 50. There are no aircraft within the "100 percent" group operating at the IMA now or expected to do so in the future. Therefore, having established the group of aircraft, the next step is to select a useful load for these aircraft.

Useful load consists of the passengers, baggage, cargo, and usable fuel that can be carried by the aircraft. The useful load is expressed as a percentage of the aircraft's MTOW. The two useful load categories available in AC 150/5325-4B are the 60 and 90 percent of useful load. The selection of a useful load category is based on the haul length and service needs of the critical aircraft (or family of aircraft). The 90 percent useful load category is used only when the critical aircraft (or family of aircraft) are unusually loaded with passengers, baggage and/or cargo, or are flying long distances (greater than 500 nautical miles).

Step 4. Determine the recommended runway length. Using Figures 3-1 and 3-2 of AC 150/5325-4B, the recommended runway length for the "75 percent" group at 60 and 90 percent useful load is reflected in the first column of **Table 3-2**. Although there are no aircraft within the "100 percent" group operating at the IMA, the recommended runway length was calculated for reference.

Step 5. Apply any necessary adjustment to the recommended runway length. The runway lengths obtained from Figures 3-1 and 3-2 are based on no wind and a dry and flat runway surface. Therefore, the runway lengths obtained are adjusted for takeoff operations to account for elevation differences in the runway and for landing operations of turbojet-powered airplanes under wet and slippery runway surface conditions. After both adjustments have been independently applied, the larger resulting runway length of the two becomes the recommended runway length. The runway lengths adjusted for takeoff and landing operations are reflected in the middle two columns of **Table 3-2**. The final runway length is listed in the right column.

Table 3-2. Primary Runway Length Calculation Results

Length per AC 150/5325-4B (a)	Takeoff Length Adjustment (b)	Landing Length Adjustment (c)	Final Runway Length (d)
75 Percent of Fleet at 60 Percent Useful Load (Figure 3-1)			
4,750	4,800	5,463 (use 5,463)	5,500
100 Percent of Fleet at 60 Percent Useful Load (Figure 3-2)			
5,450	5,500	6,268 (use 5,500)	5,500
75 Percent of Fleet at 90 Percent Useful Load (Figure 3-1)			
6,350	6,400	7,303 (use 7,000)	7,000
100 Percent of Fleet at 90 Percent Useful Load (Figure 3-2)			
8,150	8,200	9,373 (use 7,000)	8,200

Source: Analysis by Snyder & Associates, Inc.

(a) Lengths are in given in feet and are based on airport elevation of 979 feet and a mean daily maximum temperature of the hottest month (July) of 83.0 degree F per NOAA NCDC Summary of Monthly Normals, 1981-2010.

(b) The runway lengths obtained from Figures 3-1 or 3-2 are increased at the rate of 10 feet for each foot of elevation difference between the high and low points of the runway centerline. The difference between the high and low points along Runway 18-36 is five feet.

(c) The runway length for turbojet-powered airplanes obtained from the "60 percent useful load" curves are increased by 15 percent or up to 5,500 feet, whichever is less. The runway lengths for turbojet powered airplanes obtained from the "90 percent useful load" curves are also increased by 15 percent or up to 7,000 feet, whichever is less. No adjustment is necessary for turboprop-powered airplanes. The value shown in parenthesis is selected value for the landing length.

(d) The larger of the takeoff length and landing length is selected then round lengths of 30 feet and over to the next 100-foot interval.

In conclusion, Runway 18-36's existing length of 5,500 feet is adequate to accommodate current and forecasted aviation demand. However, given the dynamic nature of the aviation industry, it is prudent to have the next Master Plan Update review the data presented herein and revisit the runway length discussion.

Realizing that Runway 18-36 is bounded by 220th Street to the north and U.S. Highway 20 to the south, a future extension of the runway may be a foregone conclusion. In its current configuration, Runway 18-36 is constructed to provide for the necessary safety areas beyond the runway and the proper airspace clearance over each road. In total, the runway and associated safety area measures 7,500 feet. The distance between 220th Street and U.S. Highway 20 is approximately 1.5 miles or 7,920 feet. As such, the runway environment has been maximized to fit neatly between the two roads and their respective right-of-way. With this arrangement, any future extension of Runway 18-36 would require relocation of one or both roads as a direct impact. This would add significant cost to a runway extension resulting in an extremely high cost-to-benefit ratio and likely making such a project financially unrealistic. This of course is notwithstanding the potential impacts to the area environment and Independence community.

Regardless of runway length, the runway pavement has service needs that must be addressed in the future. Runway 18-36 is an asset and must be kept in good condition to attract business aircraft whose owners may be seeking development opportunities in the community. Assuming a 25-year service life for the pavement, reconstruction of the runway is recommended for the year 2032, the last year of this Master Plan Update's 20-year planning period. Prior to its reconstruction, regular maintenance of the pavement will be necessary and programmed into the Airport Capital Improvements Program to maintain a PCI above 70 as recommended by the Iowa DOT for Enhanced Service airports.

3.8 Crosswind Runway

Wind Analysis

Wind conditions are of prime importance in determining runway orientation and use. Where winds are consistently in one direction, a single runway can adequately provide for a safe and efficient airport. In most areas however, wind direction is not consistent and a second runway is typically required. Generally, the smaller and lighter the aircraft is, the more its performance will be affected by the wind and the more likely it will need to use a secondary runway that is better aligned with the crosswind – the component of wind that is perpendicular to the runway.

The FAA recommends additional runways when the primary runway provides less than 95 percent wind coverage. In other words, when the primary runway is usable less than 95 percent of the time, the addition of a crosswind runway is recommended increase the airport's utility and enhance flight safety. The 95 percent wind coverage is computed on the basis of crosswinds not exceeding 10.5 knots (12 mph) for small aircraft in Airport Reference Code (ARC) A-I and B-I categories, 13 knots (15 mph) for A-II and B-II categories, and 16 knots (18 mph) and 20 knots (23 mph) for all larger aircraft. These crosswind values and their corresponding ARC categories are conveyed visually in **Table 3-3**.

Table 3-3. Allowable Crosswind per FAA ARC

Allowable Crosswind Speed			
10.5 knots	13 knots	16 knots	20 knots

Airport Reference Code (ARC)					
A-I	A-II	A-III	A-IV	-	-
B-I	B-II	B-III	B-IV	-	-
C-I	C-II	C-III	C-IV	C-V	C-VI
D-I	D-II	D-III	D-IV	D-V	D-VI

Source: Federal Aviation Administration

For the most recent 10-year period of wind data[1] provided by the National Climatic Data Center, the wind coverage at the IMA afforded by Runway 18-36 is presented in **Table 3-4**. As shown in this table, the runway provides less than 95 percent wind coverage for the 10.5 and 13 knot crosswind speeds for all three weather categories. As a result, aircraft up to and including the B-II ARC classification such as the Beechcraft King Air family of turboprops and light/small Cessna Citation jets may not be capable of safely operating on Runway 18-36 during these weather categories. As such, the need for a crosswind runway is recommended per FAA guidance.

Table 3-4. Percent Wind Coverage Provided by Runway 18-36

Weather Category (see notes)	Allowable Crosswind Speed			
	10.5 knots	13 knot	16 knot	20 knot
ALL	87.59%	93.03%	97.47%	99.30%
VMC	87.96%	93.28%	97.58%	99.34%
IMC	82.77%	90.28%	96.94%	99.25%

Source: Analysis by Snyder & Associates, Inc.

(a) The ALL (all weather condition) category includes all cloud ceiling and visibility increments.

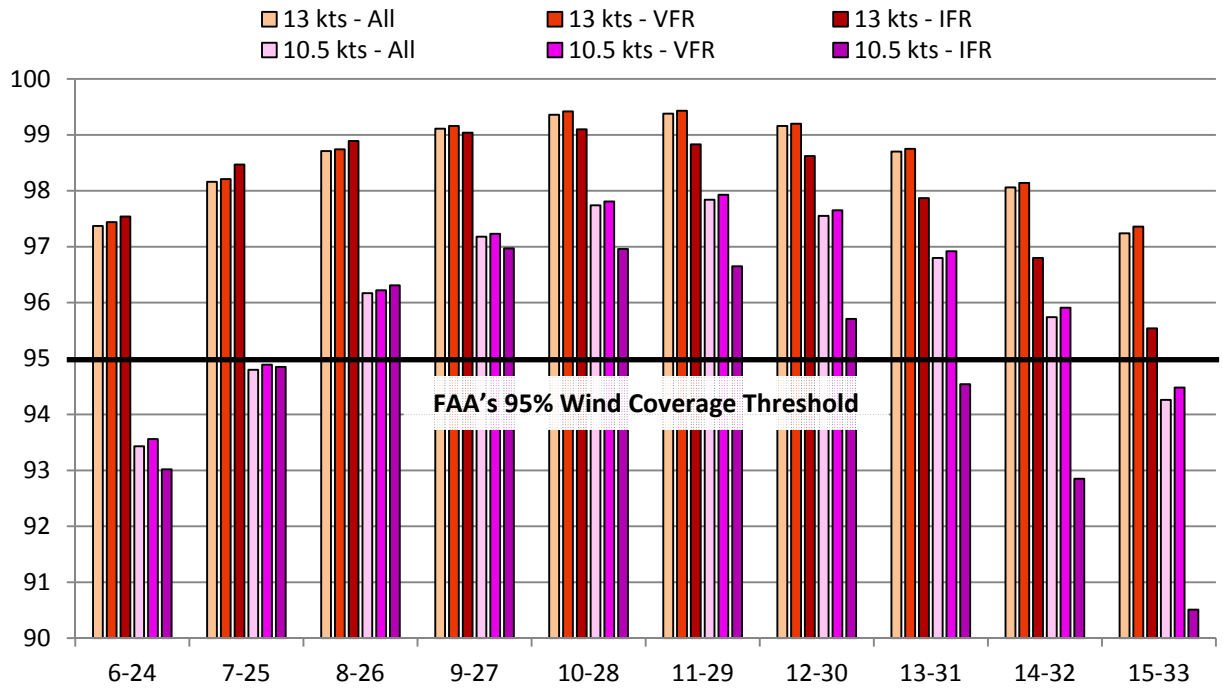
(b) The VMC (visual meteorological condition) category includes cloud ceiling of 1,000 feet above ground and higher and visibility of 3 statute miles or greater.

(c) The IMC (instrument meteorological condition) category includes cloud ceiling between 200 feet and less than 1,000 feet above ground and visibility between 1/2 statute mile and less than 3 statute miles.

[1] As the AWOS-3 at the IMA was installed in 2004, it does not yet provide 10 consecutive years of wind data as required by the FAA. As such, wind data used in this analysis was obtained from the station at the Waterloo Regional Airport (ALO) located approximately 21 nm west-northwest of the IMA. Upon review of the limited IMA wind data, it was found to provide crosswind runway coverage results very similar to that of the Waterloo wind data.

To determine viable crosswind runway orientations the ALL, VMC, and IMC weather categories for Runway 18-36 and several crosswind runway configurations were analyzed using the FAA's Wind Rose Form[2]. Ideally, a crosswind runway orientation should bring the overall airport wind coverage up to at least 95 percent when combined with the wind coverage afforded by Runway 18-36. In reviewing the wind coverage currently provided by Runway 18-36, several crosswind runways orientations were considered and the top ten results are presented in **Exhibit 3-6**.

Exhibit 3-6. Combined Wind Coverage of Runway 18-36 and Various Crosswind Runway Alignments



Source: Analysis by Snyder & Associates, Inc.

What this exhibit shows is that the most of the orientations increased wind coverage above the FAA's 95 percent threshold for the ALL, VMC, and IMC weather categories. From these wind analysis results, there are several crosswind runway orientations capable of meeting the IMA's wind coverage needs. Yet before a crosswind runway orientation can be selected, the length of runway must first be determined which begins with a review of the types of aircraft expected to use the crosswind runway followed by a determination as to the type of airport the IMA is classified as per AC 150/5325-4B, *Runway Length for Airport Design*.

Crosswind Runway Length

As the 13 knot crosswind component is the highest wind speed for which Runway 18-36 provides less than 95 percent wind coverage, the length of the crosswind runway shall be calculated for those aircraft in the ARC B-II category. These aircraft range from single-engine piston aircraft such as the Cessna 182 Skylane to multi-engine piston aircraft such as the Beechcraft Baron 55 and light/small

[2] https://airports-gis.faa.gov/airportsgis/publicToolbox/windroseForm.jsp

corporate jet aircraft like the Cessna Citation II. Following the requirements of AC 150/5325-4B, possible crosswind runway lengths were calculated using the procedure outlined in Chapter 2: *Runway Lengths for Small Airplanes with Maximum Certified Takeoff Weight of 12,500 pounds or Less*, which is fairly similar to the runway length procedure presented above for Runway 18-36. Whereas the methodology employed for Runway 18-36 includes making final adjustments to runway length, the method for "small airplanes" does not. Thus the calculated and final crosswind runway length options are presented in **Table 3-5**.

Table 3-5. Crosswind Runway Length Calculation Results

Small Airplanes Category (MTOW ≤ 12,500 lbs.)	Runway Length	Figure from AC 150/5325-4B
Fewer than 10 Passenger Seats, 95% of Fleet	3,300	Figure 2-1
Fewer than 10 Passenger Seats, 100% of Fleet	3,900	Figure 2-1
10 or more Passenger Seats	4,250	Figure 2-2

Source: Analysis by Snyder & Associates, Inc. Lengths based on the airport's elevation of 979 feet and a mean daily maximum temperature of the hottest month (July) of 83.0 degree F per NOAA NCDC Summary of Monthly Normals, 1981-2010.

With regard to passenger capacity, there are currently no aircraft with 10 or more passenger seats operating at the IMA and based on the forecast; none are expected. This includes the large Dassault Falcon 50 corporate jet which has a crew of two and seats eight passengers in its typical cabin configuration. Examples of aircraft with MTOWs of 12,500 pounds or less that typically operate at the IMA (along with their respective passenger capacities) are presented in **Table 3-6**.

Table 3-6. Passenger Capacity of Select Aircraft

Airplane	Aircraft Type	Passenger Seats	MTOW (lbs.)	FAA ARC
Cessna 182 Skylane	SEP	3	2,550	A-I
Beechcraft Baron 55	MEP	3	5,100	B-I
Beechcraft Baron 58	MEP	5	5,500	B-I
Rockwell Aero Commander 690	TP	6	9,000	B-II
Beechcraft King Air 200	TP	7	12,500	B-II
Raytheon Premiere IA	JET	7	12,500	B-I
Cessna Citation CJ2 (525)	JET	7	12,300	B-I

Source: Various aircraft manufacturer websites. Passenger seats value assumes all aircraft are pilot only operation thus counting the co-pilot seat and all seats in typical cabin configuration as passenger seats.

Therefore, what remains in this crosswind runway length analysis is an examination of the IMA to determine if it fits in either the FAA's "95 percent of fleet" definition or its "100 percent of fleet" definition. The percent of fleet is a function of an airport's location and the amount of aviation activity. According to AC 150/5325-4B, these two categories are defined as follows:

> **95 Percent of Fleet:** *This category applies to airports that are primarily intended to serve low-activity locations, small population communities, and remote recreational areas. Their inclusion recognizes that these airports in many cases develop into airports with higher levels of aviation activities. Also included in this category are those airports that are primarily intended to serve medium size population communities with a diversity of usage and a greater potential for increased aviation activities.*
>
> **100 Percent of Fleet:** *This category of airport is primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area.*

Given the setting of the IMA and its current and forecasted aviation demand, it would be classified as an airport in the 95 Percent of Fleet category. Therefore, from **Table 3-5** the length of the crosswind runway would be 3,300 feet.

In conclusion, the IMA falls under the "95 percent of fleet" category and a crosswind runway length of 3,300 feet is recommended in order to accommodate aircraft with maximum takeoff weights of 12,500 lbs. or less.

To ease the financial impact of such an investment, should it be put into action, it is recommended that the crosswind runway be implemented in two major phases. In the Phase 1, the city first would acquire the land needed for the crosswind runway and its associated safety areas and protection zones then construct a turf (grass) runway. In Phase 2, which would likely occur several years after the construction of the turf runway, the turf runway would be reconstructed with a paved surface. Turf runways are a low cost alternative to paved runways which is beneficial since several acres of land would need to be acquired fee simple for this airport improvement project. According to AC 150/5300-13A, *Airport Design*, Paragraph 314: "Turf runways can be used in many locations where traffic volume is low and aircraft wheel loading is light, such as small aircraft with low approach and takeoff speeds.

Turf runways are preferred by some pilots, especially those flying aircraft with tailwheel or tailskid type landing gear [taildraggers], gliders, agriculture sprayers, and aircraft with tundra tires." Some pilots will not operate their aircraft on a turf surface due to aircraft performance limitations, pilot preference/experience, or aircraft insurance stipulations, or other factors. Therefore, until the second phase of the crosswind runway is complete and a paved surface is available, it is envisioned that MEP, TP, and JET aircraft will more than likely not operate from a turf surface. As a result, the turf crosswind runway would be used primarily by small SEP aircraft with both tricycle and taildragger type landing gear configurations.

Crosswind Runway Design Standards and Features

The turf crosswind runway would be a visual-only runway (that is no instrument approach procedures) and designed to ARC B-I Small Aircraft standards. Because the runway surface is turf, it offers less friction than a paved surface. To compensate for this, the runway length is increase by 20 percent as recommended by AC 150/5300-13A and a turf runway measuring 3,960 feet long by 60 feet wide would be constructed. In the second phase, the runway would be paved to 3,300 feet long by 75 feet wide and designed to ARC B-II standards. The ultimate paved runway would have all the similar accessories as Runway 18-36 currently does (edge/threshold lighting, REILs, PAPIs, lighted supplemental wind cones, etc.) as well as RNAV (GPS) instrument approach procedures. Based on the information presented above, key features of the crosswind runway are summarized in **Table 3-7**. A layout of the proposed crosswind runway is presented in **Exhibit 3-7**.

Table 3-7. Crosswind Runway Design Standards and Recommended Features

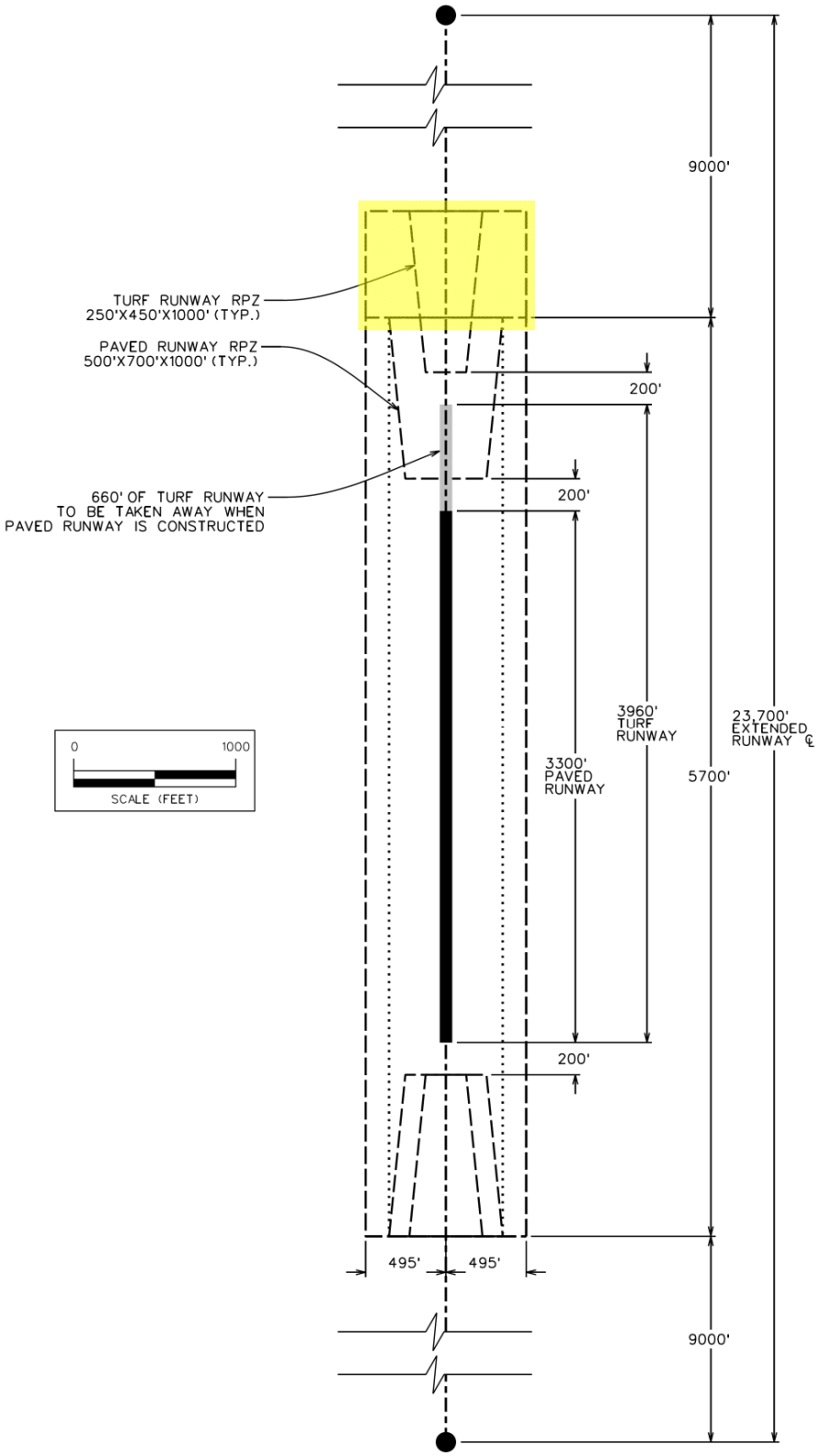
Design Standard or Feature	Runway Phase	
	Phase 1	Phase 2
Runway Surface	Turf	Paved
Airport Design Standard (ARC)	B-I Small Aircraft	B-II
Runway Dimensions	3,960 x 60	3,300 x 75
Visibility Minimums	Visual	400-1 or better
Runway Protection Zone (RPZ) Dimensions	250 x 1,000 x 450	500 x 1,000 x 700
Building Restriction Line (BRL) Distance from CL	370	495
Runway Safety Area (RSA) Dimensions	4,440 x 120	3,900 x 150
Runway Object Free Area (ROFA) Dimensions	4,440 x 250	3,900 x 500
Total Land Required	108 acres	130 acres

Source: Analysis by Snyder & Associates, Inc. All dimensions given in feet. BRL is based upon a 35 foot tall building or hangar.

Although the paved runway is shorter than turf runway by 660 feet, as evidenced in **Exhibit 3-7**, the introduction of instrument approach procedures in Phase 2 changes the airspace surrounding the runway and repositions the BRL 125 feet further from both sides of the runway centerline. The net result is a 20 percent increase in the amount of land needed over Phase 1 to construct Phase 2. It is recommended that all land needed for Phases 1 and 2 be acquired in Phase 1 to simplify the land acquisition process. The total land required is approximately 145 acres. This is calculated by using the land needed for Phase 2 of approximately 130 acres plus the portion of an RPZ from Phase 1 which is approximately 15 acres (the yellow rectangular area[3] highlighted in **Exhibit 3-7**) for a total of roughly 145 acres.

[3] This yellow rectangular area has a length of 660 feet and a width of 990 feet (495 feet either side of the runway centerline).

Exhibit 3-7. Crosswind Runway Template



Source: Snyder & Associates, Inc.

3.9 Taxiway System

With a parallel taxiway to Runway 18-36, several entrance and exit taxiways from the runway, and access to and from the Terminal Apron, the taxiway system at the IMA is robust and capable of meeting current and long-term aviation demands. Assuming a 25-year usable life for the pavement, a phased reconstruction of the taxiway system is recommended for the year 2034 which is beyond the 20-year planning period of this Master Plan Update. However, prior to its reconstruction, regular maintenance of the pavement will be necessary and programmed into the Airport Capital Improvements Program to maintain a PCI above 70 as recommended by the Iowa DOT for Enhanced Service airports.

When the taxiway system was reconstructed in 2009-2010 its design was based on FAA Advisory Circular 150/5300-13, *Airport Design*. In September 2012 the FAA released the much anticipated update of this document which included revised taxiway geometric design standards. In addition to new taxiway intersection and turning requirements, the ends of parallel taxiways are to now be rounded to provide pilots with a visual difference between a runway and parallel taxiway. The difference between the IMA's current layout versus the new standards is presented in **Exhibit 3-8**. When the taxiway system needs to be constructed in the future it will be designed to the latest FAA standards.

Exhibit 3-8. End of Taxiway Geometry Differences

Current IMA Configuration *Current FAA Design Standard*

Source: Image from Google Maps, http://maps.google.com/maps?hl=en&tab=ll, and FAA AC 150/5300-13A, Figure 4-18. Not to scale.

3.10 Terminal Apron

To determine aircraft parking space requirements for current and forecasted demand, the FAA's "Apron Size Calculations for Transient Aircraft" worksheet was utilized. From this worksheet, the Terminal Apron provides sufficient parking capacity to meet itinerant aircraft parking needs at the present time and over the next five years. However, expansion of the terminal apron appears necessary within 10 to 15 years to accommodate forecasted demand. **Table 3-8** summarizes itinerant aircraft parking needs at the IMA over the 20-year planning period. For reference, a copy of the FAA's apron sizing worksheet is included in **Appendix A**.

Table 3-8. Aircraft Parking Demand and Capacity Analysis

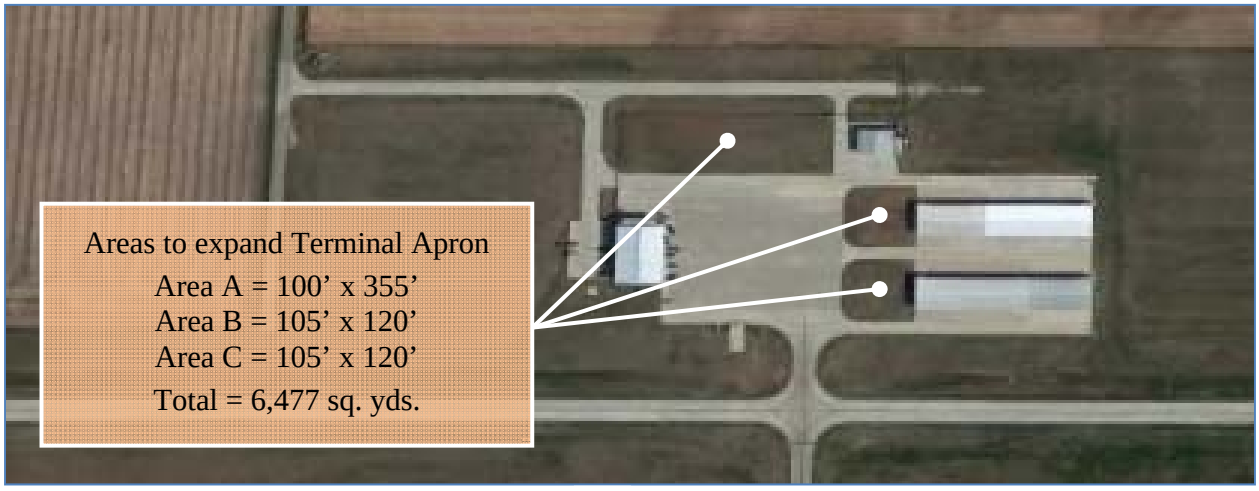
Item	Year				
	2012	2017	2022	2027	2032
Forecasted Annual Operations	9,100	10,080	11,050	12,030	13,000
Forecasted Itinerant Aircraft Ops.	3,800	4,180	4,550	5,030	5,400
Apron Size					
Apron Area Required (sq. yds.)	7,748	8,583	9,408	10,243	11,069
Apron Area Available (sq. yds.)	8,500	8,500	8,500	8,500	8,500
Apron Area Needed (sq. yds.)	None	83	980	1,743	2,569
Percent Increase of Current Apron	n/a	1%	11%	21%	30%
Dimensions of Area Needed (ft.)	**None**	27 x 27	90 x 90	125 x 125	152 x 152
Aircraft Tiedown Positions					
Positions Required	6	6	7	8	8
Positions Available	4	4	4	4	4
Positions Needed	**2**	**2**	**3**	**4**	**4**

Source: Analysis by Snyder & Associates, Inc.

As depicted in **Exhibit 3-9**, there are three areas into which the Terminal Apron could expand. In total, 6,477 square yards of area is available which is more than two and half times the additional area needed in the year 2032. There is more than adequate space available for Terminal Apron expansion without the need to acquire additional land or relocate existing adjacent facilities.

Regardless of terminal apron's size, the pavement has service needs that must be addressed. Assuming a 25-year usable life for the pavement, reconstruction of the runway is recommended for the year 2032, the last year of this Master Plan Update's 20-year planning period. Considering the anticipated need for expansion, tiedown layout reconfiguration, and reconstruction, it is recommended that a major rehabilitation or reconstruction of the terminal apron be programmed for the year 2027 or when itinerant aircraft traffic operations approach 5,000 annually or when the PCI falls below 70.

Exhibit 3-9. Areas for Terminal Apron Expansion



Source: Image from Google Maps, http://maps.google.com/maps?hl=en&tab=ll. Not to Scale

An airport improvement requested by Walter Aviation is an aircraft deicing apron planned within close proximity of to the Terminal Apron. An aircraft deicing apron is a paved aircraft parking area where frost, ice, slush, or snow is removed (deicing) from the aircraft in order to provide clean surfaces, and/or clean surfaces of the aircraft receive protection (anti-icing) against the formation of frost or ice and accumulation of snow or slush for a limited period of time. Consequently, such a facility would enhance the safety and efficiency of aircraft operations.

From the areas presented in **Exhibit 3-9**, there are several possible locations for an aircraft deicing apron. Ideally, its construction should coincide with the rehabilitation/reconstructing or expansion of the Terminal Apron to obtain a better concrete unit prices through economies of scale but it could be constructed as a stand along project as well. The facility should be designed in accordance with FAA AC 150/5300-14B, *Design of Aircraft Deicing Facilities*. In addition, environmental mitigation is required to reduce storm water discharge contamination. This would include the applicable National Pollutant Discharge Elimination System (NPDES) permit as well as other state and local permitting. Unfortunately for general aviation airports like the IMA, the FAA does not participating in the funding of aircraft deicing aprons; only those at commercial services airports. This of course does not preclude Walter Aviation and/or the city from constructing the aircraft deicing apron on its own accord.

Lastly to aid in ramp operations, a small aircraft tow tug is recommended. From Section 3.7, most of the itinerant aircraft visiting the IMA are in ARC B-II category with maximum ramp weights of 15,000 lbs and higher. An aircraft tow tug capable of moving at least 15,000 lbs of aircraft is recommended.

3.11 Airfield Electrical System

With two constant current regulators powering the runway and taxiway circuits and other NAVAIDs, the IMAs airfield electrical system can accommodate future airfield airport improvements. Should a crosswind runway be constructed and ultimately equipped with a runway edge light system, a third regulator should be installed.

3.12 Aircraft Storage

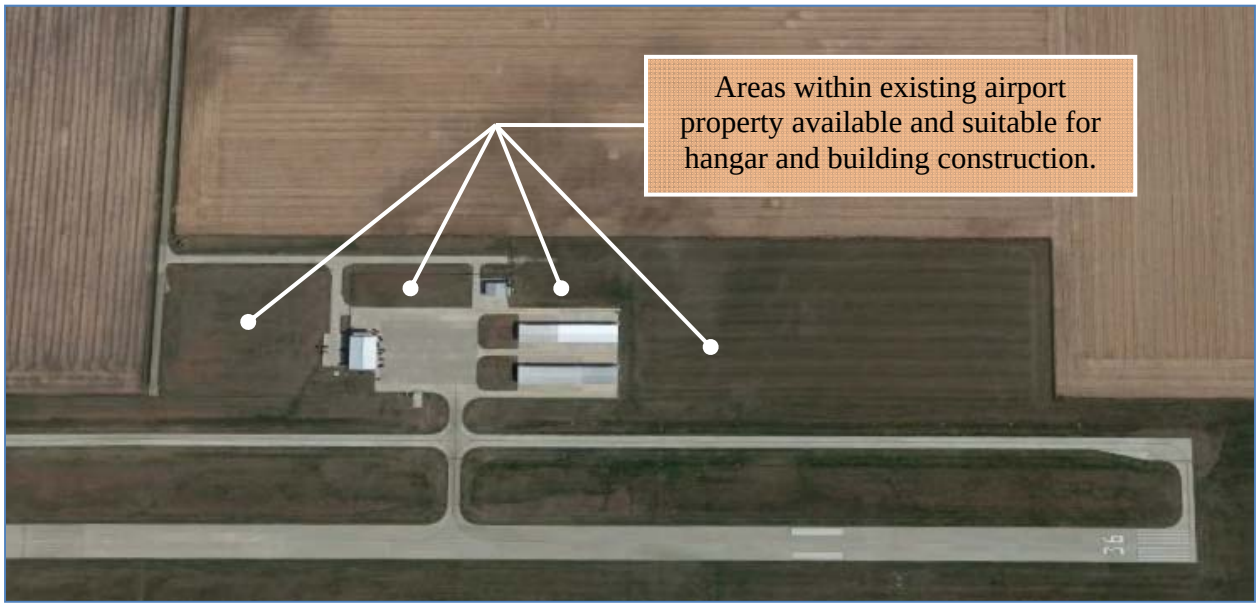
According to the forecast of based aircraft (see **Chapter 2, Forecast, Table 2-6**), an additional 12 aircraft are expected to be based at the IMA by the year 2032. Assuming the IMA continues its trend of providing hangar spaces for all based aircraft (which is a goal of Iowa DOT's Office of Aviation), **Table 3-9** presents recommended hangar needs based on the types of aircraft. It is recommended that one additional 10- to 13-unit T-Hangar for small single- and multi-engine piston aircraft and one 5,000 to 7,500 square-foot conventional hangar for larger aircraft be constructed to accommodate future based aircraft. To provide overnight storage of transient, or itinerant, aircraft that regularly visit the IMA, it is recommended that a 10,000 square-foot hangar be constructed in the near term. This hangar should be located near the Walter Aviation hangar to simplify aircraft handling logistics for their staff. **Exhibit 3-10** depicts areas available for hangar construction.

Table 3-9. Recommended Based Aircraft Storage Needs for 2032

Aircraft Type	No. of Aircraft	Hangar Type
Single Engine Piston	8	T-Hangar
Multi Engine Piston	2	T-Hangar
Turboprop	2	Conventional/Community
Business Jet	1	Conventional/Community

Source: Analysis by Snyder & Associates, Inc.

Exhibit 3-10. Areas for Hangar and Building Construction



Source: Image from Google Earth, http://maps.google.com/maps?hl=en&tab=ll. Not to Scale

3.13 Aircraft Fueling

At present, the existing 10,000 gallon Jet A fuel tank is refilled weekly during the peak month of August according to Walter Aviation. Assuming 40,000 gallons of Jet A fuel are consumed during the peak month, either more frequent Jet A fuel tank refilling is needed or additional Jet A fuel tank storage capacity is required to meet forecasted demand. As conveyed in **Table 3-10**, an additional 5,000 gallon Jet A fuel storage tank may be required by the year 2032. Space adjacent to the current underground Jet A fuel storage tank should be reserved for additional fuel storage. As an alternative to adding a second underground Jet A fuel storage tank, could be the purchase a mobile refueler truck. This would allow the airport to fuel jet aircraft where they are parked on the ramp rather than having to position them near the fuel pumps. Given the flexibility a mobile refueler truck offers, this acquisition would be the recommendation for the IMA. With regard to 100LL fuel, the existing 10,000 gallon tank is sufficient to meet forecasted demand by piston-powered aircraft.

Table 3-10. Jet A Fuel Storage Capacity Analysis

Item	Year				
	2012	2017	2022	2027	2032
Forecasted Annual Operations	9,100	10,080	11,050	12,030	13,000
Peak Month Operations	3,800	4,180	4,550	5,030	5,400
Jet A Gallons Consumed in Peak Month	40,000	45,000	49,000	53,000	58,000
Jet A Fuel Storage Capacity Required	10,000	11,250	12,250	13,250	14,500

Source: Analysis by Snyder & Associates, Inc.

3.14 Airport Maintenance Equipment

The 2011 Freightliner M2 Dump Truck and the 2011 John Deere 7130 Tractor are in excellent condition and with proper maintenance and care should remain in good working condition for 20 years. Therefore, replacement of these vehicles are not envisioned during the 20-year. However, when maintenance of the 1998 Dodge Ram 2500 Pickup Truck becomes excessive, it should be replaced. For planning purposes, its replacement should be programmed for 2018. Lastly, as the age of the John Deere 4430 Tractor is unknown but was acquired sometime between 2002 and 2004, it should be replaced in 2022.

At present, these four vehicles and related equipment are stored in the city-owned Tan Hangar. It is recommended that a dedicated airport maintenance and snow removal equipment (SRE) storage building be constructed to house these assets. Once a new equipment storage building is constructed, the Tan Hangar can be used for its original purpose of aircraft storage. This would allow for the storage of up to two single-engine piston aircraft thereby reducing the number of T-Hangar units needed in the future. **Exhibit 3-10** depicts areas available for construction of the SRE building.

3.15 Areas for Aviation Development

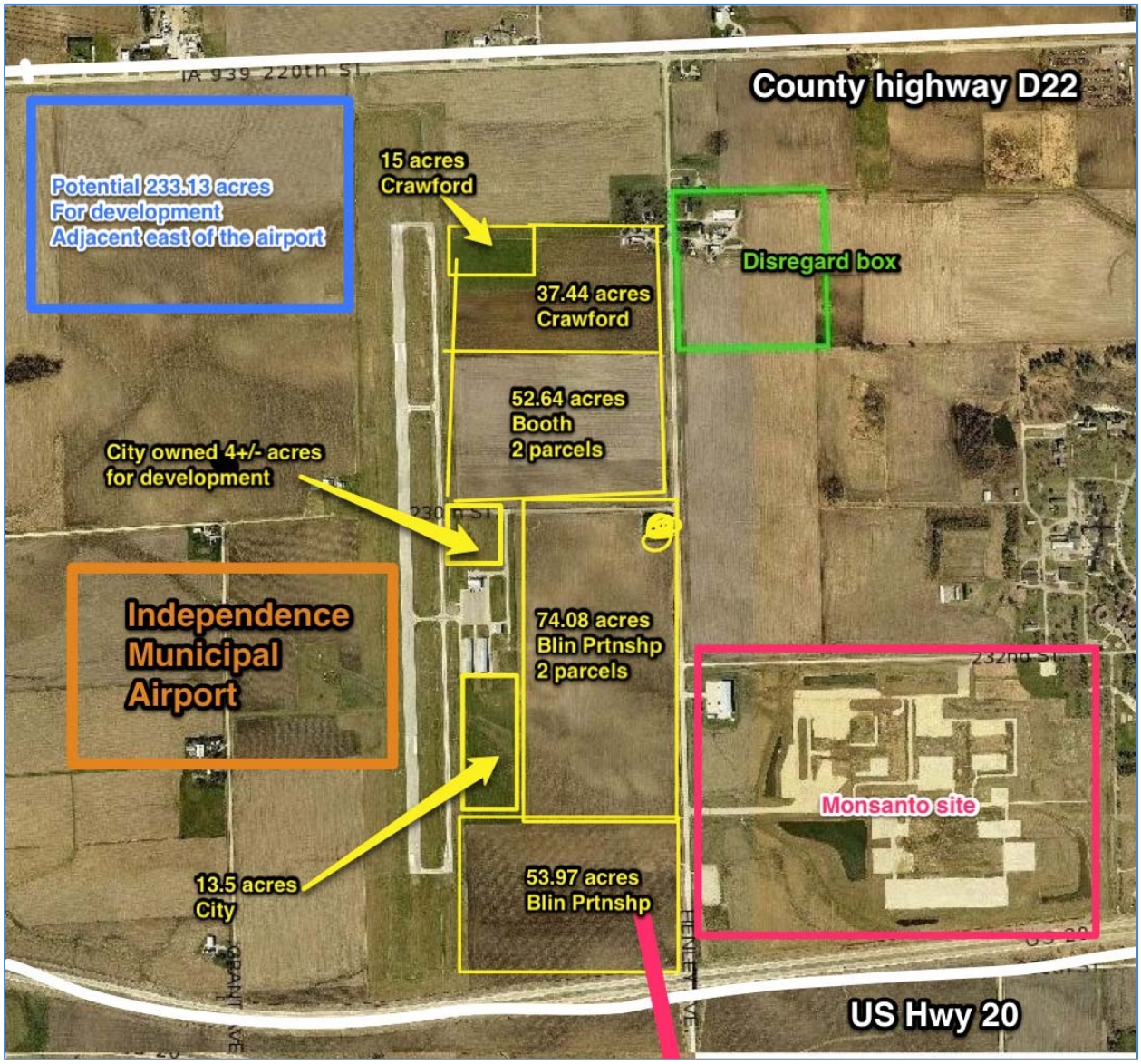
Of the total airport property owned fee simple, approximately 17.5 acres is available for aviation-related development. Of the 17.5 acres, four acres are located north of the Walter Aviation Hangar and 13.5 acres are south of the T-hangars. These two areas are depicted in **Exhibit 3-11** and provide the space necessary to construct those facilities than can accommodate forecasted demand over the 20-year planning period. This includes construction of aircraft hangars the SRE storage building.

3.16 Areas for Non-aviation Development

Given that the IMA currently serves business aviation, it is in a good position to become a regional transportation center serving not only the city of Independence and Buchanan County but also the Cedar Valley Region and much of northeast Iowa. Identifying potential areas that could support aviation and non-aviation related business development have been investigated by the Buchanan County Economic Development Commission (BCEDC)[4]. In their preliminary look has taken a preliminary look at the land between the IMA and Henley Avenue as this area is accessible via existing roadways, has several utilities in place (discussed in **Chapter 1, Inventory, Section 1.22**), and provides the opportunity for aviation businesses to access the airfield. Depicted in **Exhibit 3-11**, the area of interest is comprised of several parcels totaling approximately 234 acres with parcel data presented in **Table 3-11**. If this area, which is larger than the airport itself, or even a portion thereof were to be properly developed as an airport business park, through city, county, and private collaboration, it could serve the community well by enhancing the airport and providing jobs.

[4] http://www.growbuchanan.com/Public/Home.aspx

Exhibit 3-11. Parcels Surrounding the IMA



Source: Buchanan County Economic Development Commission. Not to scale.

Table 3-11. Property Immediately East of the IMA

Owner	Acreage	Class	Parcel ID
Properties North of 230th Street			
Crawford, Caryel O Lu Th	17.51	Ag Land	10.06.100.003
Crawford, Caryel O Lu Th	29.56	Ag Land	10.06.100.002
Crawford, Caryel O Lu Th	15.69	Ag Land	10.06.300.009
Crawford, Caryel O Lu Th *	37.44	Ag Dwelling	10.06.300.002
Booth, Richard W. & Erma R.	16.12	Ag Land	10.06.300.007
Booth, Richard W. & Erma R.	36.52	Ag Land	10.06.300.005
Properties South of 230th Street			
Thompson, Delbert D & Kenda *	1.40 ±	Residential	10.07.100.004
Blin Farms Limited Partnership	35.90	Ag Land	10.07.100.003
Blin Farms Limited Partnership	38.18	Ag Land	10.07.100.007
Blin Farms Limited Partnership	53.97	Ag Land	10.07.300.009
Total	**233.82**	**n/a**	**n/a**

Source: http://buchanan.iowaassessors.com/parcel.php?gid=136135

3.17 Summary of Recommended Improvements

From the above discussions, the airport development projects recommended for the IMA are summarized with this section. Overall, this airport master plan update assumes that the IMA will continue to accommodate primarily single- and multi-engine piston aircraft while supporting a respectable and consistent level of turboprop and business jet activity and the improvements recommended herein are in proportion to this assumption.

This summary of recommended improvements section is subdivided into three parts with each addressing the following three fundamental questions (which were posed at the beginning of this chapter) that help to determine the IMA's current and short-term requirements as well as its long-term development needs:

1) What enhancements to existing facilities and/or additional facilities are needed to allow the airport to accommodate present-day aviation demand and to maintain existing airport level of service requirements?

2) What improvements and/or additional facilities are needed to bring the airport into compliance with current FAA standards?

3) What additional facilities are needed to accommodate forecasted aviation demand?

To address Question 1, the enhancements to existing facilities or the additional facilities needed to allow the airport to accommodate present-day aviation demand and to maintain existing airport level of service requirements are summarized in **Table 3-12**. These requirements do not address any FAA standard deficiencies nor do they add to the capacity of the airport (which are addressed in the following two paragraphs). In general, the airfield configuration at the IMA is sufficient to meet present demand and the pavements and associated electrical systems are in very good condition.

Table 3-12. Recommended Projects to Projects to Accommodated Present-Day Demand and Maintain Current Airport Standards

Timeframe	Project Name and Description
1-5 years	**Replace Runway 18 and 36 PAPIs.** Expand the existing 2-box systems with 4-box systems to support current jet aircraft operations.
1-5 years	**Install Remote Communications Outlet.** Per the IASP, an RCO would improve communications with air traffic controllers.
1-5 years	**Construct Transient Aircraft Hangar.** This 100' x 100' hangar would allow for the overnight storage of transient, or itinerant, aircraft.
1-5 years	**Acquire Aircraft Tow Tug.** Tug shall be capable of towing aircraft weighing 15,000 lbs. and heavier.
1-5 years	**Construct SRE Storage Building.** Provide a dedicated facility for SRE storage and return the Tan Hangar to aircraft storage use.
6-10 years, 16-20 years	**Rehabilitate Runway 18-36.** Make pavement repairs based on level of maintenance effort and PCI value and remark. This may include rehabilitation or replacement of the runway edge lighting system (or select components) as well.
6-10 years, 16-20 years	**Rehabilitate Taxiways.** Make pavement repairs based on level of maintenance effort and PCI value and remark. This may include rehabilitation or replacement of the taxiway edge lighting system (or select components) as well.
6-10 years, 16-20 years	**Rehabilitate Terminal Apron.** Make pavement repairs based on level of maintenance effort and PCI value and remark.
6-10 years	**Construct Aircraft Deicing Apron**. Construct near the Terminal Apron to aid in aircraft deicing and anti-icing operations to improve flight safety.
6-10 years, 16-20 years	**Rehabilitate Access Road and Vehicle Parking Areas.** Make pavement repairs based on level of maintenance effort and remark.

Source: Analysis by Snyder & Associates, Inc. The timing of the recommended improvements is independent of the level of airport activity.

In responding to Question 2, **Table 3-13** presents the improvements or additional facilities that are recommended to bring the airport into compliance with current FAA standards and make the airport operating environment safer. A facility is deficient when it does not meet current FAA airport standards. If a facility needs to be improved in the future because it will no longer adhere to standards due to the airport's role being upgraded, this is not a deficiency but rather a future need. Virtually all of the facilities at the IMA are in compliance with FAA airport design standards with the exception of the taxiway system's geometrics as presented earlier.

Table 3-13. Recommended Projects to Meet Current FAA Standards and Improve Safety

Timeframe	Project Name and Description
1-5 years	**Obtain Lower Approach Minimums to Runways 18 and 36.** Lowering the approach minimums from 400-1 to 300-3/4. This improvement will begin automatically as soon as the Aeronautical Survey task (which is part of the 2013 Airprot Master Plan Update) is completed.
6-10 years	**Update the 2013 Airport Master Plan in 2020.** Normally airport master plans are updated regularly every 7 to 10 years. Therefore, an update of the 2013 Airport Master Plan should be planned for the year 2020.
11-15 years	**Update the 2020 Airport Master Plan in 2027.** Update the 2020 Airport Master Plan in the year 2027.

Source: Analysis by Snyder & Associates, Inc. The timing of the recommended improvements is independent of the level of airport activity.

While this chapter recommends a crosswind runway, the city's preliminary discussions with some adjacent landowners and members of the community reveal a general lack of support for this project. As such, this Airport Master Plan Update will not include a crosswind runway as part of the IMA's development plan. Nonetheless, to give the city a full and complete picture of what would be involved in constructing a crosswind runway; several crosswind runway layouts were explored in a technical paper titled *Exploring Alternative Crosswind Runway Layouts*. This paper allows the city to investigate the ramifications that several crosswind runway alternative would have on airport wind coverage, adjacent properties, the environment, and the safe and efficient operation of the airfield. While not included in the IMA's capital improvement program (CIP) or shown on the Airport Layout Plan (ALP), the crosswind runway project will be included in **Chapter 4: Environmental Overview** and will be submitted for environmental agency reviews. In doing so, the city and the community have an overall picture of the potential environmental impacts that would result from the crosswind runway were it to be implemented.

In speaking to Question 3, the additional facilities are needed to accommodate forecasted aviation demand are summarized in **Table 3-14**. Generally, recommendations for these types of facility improvements are determined by comparing existing facilities with forecast demand and making note of deficiencies.

Table 3-14. Recommended Projects to Accommodate Forecasted Demand

Timeframe	Activity Level	Project Name and Description
6-10 years	2018, 2022	**Acquire Replacement SRE/Maintenance Equipment.** Replace Dodge Ram 2500 Pickup and the John Deere 4430 Tractor at these times, respectively, or earlier if excessive maintenance becomes too frequent.
11-15 years	50k gal. of Jet A/month	**Acquire Jet A Fuel Truck.** Truck should have at least 3,000 gallon storage capacity.
11-15 years	35 based aircraft	**Construct 13-unit T-Hangar and Taxilanes.** Set adjacent to existing T-hangars.
16-20 years	40 based aircraft	**Construct Based Aircraft Hangar.** Hangar will measure 100' wide by 75' deep or smaller depending on aircraft size.
16-20 years	50k gal. of Jet A/month	**Reconstruct and Expand Terminal Apron.** Allows for additional itinerant aircraft parking. Reconfigure tiedown layout.

Source: Analysis by Snyder & Associates, Inc.

3.18 Facilities Beyond the Forecast Period

As the future is unknown and filled with uncertainty, planning for airport development beyond the 20-year forecast period must naturally incorporate a level of flexibility that allows the airport to adapt to the needs of its aviation community. In the event the IMA is presented with opportunities for expansion that are beyond today's expectations, space should be reserved for additional hangars. In addition, aircraft operations associated with the crosswind runway (should one be built) may one day warrant the construction of a parallel taxiway in order to provide for a more efficient and safer crosswind runway and airfield in general.

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