4. FACILITY REQUIREMENTS

A key step in the Airport Master Plan (AMP) process is determining future requirements for airport facilities that allow for airside and landside development over a 20-year planning period. By comparing the existing conditions of an airport to its predicted growth, an AMP can define requirements for runways, taxiways, aprons, hangars, terminals, and other related airport facilities to accommodate growth over the short-, intermediate-, and long-term planning periods.

An essential step in the process of estimating future airport needs is the determination of an airport's current capability to accommodate anticipated demand. Demand capacity and other analyses aid in the identification of airport deficiencies, surpluses, and opportunities for future development. Ultimately, they yield information that is used to design the Airport Layout Plan (ALP) and set the stage for future facility development.

This chapter identifies facility requirements for Colorado Plains Regional Airport (AKO or the Airport) over the next 20 years. Existing and future facility requirements and development standards are identified based on the Town of Akron's current strategic development initiatives, and by comparing the Airport's existing facilities to future facility needs rooted in the forecasts of aviation demand presented in **Chapter 3, Forecasts of Aviation Activity**. The results of Chapter 4 serve as input for the next chapter, **Chapter 5, Alternatives**, which presents an examination of development alternatives to meet any current and projected deficiencies for the Airport. That analysis will result in identifying the best strategy to meet the needs of AKO, its users, and the community.

The Federal Aviation Administration (FAA) provides guidance for planning and design of airport facilities through Advisory Circulars (AC) that promote airport safety, economy, efficiency, and sustainability. Many of the facility requirements identified at AKO incorporate FAA planning and design standards presented in FAA AC 150/5300-13A, *Airport Design*, and AC 150/5060-5, *Airport Capacity and Delay.* Other FAA ACs used to develop this chapter are cited throughout the document.

4.1 Airfield Demand Capacity

Airfield Demand Capacity refers to the number of aircraft operations that a given facility can accommodate on an hourly or annual basis. The capacity of an airfield is primarily a function of the major aircraft operating on infrastructure elements that comprise an airfield (i.e., runways and taxiways), as well as the alignment and configuration of those elements. The capacity is also related to and considered in concurrence with wind coverage, airspace utilization, and the availability and type of navigational aids (NAVAIDs). Each of these components has been examined as part of the airfield demand capacity analysis.

Key terms relative to the discussion of capacity are:

- Demand: the magnitude of aircraft operations to be accommodated in a specified period of time, provided by the forecasts.

- Capacity: a measure of the maximum number of aircraft operations that can be accommodated on an airport.
- Annual Service Volume (ASV): a reasonable estimate of an airport's annual capacity (i.e., level of annual aircraft operations that will result in an average annual aircraft delay of approximately one to four minutes).
- Delay: the difference between the actual time it takes an aircraft to operate on the airfield and the time it would take the aircraft if it were operating without interference from other aircraft or other influences, usually expressed in minutes.

4.1.1 Airfield Capacity Assumptions

Several factors are known to influence airport capacity. Visual and Instrument Flight Rule (VFR and IFR) hourly capacities for AKO are based on the following assumptions:

- Runway-use Configuration: Runway Configuration Number 1, page 8 from Advisory Circular 150/5060-5.
- Arrivals and Departures are equal.
- Percentage of Touch and Go Operations: Touch and Go operations are generally attributed to flight education. AKO currently receives occasional flight training traffic.
- Taxiways: Types of taxiways affect the capacity at an airport. Taxiways parallel to and the same length as an associated runway provide the most efficient capacity levels. AKO currently has a partial parallel taxiway.
- Airspace Limitations: Because there are no air carrier or highly active general aviation (GA) airports in its proximity, AKO has few airspace limitations.
- Runway Instrumentation: AKO has three published non-precision approach procedures that allow access during inclement weather conditions.
- Mix Index: A mathematical expression used to represent the percentage of operations conducted by larger classes of aircraft (based on weight) using the Airport. Although AKO may accommodate some larger aircraft, (exceeding 12,500 pounds), the majority of aircraft using the airport (more than 80 percent) are less than 12,500 pounds. Therefore, the Mix Index is estimated to fall between zero percent and 20 percent based on existing fleet usage and will continue to be in this range in the future. This index range is used as a reference for determining the ASV.

4.1.2 Capacity and Delay - Annual Service Volume

Under optimal conditions, AKO would have an ASV of 230,000 operations. Per the FAA, the following guidelines should be used to determine when airport capacity improvements or demand management strategies should be enacted as demand reaches designated airfield capacity levels.

- 60 percent of ASV: Threshold at which planning for capacity improvements should begin.
- 80 percent of ASV: Threshold at which planning for improvements should be complete and construction should begin.

- 100 percent of ASV: The airport has reached the total number of annual operations (demand) that it can accommodate, and capacity-enhancing improvements should be made to avoid extensive delays.

Table 4-1 reflects the percentage of total airport capacity currently being used. According to FAA's standards, AKO should start planning for capacity improvements when airport operational levels reach 138,000 operations (60 percent of ASV), and should initiate construction of those improvements at 184,000 operations (80 percent of ASV). Based on the forecast of aviation demand for AKO, capacity enhancements are not required within the planning period. As shown in **Table 4-1**, AKO is not predicted to reach beyond 9.4 percent of the ASV.

TABLE 4-1: AIRFIELD CAPACITY AND DEMAND

	2016	2021	2026	2036
ASV	230,000	230,000	230,000	230,000
Demand - Aircraft Operations	17,080	18,130	19,244	21,682
Percent of Capacity	7.4%	7.9%	8.3%	9.4%

Source: FAA AC 150/5060-5, *Airport Capacity and Delay*; AKO AMP Chapter 3, Forecasts of Aviation Activity

4.2 Airfield Requirements

Airfield facilities generally include those that support the transition of aircraft from flight to the ground or the movement of aircraft from parking or storage areas to departure and flight. This section describes the airside requirements needed to accommodate current and projected activity at AKO throughout the planning period.

4.2.1 Airport Design Standards

The FAA defines a wide variety of airport dimensional design requirements in order to promote safety, efficiency, and consistency at airports across the country. These standards can change due to updates to the regulatory documents, changes to local airport operational patterns, or because of some other priority, so it is important that a master plan review all the critical design criteria to ensure compliance and identify areas of improvement. This section reviews the FAA design criteria for AKO based on its current and projected operational patterns throughout the planning period.

The improvements recommended in this section to maintain safety clearances on the airfield are shown in **Chapter 6** on the ALP prepared for this master plan.

Design Aircraft

The basis for the FAA airport design standards is the “design aircraft” or “critical design aircraft,” defined as the largest aircraft or family of aircraft anticipated to utilize a given airport on a regular basis. The FAA defines “regular basis” as conducting at least 500 annual itinerant operations (takeoff or landing).

As discussed in **Chapter 3, Forecasts of Aviation Activity**, the critical design aircraft is the Citation Excel.

Based on the design aircraft, an appropriate Airport Reference Code (ARC) can be identified. The ARC is a coding system used to relate airport design criteria to the operational and physical characteristics of the types of aircraft intended to operate at that airport. Specifically, the ARC is an airport designation that signifies the airport's highest Runway Design Code (RDC), which itself consists of the following components:

- Aircraft Approach Category (AAC) depicted by a letter and based on aircraft approach speed (**Table 4-2**).
- Airplane Design Group (ADG) depicted by a Roman numeral and based on aircraft wing span and tail height (**Table 4-3**).
- Runway Visual Range (RVR) based on runway visibility minimums (**Table 4-4**).

Figure 4-1 displays examples of aircraft in each of the RDC categories.

TABLE 4-2: AIRCRAFT APPROACH CATEGORY

Approach Category	Approach Speed
A	< 91 knots
B	91 knots - < 121 knots
C	121 knots - < 141 knots
D	141 knots - < 166 knots
E	166 knots or more

Source: FAA AC 150/5300-13A, *Airport Design*

TABLE 4-3: AIRPLANE DESIGN GROUP

Design Group	Wingspan	Tail Height
I	< 49 feet	< 20 feet
II	49 feet - < 79 feet	20 feet - < 30 feet
III	79 feet - < 118 feet	30 feet - < 45 feet
IV	118 feet - < 171 feet	45 feet - < 60 feet
V	171 feet - < 214 feet	60 feet - < 66 feet
VI	214 feet - < 262 feet	66 feet - < 80 feet

Source: FAA AC 150/5300-13A, *Airport Design*

TABLE 4-4: RUNWAY VISUAL RANGE

RVR (feet)	Instrument Flight Visibility Category (statute mile)
5,000	**Not lower than 1 mile (AKO)**
4,000	Lower than 1 mile but not lower than ¾ mile
2,400	Lower than ¾ mile but not lower than ½ mile
1,600	Lower than ½ mile but not lower than ¼ mile
1,200	Lower than ¼ mile

Source: FAA AC 150/5300-13A, *Airport Design*

FIGURE 4-1: RUNWAY DESIGN CODE (RDC)

Source: Jviation, FAA Aircraft Characteristics Database, 2018

Based on the above criteria, the ARC for AKO is B-II-5,000. Runway 11/29 was designed and built to accommodate C-III aircraft, beyond the needs of B-II. Additional discussion related to this is included in the following sections.

4.2.2 Runway Orientation

Runway orientation is the physical layout of the airfield system, including the number of runways, their orientation, and their locations relative to each other as well as to the landside facilities. Each runway configuration has a different capacity due to operational limitations and restrictions. For example, runways that converge or intersect have lower capacities than parallel runways because an aircraft on a converging runway must wait to land or take off until the aircraft on the second runway has cleared the path for aircraft arriving or departing from the other runway.

Climatological conditions specific to the location of an airport not only influence the layout of the airfield, but also affect the use of the runway system. Surface wind conditions have a direct impact on airport operations—runways not oriented to take the maximum advantage of prevailing winds will restrict the capacity of an airport to varying degrees. When landing and taking off, aircraft are able to operate properly on a runway as long as the wind component perpendicular to the direction of travel (defined as a crosswind) is not excessive (generally, this is specific to the operational requirements and capabilities of individual aircraft).

Surface wind conditions (i.e., direction and speed) generally determine the desired alignment and configuration of the runway system. Wind conditions affect all airplanes in varying degrees; however, the ability to land and take off in crosswind conditions varies according to pilot proficiency and aircraft type. It can be generally stated that the smaller the aircraft, the more susceptible it is to the effects of crosswinds. To determine wind coverage at AKO, wind data from observations taken at the Airport from 2005 to 2015 obtained from the National Climatic Data Center was utilized to construct VFR, IFR, and all-weather wind roses. The optimum runway orientation is one that will provide AKO at least 95 percent level of wind coverage at any given crosswind component.

TABLE 4-5: WIND COVERAGE ANALYSIS FOR RUNWAY 11/29

	10.5 knots	13 knots	16 knots	20 knots
All Weather	76.83%	86.05%	94.23%	98.3%
IFR	73.48%	81.88%	90.52%	96.87%
VFR	79.41%	88.23%	95.71%	98.83%

Source: FAA AGIS Wind File Generator, National Climatic Data Center, and Wind Analysis
Notes: 10.5 knots: ARC A-I and B-I aircraft; 13 knots: ARC A-II and B-II aircraft; 16 knots: ARC A-III through D-III aircraft; 20 knots: ARC A-IV through E-VI.

As shown in **Table 4-5**, AKO's wind coverage does not meet the FAA's recommendation of 95 percent for the aircraft categories of 10.5, 13, and 16 knots. Since the Airport ARC (B-II) falls outside aircraft designated for the 16-knot category, coverage for that category is not recommended. However, 95 percent coverage for 10.5- and 13-knot category aircraft is recommended. In addition, the Airport Manager noted that wind conditions do limit aircraft operations. Often times, the wind speed and crosswind component are too great for aircraft to land. Because of this, additional analysis has been completed to observe if the wind coverage would be adequate with the addition of a second runway.

Table 4-6 displays wind coverage percentages if an additional runway with an orientation of 01/19 was constructed. This orientation was introduced in AKO's 2005 master plan as an Ultimate recommendation. Analysis shows that, in almost all crosswind situations, two runways (11/29 and 01/19) combined provide adequate wind coverage.

TABLE 4-6: WIND COVERAGE ANALYSIS (ULTIMATE RUNWAY LAYOUT)

	10.5 knots	13 knots	16 knots	20 knots
All Weather	95.12%	98.49%	99.53%	99.9%
IFR	94.31%	97.73%	99.16%	99.79%
VFR	95.66%	98.81%	99.67%	99.93%

Source: FAA AGIS Wind File Generator, National Climatic Data Center, and Wind Analysis

The current width of the runway is an important consideration in wind coverage analysis. At 100 feet wide, Runway 11/29 exceeds the minimum width requirements for most small aircraft operating at AKO. This supplementary width may be viewed as an allowance for additional wind coverage because it affords smaller aircraft excess pavement to account for greater crosswinds. **Without a crosswind runway, the primary reason to maintain a wider runway width at AKO is to enhance wind coverage.**

4.2.3 Runway Length

The purpose of this section is to determine if the lengths of the existing runways are adequate to accommodate the aircraft fleet currently operating and projected to operate at AKO. Because this length is dependent on multiple factors (such as those listed in **Table 4-7**), specific runway length requirements are individually generated for each flight originating at AKO. This runway length analysis was conducted in accordance with FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design,* to normalize those factors and ensure that the existing and future runway lengths are suitable for the forecasted critical design aircraft. FAA's methodology establishes minimum runway length requirements based primarily upon several factors, including airport elevation, average temperature, and type aircraft expected to use the runway on a regular basis.

TABLE 4-7: FACTORS AFFECTING RUNWAY LENGTH

Environmental	Airfield	Aircraft
Temperature	Runway Gradient	Length of Flight
Terrain	Airfield Elevation	Aircraft Design
Surrounding Obstructions	Runway Surface (wet/dry)	Performance Characteristics
Noise Abatement Procedures		Engine Type

Source: Jviation

TABLE 4-8: RECOMMENDED RUNWAY LENGTH

Category	Runway Data
Airport Elevation	4,715 feet
Mean Daily Maximum Temperature of the Hottest Month	88°F
Small Airplanes with Approach Speeds <30 Knots	142 feet
Small Airplanes with Approach Speeds >30 knots, <50 Knots	377 feet
Small Airplanes with <10 Passenger Seats	
– 95% of these Small Airplanes	6,000 feet
– 100% of these Small Airplanes	6,100 feet
Large airplanes weighing less than or equal to 60,000 pounds	
— 75% of these Large Airplanes at 60% Useful Load	6,300 feet
— 75% of these Large Airplanes at 90% Useful Load	8,600 feet
— 100% of these Large Airplanes at 60% Useful Load	9,000 feet
— 100% of these Large Airplanes at 90% Useful Load	>10,200 feet
Airplanes of more than 60,000 pounds	See Manufacturer Data

Source: FAA AC 150/5325- 4B, *Runway Length Requirements for Airports*

At 7,001 feet, Runway 11/29 can accommodate most users without aircraft weight limitations. However, based on the data in **Table 4-8**, a longer runway would allow larger aircraft weighing less than 60,000 pounds to take off with greater payloads. Given the current and anticipated level of activity of larger aircraft at AKO, and the Runway's ability to accommodate them, it is recommended that Runway 11/29 be maintained at 7,001 feet. Based on the need to meet wind coverage and the runway length analysis, a crosswind runway should be at least 6,000 feet in length to accommodate the majority of general aviation aircraft that are most susceptible to crosswinds.

4.2.4 Runway Width

The required width of a runway is a function of the runway design code (RDC) and the instrument approaches available for that runway. AKO exceeds the 75-foot minimum width requirement for a B-II runway.

As mentioned earlier in this and the previous chapter, it is recommended that the Ultimate ARC for AKO be designated as C-III to preserve and maintain Runway 11/29 at its current width of 100 feet to allow for additional wind coverage. Additional discussion is in **Section 4.2.6**.

4.2.5 Pavement Strength

Airfields are constructed to provide adequate pavement strength for aircraft loads, as well as resisting the abrasive action of traffic and deterioration from adverse weather conditions and other influences. They are designed not only to withstand the loads of the heaviest aircraft expected to use the airport, but they must also be able to withstand the repetitive loadings of the entire range of aircraft expected to use the pavement over many years. Proper pavement strength design represents the most economical solution for long-term aviation needs.

There are several factors that must be considered when determining appropriate pavement strength for airfield structures. These factors include, but are not limited to, aircraft loads, frequency and concentration of operations, and the condition of subgrade soils. Runway pavement strength is typically expressed by common aircraft landing gear configurations. The aircraft gear type and configuration dictate how aircraft weight is distributed to the pavement and determines pavement response to loading. Example aircraft for each type of gear configuration are as follows:

- Single-wheel: Each landing gear unit has a single tire; for example, light aircraft and some business jet aircraft.
- Dual-wheel: Each landing gear unit has two tires; for example, the Boeing 737, Boeing 727, MD-80, CRJ-200, and the Dash 8.
- Two single wheels: Two single wheels in tandem; for example, the C130.
- Dual-tandem: Main landing gear unit has four tires arranged in the shape of a square; for example, the Boeing 757 and KC135.

While aircraft operating on a runway generally can exceed the defined pavement strength, such operations will ultimately degrade the pavement prematurely and create wear issues that require more aggressive pavement maintenance. The published pavement strength of Runway 11/29 is 65,000 pounds for single-wheel, 85,000 pounds for dual-wheel, and 125,000 for dual-tandem. AKO's runway pavement strengths are adequate to accommodate existing and forecasted activity. Ongoing pavement maintenance is crucial for continued pavement strength; recommended pavement maintenance projects are specified in the capital projects list located in **Chapter 7, Financial Implementation Plan**.

4.2.6 ARC and Runway Width Considerations and Recommendations

Runway 11/29 has unique characteristics that set it apart from runways at other airports. Its current width is 100 feet, which exceeds its 75-foot width requirement. As discussed previously, Runway 11/29 has been identified as having an ARC of B-II with an approach category of at least one mile of visibility. Additional factors justifying a width of 100 feet must be considered.

1. There remains a common perception in the aviation industry that jet aircraft require runways at least 100 feet wide. While this perception is not as prevalent as the 5,000-foot-runway-length "standard," it is still factored by the aircraft insurance industry when underwriting policies. Essentially, a jet aircraft that operates regularly on a runway less than 100 feet wide is likely to be subject to a higher level of scrutiny that could result in higher insurance rates.
2. AKO has the only 100-foot-wide runway that exceeds 5,000 feet in length in the region. The closest airports having similar capabilities are much larger airports located near the Denver metroplex serving commercial airlines and corporate operators. These airports are approximately a two-hour drive from Akron and do not provide reasonable access. Growth opportunities within the region may be reliant on the close proximity of an airport capable of handling larger aircraft. Additionally, AKO's runway dimensions and location outside the Denver metroplex provide pilots with alternate facilities when a diversion is necessary.
3. During flight operations, runway width is an important consideration in inclement and/or windy conditions. Specifically, during takeoff and landing operations when an aircraft is most vulnerable, strong and variable winds (including quartering headwinds, variable crosswinds and gusts, etc.) can easily blow a pilot off runway centerline. A wider runway provides a pilot with enhanced flexibility to safely and appropriately respond to that common circumstance. This is most critical at a single-runway airport like AKO, where pilots have limited runway options. As stated earlier, a crosswind runway at AKO would provide additional wind coverage necessary to meet FAA recommendations. **The development of the crosswind runway is likely beyond the 20-year planning period (Ultimate) and will not be a part of FAA approval in this master plan.** Until the crosswind runway is constructed, the wider runway width helps compensate for the lack of wind coverage. FAA AC 150/5300-13A allows consideration of increasing operational tolerance to crosswinds by upgrading the airport layout to the next higher RDC.

4. To meet B-II design standards, the runway width would have to be narrowed from 100 feet to 75 feet. The steps to achieve that width and maintain design standards would require the demolition and removal of runway pavement, removal and relocation of runway lights, proper grading and shoulder strengthening, and other projects. It is viewed that narrowing the Runway to 75 feet may likely be more expensive than maintaining the current width. When further considering the benefits the wider runway provides, narrowing the Runway to achieve a lower standard is counterproductive.

When reviewing these individual factors in total, it is reasonable to conclude that maintaining the Runway at its current width of 100 feet provides added accessibility and safety to AKO users while representing responsible use of an asset. Therefore, it is recommended that the ultimate ARC for AKO be designated as C-III to preserve Runway 11/29 at its current width and length, and to make AKO eligible for C-III federal funding. If the Runway is not maintained (i.e. fog seal, crack seal, and rehabilitated when necessary) as a C-III runway, when considering pavement maintenance as a federally eligible project, the Town of Akron may not be capable of funding maintenance beyond the B-II level. In that event, pavement that the FAA would not be willing to assist in maintaining may potentially deteriorate at a much faster pace.

4.2.7 Taxiways

Like runway design, taxiway design standards are based on a combination of the ADG and the Taxiway Design Group (TDG) criteria defined in FAA AC 150/5300-13A. The TDG is centered on the ratio of the overall Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance of the critical design aircraft. As mentioned previously, the current and forecasted design aircraft for AKO is the Citation Excel; therefore, TDG 2 is designated for AKO.

A taxiway system should be designed to facilitate safe and efficient aircraft movement to and from the runways and aprons that serve terminal buildings, hangars, and general aviation facilities. It is generally recommended that an airport's primary runway be served by a full-length parallel taxiway to allow aircraft to enter or exit the runway environment as expeditiously as possible.

FAA's taxiway design requirements are intended to enhance the overall safety of taxiway operations and minimize opportunities for runway incursions. Many of these requirements are relatively new (circa 2012) and were not in effect during the previous master planning efforts. The design principles for taxiway system layouts are listed in **Table 4-9.**

TABLE 4-9: TAXIWAY DESIGN PRINCIPLES

Design Principle	Summarized Definition
Steering Angle	Design taxiways such that the nose gear steering angles is < 50 degrees
Fillet Design	– Traditional fillet design standards have been replaced – New fillet design more effectively reflects aircraft wheel tracks
Standardize Intersection Angles	– 90-degree turns – 30-, 45-, 60-, 90-, 120-, 135-, and 150-degree preferred intersection angles

Design Principle	Summarized Definition
Safety and Object Free Areas	Areas along the edges of taxiways to protect aircraft and property
Concepts to Minimize Runway Incursions	
Increase Pilot Situational Awareness	– Utilize the "three-node concept" – Pilot should have three or fewer choices at an intersection (left, right, straight ahead)
Avoid Wide Expanses of Pavement	Wide pavement requires placing signs far from a pilot's eye
Limit Runway Crossings	Reduces the opportunity for human error
Avoid "High Energy" Intersections	– Located in the middle third of the runways – Limit the runway crossings to the outer thirds of the runway
Increase Visibility	– Provide right angle intersections for best pilot visibility – Acute angle runway exits should not be used as runway entrance or runway crossing
Avoid "Dual Purpose" Pavements	Runways used as taxiways and taxiways used as runways can lead to confusion
Indirect Access	Eliminate taxiways leading directly from an apron to a runway
Hot Spots	Limit the number of taxiways intersecting in one spot

Source: FAA

AKO has one 35-foot-wide partial parallel taxiway and two connector taxiways. Based on taxiway design standards, the following recommendations are proposed:

- Lengthen the partial parallel taxiway to 7,001 feet and 35-feet-wide.
- Replace taxiway reflectors with taxiway lighting.
- Realign the taxiway leading directly from the runway to the apron to effectively require a pilot to make a turn before accessing the runway.

4.2.8 Navigational Aids

Navigational aids (NAVAIDs) consist of equipment to aid pilots in locating an airport to provide horizontal guidance information for a non-precision approach, and to provide horizontal and vertical guidance information for a precision approach. Minimums for such procedures are based on several factors, including aircraft characteristics, obstacles, equipment, approach lighting, and weather reporting equipment. The condition of AKO's NAVAIDs and visual aids is shown in **Table 4-10**.

TABLE 4-10: AKO'S NAVAIDS AND VISUAL AIDS

NAVAIDs / Visual Aids	Condition	Comments
Rotating Beacon	Good	
ASOS	Good	Would have to be relocated to allow for development in the terminal area.
VOR/DME	Good	
PAPI	Good	Runway 11 PAPI was replaced in 2017. Replacement of Runway 29 PAPI is pending (as of 2018).

Source: www.airnav.com/airport/KAKO, Jviation
Notes: PAPI = Precision Approach Path Indicator; ASOS = Automated Surface Observing System; VOR/DME = Very High Frequency Omnidirectional Range/Distance Measuring Equipment

AKO has three published instrument approach procedures designed to provide pilots with varying degrees of navigational guidance to the Airport during inclement weather. All of the procedures are defined as non-precision; that is, none of them provide vertical guidance that is accepted and defined by the FAA as precise. The existing instrument procedures and their respective minimums (descent altitude/visibility) are shown in **Table 4-11**. Based on feedback and input from airport management and users, it is recommended that AKO establish, at a minimum, approach procedures with ¾-mile visibility to increase the utility of the Airport during meteorological conditions. To achieve lower approach visibility minima, it is recommended that the runway ends served by these approaches have simplified approach lighting systems.

TABLE 4-11: INSTRUMENT PROCEDURES

Instrument Approach	Lowest Minimums
RNAV (GPS) Runway 11	– 250 feet AGL – 1 mile visibility
RNAV (GPS) Runway 29	– 250 feet AGL – 1 mile visibility
VOR Runway 29	– 439 feet AGL – 1 mile visibility

Source: www.airnav.com/airport/KAKO
Notes: RNAV = Area Navigation; AGL = above ground level

4.2.9 Dimensional Standards

Safe and efficient operations at an airport require that certain areas on or near the airport be clear of objects or restricted from a certain function, composition, and/or height. The key standards shown in **Table 4-12** provide guidance for existing and future development at AKO for a safe operating environment for aircraft. The dimensions of these areas are based on the ARC B-II-5,000 (current) and C-III-4,000 (ultimate) at given approach visibility minimums.

TABLE 4-12: RUNWAY/TAXIWAY PROTECTION AREA STANDARDS

B-II 5,000 Standards	C-III 4,000 Standards
Runway Centerline to Taxiway Centerline Separation	
240 ft.	400 ft.
Runway Safety Area	
Length beyond departure end: 300 ft. Length prior to threshold: 300 ft. Width: 150 ft.	Length beyond departure end: 1,000 ft. Length prior to threshold: 600 ft. Width: 500 ft.
Taxiway Safety Area (Width)	
79 ft.	118 ft.
Runway Object Free Area	
Length beyond runway end: 300 ft. Length prior to threshold: 300 ft. Width: 500 ft.	Length beyond runway end: 1,000 ft. Length prior to threshold: 600 ft. Width: 800 ft.
Object Free Zone (Width)	
250 ft.	400 ft.

B-II 5,000 Standards	C-III 4,000 Standards
Approach Runway Protection Zone	
Length: 1,000 ft. Inner Width: 500 ft. Outer Width: 700 ft. Acres: 13.77	Length: 1,700 ft. Inner Width: 1,000 ft. Outer Width: 1,510 ft. Acres: 48.98
Departure Runway Protection Zone	
Length: 1,000 ft. Inner Width: 500 ft. Outer Width: 700 ft. Acres: 13.77	Length: 1,700 ft. Inner Width: 500 ft. Outer Width: 1,010 ft. Acres: 29.47

Source: FAA AC 150/5300-13A, *Airport Design,* Tables 4-1, A7-4, and A7-9

Runway Safety Area

The Runway Safety Area (RSA) enhances the safety of aircraft by providing an area around the runway that is prepared or suitable for reducing the risk of damage to an aircraft that undershoots, overruns, or veers off the runway. The RSA also provides greater accessibility for firefighting and rescue equipment during such incidents. The RSA should generally be free of objects, except for objects that need to be located in the RSA because of their function. Objects higher than three inches above grade should be constructed of low-impact resistant supports (frangible mounted structures) of the lowest practical height with the frangible point no higher than three inches above grade.

The RSA should be cleared and graded and have no potential hazardous ruts, humps, depressions, or other surface variations. It should also be drained by grading or storm sewers to prevent water accumulation. The RSA should also be capable, under dry conditions, of supporting an aircraft that veers off the runway, snow removal equipment and aircraft rescue and firefighting equipment. The area is located symmetrically about the runway; extending outward from the runway centerline (equal distance) and a specific distance beyond the runway ends that depends on the approach speed and wingspan of the critical aircraft family as well as the approach visibility minimums established or planned for the runway.

The last ALP shows the runway threshold relocated to limit noise impacts on the town of Akron. It is recommended the relocation of the runway threshold still be shown as an ultimate objective to meet RSA dimensions associated with a C-III designation and continue to address local community noise concerns.

Taxiway Safety Area

The Taxiway Safety Area (TSA) is centered on the taxiway centerline and similar to the RSA, is the surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft that has deviated from the taxiway. It is recommended that as taxiways are extended at AKO, they meet the TSA dimensional standards set forth in FAA AC 150/5300-13A.

Object Free Area

The Object Free Area (OFA) is a two-dimensional area centered on the runway, taxiway, and taxilane centerlines. The OFA is an area clear of objects that could disrupt the flow of aircraft, except for frangible visual NAVAIDs that need to be in the OFZ because of their function. Except where precluded by other clearing standards, it is acceptable to place objects that need to be in the OFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the OFA. Objects that are non-essential for air navigation or aircraft ground maneuvering purposes are not to be placed in the OFA (this includes parked airplanes and agricultural operations). Dimensional standards for the Runway OFA are shown in **Table 4-12**.

Obstacle Free Zone

The Obstacle Free Zone (OFZ) is a three-dimensional volume of airspace that supports the transition of ground-to-airborne operations or vice versa. The OFZ clearing standards preclude taxiing and parked airplanes and object penetrations, except frangible visual NAVAIDs that need to be in the OFZ because of their function.

Because AKO does not have an approach lighting system, the only applicable area for the OFZ is around the runway centerline. FAA AC 150/5300-13A states, “The OFZ is the airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway, and for missed approaches.” In addition, the OFZ extends 200 feet beyond each end of the runway and is 250 feet wide for operations on runways by small aircraft with approach speeds of 50 knots or more. The width of the OFZ widens to 400 feet when large aircraft begin operating at the Airport. Additional OFZ standards apply when approach lighting systems are installed.

Runway Protection Zones

The Runway Protection Zone (RPZ) is designed to provide additional protection for people and property on the ground. This protection is provided through airport owner control of RPZs, preferably through the acquisition of sufficient property interest in the RPZ, and includes clearing RPZ areas of incompatible objects and activities. The RPZ represents the approach surface from the ground, is trapezoidal in shape, and is centered on the extended runway centerline. Its size depends on the approach speed and wingspan of the critical aircraft family as well as the approach visibility minimums established or planned for the runway. The RPZ consists of two components: the central portion and the controlled activity area. The central portion of the RPZ extends from the beginning to the end of the RPZ and is centered on the runway centerline; its width is equal to the runway OFA. The controlled activity area of the RPZ is the remaining area on either side of the central portion of the RPZ.

Runway 29’s approach RPZ is currently over Highway 63. FAA AC 5300-13A states, “It is desirable to clear the entire RPZ of all above-ground objects. Where this is impractical, airport owners, as a minimum, should maintain the RPZ clear of all facilities supporting incompatible activities.” Per FAA Memorandum, *Interim*

Guidance on Land Uses within the RPZ (dated 9/27/2012), public roads and highways are "incompatible" and must be addressed when runway enhancements effect a change in the approach minimums and/or RPZ. Therefore, if/when the C-III designation and reduced approach visibility minimums changes occur, it is recommended that AKO relocate the runway threshold to comply with RPZ standards. This recommendation is illustrated on the ALP as an ultimate objective.

4.2.10 Airspace Requirements

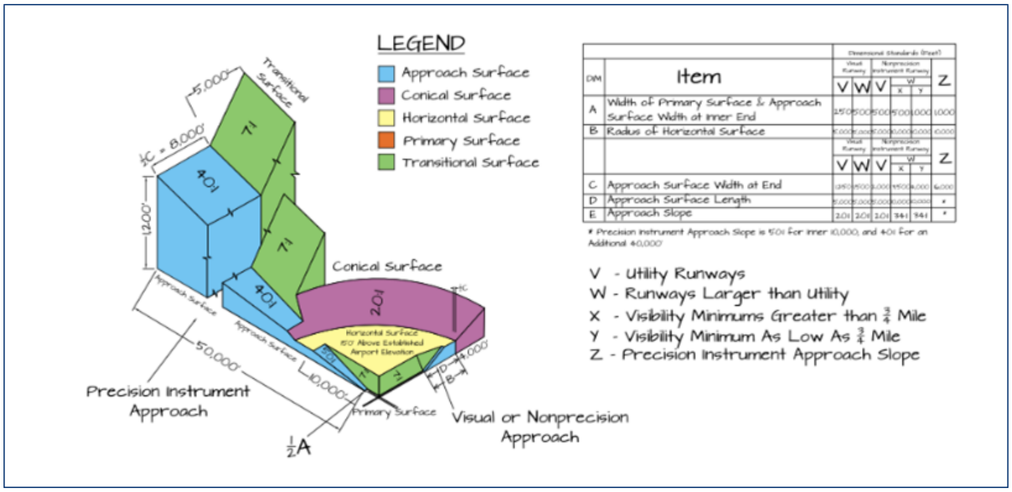
In addition to the primary airport infrastructure on the ground, FAA also requires airports to consider the surrounding airspace infrastructure. FAA standards apply to the use of navigable airspace through the definition of imaginary airspace surfaces, which are geometric shapes with size and dimensions based on the category of each runway for existing and planned airport operations, the types of instrument approaches, and their enabling regulatory document. The FAA grant assurances signed by AKO require that the imaginary surfaces be cleared of all obstructions, to the extent feasible.

Any changes to the airfield must be reviewed by the FAA to ensure there is appropriate obstacle clearance to maintain safe airport operations. Prior to any airport development, AKO or the Town must request that the FAA conduct an airspace evaluation to determine the potential impact a project may have on airport safety, regardless of scale; the airspace evaluation includes determining the impact on an airport's imaginary airspace surfaces. For the purposes of the AMP, three primary regulatory documents (and their associated airspace surfaces) were considered:

1. Title 14, Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, defines five imaginary surfaces, shown in **Title 14,** Code of Federal Regulations, including the Primary, Approach, Horizontal, Conical, and Transitional surfaces. Any object that penetrates these surfaces is considered to be an obstruction and may affect navigable airspace. Unless these obstructions undergo additional aeronautical study to conclude they are not a hazard, obstructions are presumed to be a hazard to air navigation.[1] Hazards to air navigation may include terrain, trees, permanent or temporary construction equipment, or permanent or temporary manufactured structures (such as power lines) penetrating one of the Part 77 surfaces.

[1] Title 14, Code of Federal Regulations Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*

FIGURE 4-2: TITLE 14 CFR PART 77 SURFACES



Source: FAA

2. FAA AC 150/5300-13A, *Airport Design*, defines approach airspace surfaces that are separate from 14 CFR Part 77, and are designed to protect the use of the runway in both visual and instrument meteorological conditions near the airport. These approach surfaces are defined by each runway's current approach type (i.e., visual, non-precision instrument, etc.), and typically are trapezoidal in shape, extending away from the runway along the centerline and at a specific slope. To establish the location of a runway threshold, the associated approach surface must be clear of all obstructions. If it is not clear, either the obstructions must be removed, or the runway threshold must be relocated until its associated approach surface is clear.
3. FAA Order 8260.3B, *U.S. Standard for Terminal Instrument Procedures (TERPS)* generally defines a wide variety of airspace surfaces that are designed to establish and maintain safe operational conditions around an airport for aircraft using instrument approaches. Obstructions to a TERPS surface can result in impacts to the instrument approach that could include a raising of minimums, making the approach unavailable in certain conditions, or decommissioning the instrument approach altogether

An aeronautical survey and obstruction analysis was performed on these surfaces at AKO. The ALP includes airspace and inner approach drawings that document the location and height of possible obstructions and their disposition. Further, data collected from the aeronautical survey will be uploaded to the FAA's Airport GIS system.

4.3 Landside Requirements

This section describes the landside requirements needed to accommodate AKO's general aviation and commercial activity throughout the planning period. Areas of focus include the terminal building, hangars, aprons and tie-down areas, automobile parking, as well as the various associated support facilities.

4.3.1 Airport Access

AKO is located along Highway 63, one mile north of the intersection of Highway 63 and Highway 34, providing convenient access for anyone driving to AKO. There are no recommendations to change the airport access as it accommodates all current and projected needs. Access to newly developed areas is shown on the ALP.

4.3.2 Terminal/Administration Building

Conveniently located along Highway 63, AKO's terminal is currently occupied by the fixed-base operator (FBO), Hayes Aviation. The terminal building includes offices, a pilot's lounge/planning area, waiting area, restrooms, vending machines with an eating area, and access to the Internet and weather services.

The terminal building was originally constructed in 1946 as two T-hangars. In 1951, this structure was renovated to be a gas station and repair shop. The building was last remodeled to serve as the terminal/administration building. The building is beyond its useful life and requires frequent, ongoing maintenance. Additionally, there appears to be movement and slippage where the building and the adjacent aircraft apron pavement meet, bringing into question their integrity and safety. It is recommended that AKO construct a new terminal within the next five to ten years.

Most terminal buildings at airports like AKO are between 1,500 and 2,500 square feet and include space for passenger waiting, flight planning, restrooms, concessions, small office, and a sales counter area. The new terminal should include space for these and any other AKO- or FBO-specific requirements. Some terminal buildings include space for a restaurant with a view to the airfield, or limited restaurant choices. Upon design of a new terminal building, the Town of Akron should consider if this would be an attractant and a potential revenue-enhancing opportunity.

4.3.3 Hangars

Hangars are used to store aircraft, provide protection from adverse weather conditions, and supply additional security. Hangars are also used for temporary storage while an aircraft is undergoing maintenance and/or repairs. The demand for hangar storage is generally a function of the number and type of based aircraft. All the hangars at AKO are utilized for private aircraft storage and maintenance.

The forecast for AKO shows growth from 13 to 17 based aircraft over the planning period. The results from the hangar storage analysis are shown in **Table 4-13.**

TABLE 4-13: HANGAR STORAGE REQUIREMENTS

	Current	2021	2026	2036
Required Hangar Spaces [1]	13	14	15	17
Total Square Feet of Hangar Space [2]	32,500	35,000	37,500	42,500
Existing Hangar Square Footage Available	34,500	34,500	34,500	34,500
Hangar Space Requirement Surplus or (Deficit)	2,000	(500)	(3,000)	(8,000)

Notes: [1] Assumed 100% of based aircraft would be stored in hangars.
[2] Assumed an average of 2,5000 square feet to accommodate most general aviation aircraft and other maintenance-related functions.

AKO Terminal Area

As evidenced in aerial photos of the Airport, the hangars were not built in an organized layout. Further, many of the hangars have uses besides aircraft storage, such as aircraft maintenance, equipment, and repair facilities. Generally, a larger amount of space is needed to accommodate these types of uses and was accounted for in the analysis. As demand warrants, future hangar construction will be carried out to best accommodate airport growth. Part of the goal of the master plan is to lay out the ideal position and access for hangar facilities to make the best use of available land while meeting the needs of AKO users. Alternative options and a recommended layout to meet requirements shown above are provided in the next chapter.

4.3.4 Apron and Tiedown Areas

AKO's 80,000-square-foot concrete apron has 17 "T" parking spots painted to accommodate multiple power-in, power-out parking areas. This ramp was constructed in 1993 and is in poor condition in several areas. As pavement deteriorates, pieces come apart and create hazards for vehicles and aircraft. CDOT Aeronautics uses a pavement condition index (PCI) of 1 to 100 to determine when pavement should be updated, with 100 being excellent condition. CDOT recommends pavement be replaced when it is 54 or below. AKO'S apron currently has a PCI of 43; it is recommended the apron be replaced within the next five to ten years.

Based on planning criteria and interviews with airport management, the current size of the apron space (80,000 square feet) is adequate to accommodate existing and future demand. A key component in the determination of the overall amount of apron space is a function of the location of facilities and proximity to the runway/taxiway system. An apron area that best suits the future location of the terminal building, provides ample tiedown/parking space, and accesses existing and future hangars is presented in **Chapter 5, Alternatives**.

4.3.5 Automobile Parking

Parking for airport visitors is on the east side of the terminal building and west of Highway 63. The parking lot accommodates approximately 13 cars.

Automobile parking is typically provided for based aircraft owners, Airport employees, and visitors. Utilizing typical planning rules of thumb for airports like AKO, an analysis was completed to determine the required number of auto parking spaces and square yardage (see **Table 4-14**). This analysis does not include space for the movement of vehicles within the parking area. It is recommended that parking for automobiles be increased when a new terminal building is constructed.

TABLE 4-14: AUTO PARKING REQUIREMENTS

	Current	2021	2026	2036
Required Parking Spaces [1]	20	21	23	26
Total Square Yards of Parking Space	560 sy	588 sy	644 sy	728 sy
Existing Parking Square Yardage Available	560 sy	560 sy	560 sy	560 sy
Parking Space Requirement Surplus or (Deficit)	- sy	(28) sy	(84) sy	(168) sy

Notes: [1] Assumes one auto parking space per based aircraft plus 50% for visitors/employees.

4.3.6 Utilities

Electrical power for AKO is provided by Y-W Electric Association, Inc. Gas services are provided by Kinder Morgan Energy Gas Company and telephone services are provided by CenturyLink Telecommunications Company. If development occurs along the north side of the airfield, additional capacity for each utility may be added from existing services. Any additional facilities added to the west or south sides of the airfield would likely require extensive infrastructure improvements.

4.4 Airport Support Facilities

Current conditions at the Airport and potential future developments may impact aviation-support facilities. Potential requirements necessary to meet deficiencies or address future needs for facilities that support the Airport's infrastructure and basic services are detailed below.

4.4.1 Fuel Storage Facilities

As a major revenue source for the Airport, aviation fuel sales have significant financial impact for AKO in addition to benefiting its users. Fuel storage requirements are typically based on maintaining a two- or three-week supply of fuel during an average month. The availability for more frequent deliveries can reduce the fuel storage capacity requirement, however deliveries add to the cost of fuel. Storage beyond a four-week period is not recommended as the quality of the fuel could degrade.

The main fuel storage area is parallel to the taxiway and northwest of the apron area. The Airport has a 100-LL self-serve fuel pump and two fuel trucks (100LL and Jet A) supplied by two 10,000-gallon tanks. In total, AKO has a capacity of 11,600 gallons of 100LL and 13,000 gallons of Jet A, enough storage for current and projected activity.

4.4.2 Airport Security

Airport security is essential to the safe operation of any airport. Because AKO is not a commercial service airport, there are no mandated security regulations. The Transportation Security Administration (TSA) and Aircraft Operator's and Pilot's Association (AOPA) have published guidelines for general aviation airports. TSA's document "Security Guidelines for General Aviation Airports" states:

> "The purpose of the Security Guidelines for General Aviation Airports Information Publication (IP) is to provide owners, operators, sponsors, and other entities charged with oversight of GA airports a set of federally endorsed security enhancements and a method for determining when and where these enhancements may be appropriate. The document does not contain regulatory language nor is it intended to suggest that any recommendations or guidelines should be considered a mandatory requirement."

AOPA's Airport Watch and General Aviation Hotline are two other programs that are highly utilized throughout the industry. The consensus throughout the general aviation airport community is that general aviation airports should have perimeter fencing for security and to reduce wildlife occurrences on the airfield, and that controlled-access gates be installed at key access points and monitored by Airport/security staff. AKO currently has controlled-access gates, but limited fencing. It is recommended that AKO construct a security/wildlife fence surrounding the entire airport property, and continue to monitor airport access through existing and future controlled-access gates.

4.4.3 Airfield Maintenance Facilities

The two largest categories of airfield maintenance are generally snow removal and mowing. At AKO, these tasks are performed by the Town of Akron. Subsequently, there are no on-airfield storage buildings for plows or mowers. If the Airport purchases maintenance equipment, storage facilities would need to be built to ensure its safety and longevity. Based on the Airport's acreage (approximately 640 acres) it is recommended that a maintenance equipment storage building from 3,000 to 4,000 square feet be added to the ALP, if/when the facility is deemed necessary.

4.4.4 Aircraft Rescue and Firefighting

AKO does not currently accommodate air carrier aircraft, nor does it hold a Part 139 certificate; subsequently, it is not required to have Aircraft Rescue and Firefighting (ARFF) available. However, emergency response services are provided from the Town of Akron Fire Department, located one mile from AKO. This emergency response service is adequate for the 20-year planning range.

4.5 Facility Requirements Summary

Various improvements at AKO will be needed over the 20-year planning period. **Table 4-15** summarizes the airside, landside, and support facility development needs identified in this chapter, along with a brief justification for each improvement. The facilities listed in the table will undergo further review and evaluation in later chapters to determine the feasibility of the requirements. Development alternatives are reviewed and a recommended concept is presented in **Chapter 5, Alternatives**, and illustrated on the ALP in **Chapter 6**.

TABLE 4-15: FACILITY RECOMMENDATIONS

Facility	Future Requirement	Justification
Terminal Construction	Construct a new terminal building and associate access and parking.	Create a safer, more updated space for the public.
Apron Reconstruction	Pave a new apron to accommodate existing and future aircraft.	Increase safety and reduce foreign object debris (FOD).
Hangar Development	T-hangar and box hangar development.	As demand warrants.
Runway Development	Relocate Runway 11/29 threshold while maintaining width. Ultimate crosswind runway to meet FAA wind coverage recommendations if land and funding are available.	Maintain width and ARC C-III for wind coverage (primary reason) and as a regional resource and benefit to airport users. Crosswind runway to meet wind coverage, if possible, beyond 20-year planning range.
Approach Capabilities	Lower instrument approach visibility minimums to ¾-mile.	Address needs of existing users and attract others during adverse weather conditions.

Facility	Future Requirement	Justification
Taxiway Improvements	Extend taxiway the full length of the runway and other enhancements.	Increase safety and airfield efficiency. Meet design standards.
Maintenance Equipment Storage	Storage building for airfield maintenance equipment.	Needed if airfield maintenance responsibilities were to shift to AKO.
Airfield Perimeter Fencing	Supplement existing fencing near terminal building to encompass entire airport property.	Security and wildlife management.
In-fill Development	Hangar and non-aeronautical development within vacant spaces.	Development where practical.

Source: Jviation

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