CHAPTER 4: FACILITY REQUIREMENTS

Introduction

This chapter of the Airport Master Plan analyzes the existing and anticipated future facility needs at the Ronan Airport (7S0). The report is divided into sections that assess the needs of primary airport elements including airside facilities, general aviation facilities, landside elements and support facilities.

Airside requirements are those necessary for the operation of aircraft. Landside requirements are those necessary to support airport, aircraft and passenger operations. Proposed requirements are based on a review of existing conditions, capacity levels, activity demand forecasts and airport design standards using FAA guidance and industry standards. Existing facility deficiencies are identified along with potential future facility needs. The level of review completed is sufficient to identify major airport elements that should be addressed in this comprehensive airport plan.

Potential solutions to address the facility needs through the planning period are discussed in this chapter. Specific alternatives that implement the recommendations are evaluated in **Chapter 5: Alternatives Analysis**.

This chapter provides a review of the facility needs for the following airport infrastructure categories:

- Airside Facilities
- General Aviation
- Support Facilities
- Landside Facilities

Planning Activity Levels (PALs)

For this Master Plan study, PALs are used to identify demand thresholds for recommended facility improvements. If an activity level is approaching a PAL then the airport should prepare to implement the improvements. Alternatively, activity levels that are not approaching a PAL can allow improvements to be deferred.

There are various airport activity measures used to determine facility requirements at general aviation airports including based aircraft, total aircraft operations and critical design aircraft annual operations. Airport activity can be sensitive to industry changes as well as national and local economic conditions. This results in difficulty in identifying a specific calendar year for the airport to each demand levels associated with recommended improvements.

The demand forecasts developed in this study do correspond to an anticipated planning level calendar year to each PAL (2020, 2025, 2030, 2035) from the preferred aviation forecasts.

Table 4-1 – Planning Activity Levels (PALs)

Metric	Base	PAL 1	PAL 2	PAL 3	PAL 4
Activity Metrics					
Total Annual Operations	9,850	10,255	10,576	10,870	11,377
Peak Month Operations	1,063	1,105	1,138	1,169	1,222
Busy Day Operations	41	42	44	45	47
Design Hour Operations	3	3	3	3	4
Total Based Aircraft	29	31	32	34	35

Source: KLJ Analysis

Airside Facilities

Airfield Design Standards

Guidance on FAA airport design standards is found in FAA AC 150/5300-13A, *Airport Design (Change 1)*. Airport design standards provide basic guidelines for a safe, efficient, and economic airport system. Careful selection of basic aircraft characteristics for which the airport will be designed is important. Airport designs based only on existing aircraft can severely limit the ability to expand the airport to meet future requirements for larger, more demanding aircraft. Similarly, airport designs that are based on large aircraft unlikely to operate at the airport are not economical.

DESIGN AIRCRAFT

Aircraft characteristics relate directly to the design components on an airport. Planning a new airport or improvements to an existing airport requires the selection of one or more "design aircraft." FAA design standards for an airport are determined by a coding system that relates the physical and operational characteristics of an aircraft to the design and safety separation distances of the airfield facility. The design aircraft is the most demanding aircraft fleet operating or forecast to operate at the airport on a regular basis. It is not the usual practice to base the airport design on an aircraft that uses the airport infrequently. Projects are eligible for FAA funding if they are needed for the design aircraft. The minimum threshold is 500 annual itinerant operations. **Aviation demand forecasts show the overall design aircraft at 7S0 will stay at Airport Reference Code (ARC) B-II, Small Aircraft (less than 12,500 pounds) throughout the planning period, but that B-II, Large Aircraft (greater than 12,500 pounds) will continue to increase at the airport throughout the planning period. Also, the Tribe has mentioned that they would like to base __ CL 215 aircraft at the airport. The CL 215 has an ARC of A-III, which should be considered in the planning of the airport**.

Table 4-2 – Design Aircraft Operations

Metric	Base	PAL 1	PAL 2	PAL 3	PAL 4
Critical Design Aircraft Operations					
AAC-A/B, ADG-II, TDG-2, Small	512	515	518	522	540
AAC-A/B, ADG-II, TDG-2, Large	44	148	324	346	360

Source: KLJ Analysis. AAC = Aircraft Approach Category (AAC), ADG = Airplane Design Group, TDG = Taxiway Design Group. Large Aircraft: >12,500 lbs. Maximum Takeoff Operating Weight (MTOW), Small Aircraft: $\leq$ 12,500 lbs. MTOW. Green highlight depicts substantial use of the design aircraft category.

AIRFIELD DESIGN CLASSIFICATIONS

The FAA has established aircraft classification systems that group aircraft types based on their performance and geometric characteristics. These classification systems are used to determine the appropriate airport design standards for specific runway, taxiway, apron, or other facilities, as described in AC 150/5300-13A, Change 1.

- **Aircraft Approach Category (AAC):** a grouping of aircraft based on approach reference speed, typically 1.3 times the stall speed. Approach speed drives the dimensions and size of runway safety and object free areas.
- **Airplane Design Group (ADG)**: a classification of aircraft based on wingspan and tail height. When the aircraft wingspan and tail height fall in different groups, the higher group is used. Wingspan drives the dimensions of taxiway and apron object free areas, as well as apron and parking configurations.
- **Taxiway Design Group (TDG):** a classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. TDG relates directly to taxiway/taxilane pavement width and fillet design at intersections.

In addition, approach visibility minimums are added to determine the Runway design Code (RDC) for a particular runway:

- **Approach Visibility Minimums:** relates to the visibility minimums expressed by Runway Visual Range (RVR) values in feet. These distances relate to the minimum distance pilots must be able to see the runway or lighting from the runway. Visibility categories include visual (V), non-precision (NPA), approach procedure with vertical guidance (APV) and precision (PA). Lower visibility minimums require more complex airfield infrastructure and enhanced protection areas including safety and object free areas as well as runway-to-taxiway separation distances.

Although not a classification, runway length is driven by the landing and departure performance characteristics of the most demanding design aircraft as identified in FAA AC 5325-4B, *Runway Length Recommendations for Airport Design*.

Table 4-3 – Airfield Classification Systems

Aircraft Approach Category (AAC)		
AAC	**Approach Speed**	
A	Approach speed less than 91 knots	
B	Approach speed 91 knots or more but less than 121 knots	
C	Approach speed 121 knots or more but less than 141 knots	
D	Approach speed 141 knots or more but less than 166 knots	
E	Approach speed 166 knots or more	
Airplane Design Group (ADG)		
ADG	**Tail Height (ft.)**	**Wingspan (ft.)**
I	< 20’	< 49’
II	20’ - < 30’	49’ - < 79’
III	30’ - < 45’	79’ - < 118’
IV	45’ - < 60’	118’ - < 171’
V	60’ - < 66’	171’ - < 214’
IV	66’ - < 80’	214’ - < 262’
Approach Visibility Minimums		
RVR (ft.)*	**Instrument Flight Visibility Category (statue mile)**	
N/A (VIS)	Visual (V)	
5000	Not lower than 1 mile (NPA)	
4000	Lower than 1 mile but not lower than ¾ mile (APV)	
2400	Lower than ¾ mile but not lower than ½ mile (CAT-I PA)	
1600	Lower than ½ mile but not lower than ¼ mile (CAT-II PA)	
1200	Lower than ¼ mile (CAT-III PA)	

Source: FAA AC 150/5300-13A - Change 1, Airport Design
**RVR values are not exact equivalents*
APV = Approach with Vertical Guidance, PA = Precision Approach

AIRPORT REFERENCE CODE (ARC)

The Airport Reference Code (ARC) is an airport designation that represents the AAC and ADG of the aircraft that the entire airfield is intended to accommodate on a regular basis. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport.

RUNWAY DESIGN CODE (RDC)

RDC is a code signifying the design standards to which the overall runway is to be planned and built, typical based on the design aircraft and approach visibility minimums for a particular runway. RDC provides the information needed to determine the design standards that apply.

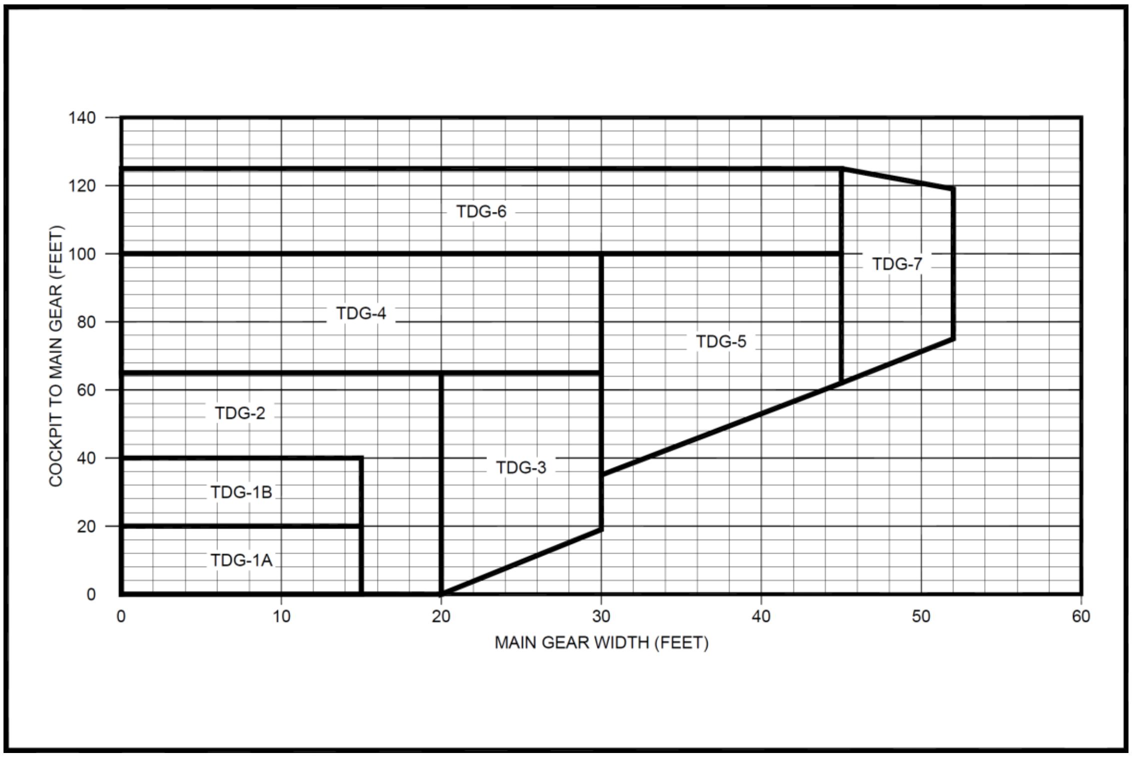
RUNWAY REFERENCE CODE (RRC)

RRC is a code signifying the current operational capabilities of each specific runway end and adjacent parallel taxiway. RRC is split into Approach Reference Code (APRC) and Departure Reference Codes (DPRC) for each phase of flight. APRC classifications are expressed in three components: AAC, ADG, and the lowest approach visibility minimums that either end of the runway is planned to provide. DPRC classifications utilize AAC and ADG components only. A runway end may have more than one RRC depending on the minimums available to a specific AAC.

TAXIWAY DESIGN GROUP (TDG)

TDG relates to the dimensions of the aircraft landing gear including distance from cockpit to main gear (CMG) or wheelbase and main gear width (MGW). These dimensions relate to an aircraft’s ability to safely maneuver taxiways at an airport. Taxiways/taxilanes on an airport can be constructed to a different TDG based on the expected use of that taxiway/taxilane by the design aircraft.

Table 4-3 – Taxiway Design Group



Source: [FAA AC 150/5300-13A - Change 1, Airport Design]

OTHER DESIGN CONSIDERATIONS

Other airport design principles are important to consider for a safe and efficient airport design:

- **Runway/Taxiway Configuration:** The configuration of runways and taxiways affects the airport's capacity/delay, risk of incursions with other aircraft on the runway and overall operational safety. Location of and type of taxiways connecting with runways correlates to runway occupancy time. The design of taxiway infrastructure should promote safety by minimizing confusing or complex geometry to reduce risk of an aircraft inadvertently entering the runway environment.
- **Approach and Departure Airspace & Land Use**: Runways each have imaginary surfaces that extend upward and outward from the runway end to protect normal flight operations. Runways also have land use standards beyond the runway end to protect the flying public as well as persons and property on the ground from potential operational hazards. Runways must meet grading and clearance standards considering natural and man-made obstacles that may obstruct these airspace surfaces. Surrounding land use should be compatible with airport operations. Airports should develop comprehensive land use controls to prevent new hazards outside the airport property line. Obstructions can limit the utility of a runway.
- **Meteorological Conditions**: An airport's runways should be designed so that aircraft land and takeoff into the prevailing wind. As wind conditions change, the addition of an additional runway may be needed to mitigate the effects of significant crosswind conditions that occur

more than five percent of the year. Airports that experience lower cloud ceiling and/or visibility should also consider implementing instrument procedures and related navigational aids to runways to maximize airport utility.

- **Navigation Aids & Critical Areas:** Visual navigational aids (NAVAIDs) to a runway or the airfield require necessary clear areas for these NAVAIDs to be effective for pilots. Instrument NAVAIDs on an airport require sufficient clear areas for the NAVAID to properly function without interference to provide guidance to pilots. These NAVAID protection areas restrict development.
- **Airfield Line of Sight:** Runways need to meet grading standards so that objects and aircraft can be seen along the entire runway. A clear line of sight is also required for intersecting runways within the Runway Visibility Zone to allow pilots to maintain visual contact with other objects and/or aircraft that may pose a hazard.
- **Interface with Landside:** The airfield configuration should be designed to provide for the safe and efficient operation of aircraft as they transition from the airfield to landside facilities such as hangars and terminals.
- **Environmental Factors:** Airport development must consider potential impacts in and around the airport environs through the National Environmental Policy Act (NEPA). Additionally, development should also reduce the risk of potential wildlife hazards such as deer and birds that may cause hazards to flight operations.

Design Aircraft

The design aircraft types must be identified to determine the appropriate airport design standards to incorporate into airport planning. The existing and future design aircraft characteristics associated with the runways at 7S0 are summarized in the tables below.

Table 4-4 – Existing Airfield Design Aircraft Summary

Design Characteristics	Runway 16-34
Aircraft Make/Model	Beechcraft King Air B-200
Airplane Approach Category	B
Airplane Design Group	II
Taxiway Design Group	2
Wingspan	57' 11" (w/ winglets)
Length	43' 9"
Tail Height	15' 0"
Cockpit to Main Gear	8' 4"
Main Gear Width	18' 7"
Approach Speed (1.3 x Stall)	97 knots
Maximum Takeoff Weight	12,500 pounds
Landing Gear Configuration	Dual Wheel
Aircraft Classification Number	2-4

Source: Beechcraft, KLJ Analysis

The future & ultimate design aircraft for Runway 16-34 is forecast to exceed triggering thresholds if the Tribe decides to base the CL-215 (A-III) at the airport, but until that happens the design aircraft will remain the Beech King Air. Also there is an upward trend for the Ronan Airport with regards to larger aircraft (C-II), again while the triggering threshold (500 operations) will not be crossed the airport should remain aware of operations by these aircraft and should plan to accommodate them.

Table 4-5 – Future & Ultimate Airfield Design Aircraft Summary

Design Characteristics	Future Runway 16-34
Aircraft Make/Model	Beechcraft King Air B-200
Airplane Approach Category	B
Airplane Design Group	II
Taxiway Design Group	2
Wingspan	57' 11" (w/ winglets)
Length	43' 9"
Tail Height	15' 0"
Cockpit to Main Gear	8' 4"
Main Gear Width	18' 7"
Approach Speed (1.3 x Stall)	97 knots
Maximum Takeoff Weight	12,500 pounds
Landing Gear Configuration	Dual Wheel
Aircraft Classification Number	2-4

Source: Cessna, KLJ Analysis

Exhibit 4-1 Typical Aircraft by ARC

ARC A-I/Small Aircraft		ARC A-II/Small Aircraft	
Cessna 150 **Cessna 182** Piper Archer Piper Seneca Ayres Thrush 600		Cessna 208 **Pilatus PC-12** Air Tractor 502B	
ARC B-I/Small Aircraft		**ARC B-II/Small Aircraft**	
Beech Baron 58 **Cessna 421** Beech King Air 100		Beech King Air 90 **Beech King Air 200**	
ARC B-II/Large Aircraft		**ARC A-III**	
Beech King Air 350 **Cessna Citation XLS** Swearingen Metro III		**CL-215**	

Source: KLJ Analysis, Wikipedia.org, Airliners.net

Airfield Capacity

The total capacity of the airfield is the measure of the maximum number of aircraft arrivals and departures capable of being accommodated for a runway and taxiway configuration. Delay occurs when operations exceed the available capacity at an airport. Airports should plan to provide capacity enhancements well in advance to avoid undue operational delays. A master planning-level analysis was completed using the methods outlined in FAA AC 150/5060-5, *Airport Capacity and Delay* and Airport Cooperative Research Program (ACRP) Report 79: *Evaluating Airport Capacity*.

Airfield capacity is measured using various metrics:

- **Hourly Capacity**: The maximum throughput of arrivals and departures an airfield can safely accommodate in a one-hour period.
- **Annual Service Volume**: The maximum throughput of annual operations and airfield can safely accommodate in one-year with an acceptable level of delay.
- **Aircraft Delay**: The difference in time between a constrained and an unconstrained aircraft operation, measured in minutes.

INPUT FACTORS

Aircraft Fleet Mix

Different types of aircraft operating on an airport impacts airport capacity. In addition to required arrival and departure flow separation requirements between similar aircraft types, aircraft with different speeds create the need for additional spacing requirements to maintain minimum separation between operating aircraft. The airport's fleet mix index is established using guidelines established in ACRP Report 79.

Table 4-6 – Aircraft Fleet Mix Classifications

Aircraft Classification	Characteristics
Small - S	Less than 12,500 lbs. (Single Engine)
Small - T	Less than 12,500 lbs. (Twin Engine)
Small +	Corporate airplanes between 12,500 lbs. and 41,000 lbs.
Large - TP	Turboprop between 12,500 lbs. and 255,000 lbs.
Large - Jet	Jet between 41,000 lbs. and 300,000 lbs.
Large - 757	Boeing 757 series
Heavy	More than 300,000 lbs.

Source: ACRP Report 79

The aircraft fleet mix percentage for capacity calculations is based on the aviation forecasts. Overall fleet mix assumptions for 7S0 are summarized in the following table.

Table 4-7 – Aircraft Fleet Mix Assumptions

Aircraft Classification	Base	PAL 4
Small – S	80.0%	80.0%
Small – T	10.0%	5.0%
Small +	10.0%	15.0%

Source: ACRP Report 79, KLJ Analysis

Runway Use

The runway use configuration affects the operational efficiency and capacity of an airfield. At 7S0, a single-runway configuration is assumed. The only usable runway is assumed to be Runway 16-34 as this runway can handle VFR and IFR operations, arrivals and departures.

Other Considerations

Meteorological conditions are an important consideration for capacity calculations. An analysis of the weather observations over the past 10 years show Visual Meteorological Conditions (VMC) conditions are experienced approximately 93 percent of the time. Instrument Meteorological Conditions (IMC) exist for the remainder.

Touch-and-go operations are those that land then takeoff on the same runway without exiting the runway. These are typically conducted during flight training activities. They normally occur with small training aircraft and account for two operations, thus increasing airfield capacity. For capacity calculation purposes it is assumed 25 percent of the total operations at 7S0 are touch-and-go.

HOURLY CAPACITY

Hourly capacity is calculated during IMC and VMC conditions using assumptions identified in this report and calculations identified in ACRP Report 79. Weighted hourly capacity is determined based on runway utilization, weather conditions and an FAA weighting factor. The results assume a mix of arrivals and departures. With no change to the airfield configuration, the hourly capacity does not significantly change due to a minimal change in fleet mix.

Table 4-8 – Hourly Capacity

Factors	Base	PAL 4
Single Runway Use Scenario (Mixed Operations)		
VMC Hourly Capacity	74	73
IMC Hourly Capacity	53	53
Weighted Average Hourly Capacity	72	72

Source: ACRP Report 79, KLJ Analysis

ANNUAL SERVICE VOLUME

Annual Service Volume (ASV) is an estimate of the total annual aircraft operations on an airfield annually. ASV is calculated based on the weighted hourly capacity multiplied by hourly and daily demand ratios. The ratio of the total operations to an airport's ASV determines if and when an airport should plan for capacity improvements to increase overall capacity. The ASV for 7S0 is calculated based on hourly capacity and other assumptions at 183,500 operations.

Table 4-9 – Annual Service Volume (ASV)

Metric	Base	PAL 1	PAL 2	PAL 3	PAL 4
Annual Operations	9,850	10,255	10,576	10,870	11,377
Average Busy Day	82	85	88	90	93
Average Design Hour	6.8	7.0	7.3	7.4	7.7
Annual Service Volume	183,500	183,500	183,500	183,500	183,500
Capacity Level	**5.37%**	**5.55%**	**5.76%**	**5.89%**	**6.10%**

Source: FAA AC 150/5060-5, Airport Capacity and Delay, KLJ Analysis

7S0 does not approach the threshold of 60 percent which would trigger planning for capacity improvements. As a result, **there are no foreseen airfield capacity issues at 7S0**.

Meteorological Considerations

Meteorological conditions that affect the facility requirements of an airport include wind coverage and weather conditions encountered. Wind coverage and weather conditions are evaluated based on the two different flight rules, VFR and IFR. Visual Meteorological Conditions (VMC) are encountered when the visibility is 3 nautical miles or greater, and the cloud ceiling height is 1,000 feet or greater. Conditions less than these weather minimums are considered Instrument Meteorological Conditions (IMC) requiring all flights to be operated under IFR.

In mountainous terrain wind patterns and geography can greatly change within just a few miles so it is important to utilize weather observation stations that are as close as possible to the airport with similar geographical features. Ronan Airport does have a non-federally owned SuperAWOS on the airfield however after reviewing the weather observations it was determined that the desired 10 years of data was not available and there were an abnormally high number (approximately 34%) of wind calm observations. The Ronan Remote Automatic Weather Station (Station ID: RONM8) station located 2 miles south of the airport was selected for the all-weather wind coverage. Observations from 2006-2015 were reviewed from MesoWest with the periodic observations within each hour removed. This method provides a comprehensive look into the true average weather trends at an airport without skewing conditions toward IFR where multiple observations may be taken each hour due to changing conditions.

Because the station in Ronan does not collect all the information to determine IMC, the Missoula Airport ASOS located approximately 45 miles to the south was used to develop the IFR and Meteorological analysis. This station was chosen as it was the closest facility to Ronan Airport which reported ceiling and visibility and had similar geographic layout. Observations from 2006-2015 were reviewed from the Airports GIS Windrose Generator which is based on National Climatic Data Center (NCDC) data.

Wind coverage is important to airfield configuration and utilization. Aircraft ideally takeoff and land into a headwind aligned with the runway orientation. Aircraft are designed and pilots are trained to land aircraft during limited crosswind conditions. Small, light aircraft are most affected by crosswinds. To mitigate the effect of crosswinds, FAA recommends runways be aligned so that excessive crosswind conditions are encountered at most 5 percent of the time. This is known as a "95 percent wind coverage" standard. Each aircraft's AAC-ADG combination corresponds to a maximum crosswind wind speed component.

Small Aircraft Crosswind Landing Diagram

(faasafety.gov)

Even when the 95 percent wind coverage standard is achieved for the design airplane or airplane design group, cases arise where certain airplanes with lower crosswind capabilities are unable to utilize the primary runway. The maximum crosswind component for different aircraft sizes and speeds are shown in **Table 4-12**.

Table 4-12 – FAA Wind Coverage Standards

AAC-ADG	Maximum Crosswind Component	Applicable Runway(s)
A-I & B-I	10.5 knots	Runway 16-34
A-II & B-II	13.0 knots	Runway 16-34

Source: FAA AC 150/5300-13A - Change 1, Airport Design

Wind coverage for the airport is separated into all-weather, VMC and IMC alone. An all-weather analysis helps determine runway orientation and use. VMC is when most flight training operations occur. Local weather patterns commonly change in IMC. An IMC review helps determine the runway configuration for establishing instrument approaches.

The all-weather wind analysis for 7SO (Ronan Airport) is summarized in **Table 4-13**.

Table 4-13 – All-Weather Wind Analysis

Runway	AAC-ADG	Crosswind Component (Wind Speed)	
		10.5 knots	13.0 knots
Runway 16-34	B-II	99.33%	99.64%

Source: MesoWest data from RONM8 RAWS (2006-2015; hourly)

For all-weather conditions, the B-II design aircraft crosswind component (13 knots) is accommodated on Runway 16-34 during all-weather conditions with airfield wind coverage exceeding 95 percent. For A-I and B-I small aircraft, Runway 16-34 provides adequate wind coverage (10.5 knots) exceeding 95 percent. **The current runway configuration meets FAA standards for overall all-weather wind coverage.**

Table 4-14 summarizes the IMC wind coverage by runway and by runway end. Runway 16-34 provides adequate wind coverage exceeding 95 percent for both 10.5 and 13 knot crosswind components. **The current runway configuration meets FAA standards for IMC wind coverage.**

Table 4-14 – IMC Wind Analysis

Runway	AAC-ADG	Crosswind Component (Wind Speed)	
		10.5 knots	13.0 knots
Runway 16-34	B-II	95.79%	97.24%
Runway 16 Only	B-II	72.76%	73.55%
Runway 34 Only	B-II	77.19%	77.85%

Source: Airports GIS data from KMSO ASOS (2006-2015; hourly)

When reviewing each runway end, the Runway 34 end accommodates the higher percentage of aircraft given the prevailing wind conditions during IMC. Both runway ends have published non-precision instrument approach procedures with identical weather minimums.

WEATHER CONDITIONS

Cloud Ceiling & Visibility

When IMC weather conditions occur, aircraft must operate under IFR and utilize instrument approach procedures to land. IMC conditions drive the need for instrument approach procedures with sufficient weather minimums to enhance airport utilization.

Current GPS instrument approach weather minimums are 357-foot cloud celling and 1 ¼ mile flight visibility for both Runway 16 and 34.Weather conditions are broken down into occurrence percentages based on current instrument approach minimums in **Table 4-15**.

Low Visibility Airport Operations

(skybrary.aero)

Table 4-15 – Meteorological Analysis

Weather Condition	Percentage	Days per Year	Hours per Year
VMC	96.06%	350.62	8414.86
Usable IMC	2.10%	7.67	183.96
Usability	**98.16%**	**358.28**	**8598.82**
Below Weather Minimums*	1.84%	6.72	161.18
Total	**100.00%**	**365.00**	**8760.00**

**Runway 16 and Runway 34 LPV GPS approach: 1 ¼ mile visibility, 357 foot ceiling*
Source: National Climatic Data Center data from MSO ASOS (2006-2015; hourly), KLJ Analysis

Based on cloud ceiling and visibility observations, Ronan Airport can be accessed 98.16% of the time with the current GPS approach. This equates to 161.18 hours per year or the equivalent of 6.72 days annually where the airport cannot operate.

Temperature

Average high temperature data for the hottest month was reviewed from climate data available from the NCDC for Round Butte which is approximately 8 miles to the east of Ronan Airport. This NCDC data from 1981-2012 indicates the average high temperature in July to be 83.1 degrees Fahrenheit. Temperature affects recommended runway lengths.

Runways

7S0 has one general aviation runway, Runway 16-34. This runway is 4,800 feet long and 75 feet wide. This runway is currently designed to accommodate non-precision instrument approaches with visibility minimums as low as 1 ¼ mile.

RUNWAY DESIGN CODE (RDC)

The design aircraft and instrument approach minimums drive the RDC designation for each runway. The RDC for Runway 16-34 is B/II(S)/5000 (no lower than 1 mile) for small aircraft. Because the runway has a published pavement strength for large aircraft that occasionally use the runway, the Runway 16-34 RDC is recommended to be maintained at B/II/5000. No significant operations occur in larger aircraft types such as ADG-III or AAC-C.

The future Runway 16-34 RDC would be B/II/5000 to accommodate regular use of large aircraft. If instrument approaches are enhanced to no lower than ¾ mile then the RDC would also change to B/II/4000.

RUNWAY REFERENCE CODES (RRC)

The existing operational capabilities of the runway is identified based on a taxiway separation distance. The current Runway 16-34 to parallel taxiway separation distance is 240 feet. The existing approach reference code (APRC) for Runway 16-34 is B/II/5000 (not lower than 1 ¼ mile) while the departure reference code (DPRC) is B/II. **This meets the current needs, however if the Tribe decides to base the CL 215 at the airport, which is an ARC A-III, the airport will need to increase the taxiway separation to 300 feet (60 feet shift).**

DESIGN STANDARDS

Basic Safety Standards

One primary purpose of this master plan is to review and achieve compliance with all FAA safety and design standards. The design standards vary based on the RDC and RRC as established by the design aircraft. In addition to the runway pavement width, some of the safety standards include:

- **Runway Safety Area (RSA):** A defined graded surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot or excursion from the runway. The RSA must be free of objects, except those required to be located in the RSA to serve their function. The RSA should also be capable to supporting airport equipment and the occasional passage of aircraft.
- **Runway Object Free Area (ROFA):** An area centered on the ground on a runway provided to enhance the safety of aircraft operations by remaining clear of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.
- **Runway Obstacle Free Zone (ROFZ):** The OFZ is the three-dimensional volume of airspace along the runway and extended runway centerline that is required to be clear of taxiing or parked aircraft as well as other obstacles that do not need to be within the OFZ to function. The purpose of the OFZ is for protection of aircraft landing or taking off from the runway and for missed approaches.

Other design standards include runway shoulder width to prevent soil erosion or debris ingestion for jet engines, blast pad to prevent soil erosion from jet blast, and required separation distances to markings, objects and other infrastructure for safety. Critical areas associated with navigational aids as well as airspace requirements are described further in this chapter.

The RSA, ROFA and ROFZ appear to meet current FAA design standard.

LAND USE CONTROL

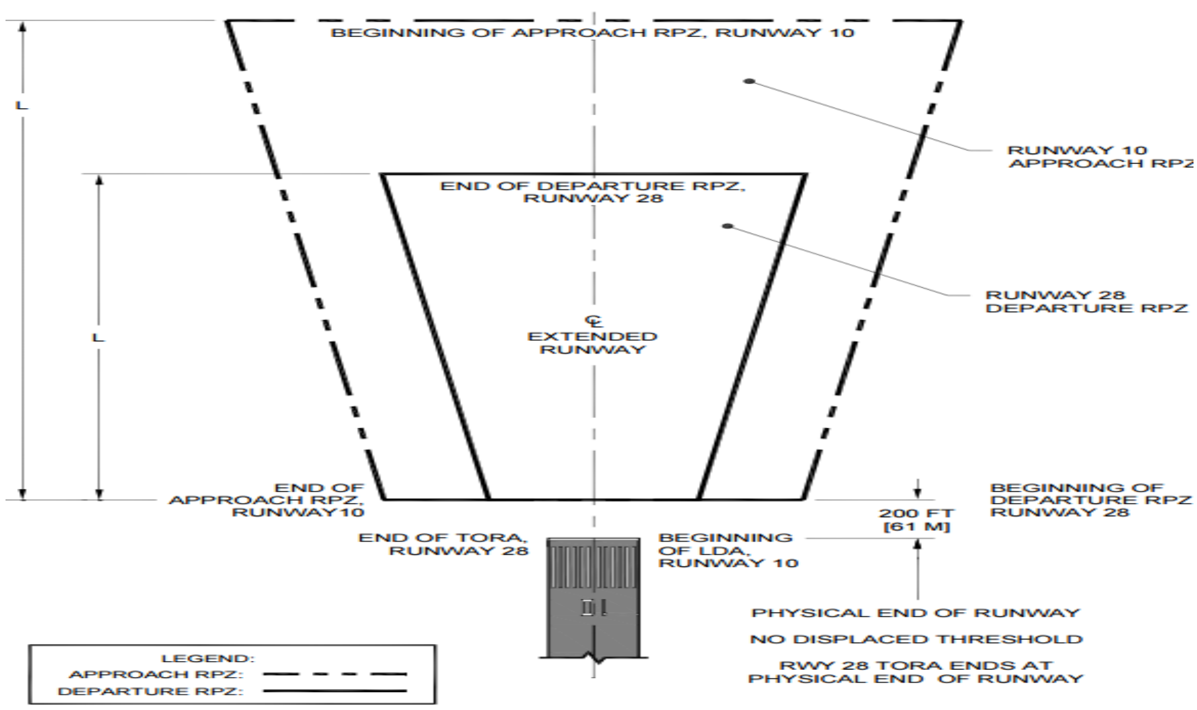
Runway Protection Zone (RPZ)

The Runway Protection Zone (RPZ) is a trapezoidal land use area at ground level prior to the landing threshold or beyond the runway end. The RPZ's function is to enhance the protection of people and property on the ground. The RPZ size varies based on the runway's RDC. The RPZ is further broken down into two types and two areas:

- **Approach RPZ:** Approach RPZ extends from a point 200 feet from the runway threshold.
- **Departure RPZ:** Departure RPZ extends 200 feet from the runway end or claimed Takeoff Runway Available (TORA).
- **Central Portion:** Land within the RPZ centered on runway centerline with a width matching the width of the ROFA.
- **Controlled Activity Area:** Land with the RPZ on the sides of the central portion.

FAA permissible land uses without further evaluation include farming that meets airport design standards, irrigation channels that do not attract wildlife, controlled airport service roads, underground facilities and unstaffed NAVAIDs that are required to be within the RPZ. Airport owners should, at a minimum, maintain the RPZ clear of all facilities supporting incompatible activities. It is desirable to clear all above-ground objects from the RPZ.

Exhibit 4-2 – FAA Runway Protection Zone



Source: *FAA AC 150/5300-13A, Change 1 (Airport Design)*

RPZs and the effort to ensure compatible land use within them are currently a high priority for the FAA. Protection of the RPZ is achieved through airport control over RPZs including fee title ownership or clear zone easement. The increased emphasis has resulted in additional requirements to monitor and analyze RPZs for conformance to established policies and standards.

In September 2012, FAA issued an interim policy on activities within an RPZ providing airports with guidance on land use compatibility standards. The standards from the interim guidance are summarized below:

- **New or Modified Land Uses:** FAA coordination is required for new or modified land uses within the RPZ as a result of an airfield project, change in RPZ dimensions or local development proposal.
- **Land Uses Requiring FAA Coordination:** Building and structures, recreational land uses, transportation facilities (i.e. roads, parking, rail), fuel storage, hazardous material storage, wastewater treatment, above-ground utility infrastructure
- **Alternatives Analysis:** A full range of alternatives must be evaluated prior to FAA coordination that avoid introducing the land use into the RPZ, minimize the impact of the land use in the RPZ and mitigate risk to people and property on the ground.
- **Existing Land Uses in the RPZ:** No change in policy, airports should work with FAA to remove or mitigate the risk of any existing incompatible land uses in the RPZ. Incompatible land uses in the RPZ from previous FAA guidance include but are not limited to residences, places of public assembly (i.e. uses with high concentration of persons), fuel storage facilities and wildlife attractants.

The following man-made land uses are within the approach RPZs at 7S0:

- **Runway 16:** Public road (North Crow Road)
- **Runway 34:** Public road (Old Highway 93)

The land uses in the existing RPZs appear to be acceptable at the present time. Further review is required if new land uses, runway end locations or a change in the size of the RPZ is proposed and a land use requiring FAA coordination is in the RPZ.

7S0 should acquire land to control all existing, future and ultimate RPZs in fee simple or land use easement, except for those areas within a road's prescriptive use or right-of-way.

Land Acquisition

According to the FAA, off-airport development has the potential to have a negative impact on current and future airport operations when it creates obstacles to airport design, land use and airspace standards surrounding the airport. Land acquisition allows the airport to protect airspace and land use areas from possible intrusions. Acquiring all land is generally not feasible, and is usually supplemented by local zoning and easements to mitigate potential incompatible land uses and potential obstacle conflicts.

FAA and the Montana Aeronautics Division encourage the airport sponsor to own the following land for existing and planned airport configuration:

- Airport Infrastructure
- Runway and Taxiway Object Free Areas
- Runway Protection Zones
- Building Restriction Line
- Navigational aid critical areas
- Airspace protection

Identified land acquisition areas to help meet current standards include acquiring the remainder of the Runway 16 and 34 RPZ in fee simple. Land required for future development will be identified in **Chapter 5: Alternatives Analysis**.

Airport Zoning

FAA recommends airport sponsors protect airport land use and airspace through local zoning. Owners of public airports in Montana are encouraged to enact airport overlay zoning to protect airspace and surrounding land use for public safety. The intent of zoning is to:

- Protect the airport from incompatible land uses that could interfere with the safety operation of the airport,
- Protect public safety by reducing the potential for fatalities, property damage or noise complaints within the vicinity of the airport, and
- Protect the public investment made by taxpayers in the airport and the economic benefits it provides to the region restrict land uses

Land use safety zones and other zoning standards are established in Section 67-7-203, of Montana State Code. Current minimum airspace zones follow Federal Aviation Regulation (FAR) Part 77 standards. Current land use zones and standards are identified in **Appendix X: Airport Zoning**

RUNWAY LENGTH

Sufficient runway length is important for the airport to maintain operational capability. It allows an aircraft operator to adequately serve their destinations. Restrictions on runway length may lead to reduced weight on a flight, which then translates in reduced fuel, passenger and/or cargo loads.

The recommended runway length for an airport facility varies widely based on runway usage (operational frequency), specific aircraft operational demands (aircraft type, weight/load), configuration (elevation, gradient) and meteorological conditions (temperature, runway surface condition). Runway length should be suitable for the forecasted design aircraft fleet.

As of the date this Master Plan study was initiated, FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design* was the current guidance for determining runway lengths at airports.

Design Aircraft

The current overall design aircraft family is a Beechcraft King Air B200 twin-engine turboprop airplane with a maximum takeoff weight of 12,500 pounds. This aircraft is operated in various seat configurations ranging from 9 to 11 passenger seats.

Existing FAA Standard

A runway length analysis was performed using the FAA's current methodology found in FAA AC 150/5325-4B. The design approach identifies a recommended runway length based on a family grouping of design aircraft. The AC states that for airports with elevations above 3,000 feet, airport designers must use 100 percent of fleet of less than 10 passengers, as depicted in Figure 2-1 of the AC.

Table 4-16 – FAA AC 150/5345-4B Runway Length Requirements

Airport and Runway Data	
Airport Elevation	3,086 feet
Mean Daily Maximum Temperature of Hottest Month	84.0˚F
Maximum Difference in Runway Centerline Elevation	14 feet (+140 feet)
Runway Condition	Wet and Slippery Runways*
Aircraft Classification	**Recommended Runway Length**
Small airplanes 12,500 pounds or less	
10 or more passenger seats	4,800 feet
Less than 10 passenger seats at 100 percent of fleet	**5,100 feet**
Less than 10 passenger seats at 95 percent of fleet	4,400 feet
Large airplanes less than 60,000 pounds but greater than 12,500 pounds	
100 percent of fleet at 90 percent useful load	8,900 feet
100 percent of fleet at 60 percent useful load (Wet)	6,700 feet
100 percent of fleet at 60 percent useful load (Dry)	6,700 feet
75 percent of fleet at 90 percent useful load	7,700 feet
75 percent of fleet at 60 percent useful load (Wet)	**5,500 feet**
75 percent of fleet at 60 percent useful load (Dry)	**5,500 feet**

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design
Note: Runway length requirements estimated based on charts for airport planning purposes only.
For turbine-powered aircraft.* ***Green* *highlighted text depicts applicable requirements.*

Analysis

When considering existing critical runway length requirements at 7S0, a fleet mix of small airplanes with fewer than 10 passenger seats was used. A fleet mix classification must be selected based on the geographic characteristics of a community and airport activity rather than specific aircraft. The geographic characteristics alone at Ronan warrant a 100 percent of fleet classification for aircraft with less than 10 passenger seats.

The FAA required runway length is approximatel**y 5,100 feet** to support 100 percent of fleet, based on the elevation.

The future design aircraft would be classified as a large airplane greater than 12,500 pounds. The Cessna Citation XLS+ business jet aircraft falls into the 75 percent of fleet classification. The exact percent useful load is not known at this time, however short-haul trips are assumed to travel from 7S0 to destinations in the Midwest, Northwest states and California. Based on this approach, the future recommended runway length to accommodate regular use of this large airplane at 7S0 is **5,500 feet** based on Part 91, *General Operating and Flight Rules*.

Declared Distances

Declared distances are the maximum runway lengths available and suitable to meet takeoff, rejected takeoff and landing distance performance requirements for turboprop and turbojet powered aircraft. Declared distance elements include:

- **Takeoff Run Available (TORA):** the distance available for ground run of an aircraft taking off
- **Takeoff Distance Available (TODA):** TORA plus any remaining runway or clearway length
- **Accelerate-Stop Distance Available (ASDA):** the runway plus stopway length available for the acceleration and deceleration of an aircraft aborting a takeoff
- **Landing Distance Available (LDA):** the runway length available for the landing of an aircraft

For a normal runway all lengths equal the runway length. A special application of declared distances can be used to meet operational safety requirements. Declared distances can be used to mitigate approach/departure obstructions, land use incompatibilities, or incompatible airport design areas by adjusting usable runway lengths. They cannot be used to increase available runway length.

A special application of declared distances is not planned in the future.

Runway Length Summary

The existing length of 4,800 feet is not sufficient to accommodate the existing aircraft using Runway 16-34. The existing runway length of 5,100 feet is needed based on FAA AC 150/5325-4B. A future runway length of 5,500 feet is required to meet aircraft that are currently operating at the airport but not to the level needed to justify the additional length at this time. It is recommended that the airport plan for 5,500 feet, but construct 5,100 feet as soon as possible.

PAVEMENT STRENGTH

Airfield pavements should be adequately maintained, rehabilitated and reconstructed to meet the operational needs of the airport. Typical airport pavements have a 20-year design life. The published pavement strength is based on the construction materials, thickness, aircraft weight, gear configuration and operational frequency for the pavement to perform over its useful life. Larger aircraft could exceed the pavement strength but not on a regular basis.

The new FAA standard for measuring the reporting pavement strength on runways with pavement strengths greater than 12,500 pounds is defined in FAA AC 150/5335-5C, *Standard Method of Reporting Airport Pavement Strength*. The Aircraft Classification Number – Pavement Classification Number (ACN-PCN) method is defined within this guidance. The PCN value should equal or exceed the ACN value assigned for the design aircraft. There is no PCN published for Runway 16-34 at Ronan Airport. A PCN determination is required at non-certificated airports when the runway pavement is reconstructed.

The existing design aircraft for pavement strength calculations is the Beechcraft King Air 200 a maximum gross takeoff weight of 12,500 pounds and an Aircraft Classification Number (ACN) of 3 assuming medium soil conditions. The future design aircraft for pavement strength will remain the same with the Beechcraft King Air 200. The current published gross weight is up to 20,000 pounds single-wheel gear (SWG).

The current runway strength appears to meet existing and future needs. Runway 16-34 could be reclassified to accommodate aircraft 12,500 pounds or less to reflect the current design aircraft, however it is not recommended to reduce the utility of the runway.

Table 4-17 – Pavement Strength Requirements

Runway	Existing Published		Future & Ultimate Need	
	Capacity	PCN	Capacity	PCN
Runway 16-34	20,000 lbs. - SW	N/A	20,000 lbs. - SW	3

Source: 7S0 Pavement Condition Survey (2015), KLJ Analysis
SW = Single Wheel, DW = Dual Wheel landing gear configuration

PAVEMENT SURFACE

Runway 16-34 is currently a bituminous asphalt surface without any surface treatment. Runway grooving improves aircraft stopping performance in wet or contaminated runway conditions. **Runway grooving is recommended at 7S0 to help current and forecasted aircraft usage.** FAA AC 150/5320-12C considers this to be high priority safety work.

RUNWAY DESIGNATION

Runway designation is determined by the magnetic bearing (azimuth) of the runway centerline which is relative to the location of the magnetic north pole. The runway designator number is the whole number nearest the one-tenth of the magnetic azimuth along the runway centerline when viewed from the direction of aircraft approach.

The 2016 magnetic declination at 7S0 is 13.59° east, changing 0.38° west per year as the location of the magnetic north pole moves over time. **Runway 16/34 should be re-designated in the future to 17/35.** FAA will make a determination if runways are to be re-designated. Any change to runway designation will be made at the discretion of FAA as it requires the update of national aeronautical publications, procedures and signage. The official FAA published magnetic declination is 15° east from 2005. See **Table 4-18** for details.

Table 4-18 – Runway Designation Requirements

Runway Designation	Existing Magnetic Bearing (2016)	Future Magnetic Bearing (2035)	Recommended Future Designation
Runway 16/34	166.38°/346.38°	168.98°/348.98°	17/35

Source: National Oceanic and Atmospheric Association (NOAA), KLJ Analysis

PAVEMENT CONDITION

The typical useful life of a bituminous pavement ranges from 20 to 30 years if properly maintained. The useful life for a concrete pavement can extend to 40 years and beyond. Bituminous Runway 16-34 has a Pavement Condition Index (PCI) rating of 65 as of 2015. Pavement should undergo regular pavement maintenance by crack sealing joints annually and applying surface treatment every 5-7 years. Reconstruction is necessary when the base layers require work.

Based on the 2015 Pavement Management Report and field observations, Runway 16-34 does require major rehabilitation work in the next five years.

Instrument Procedures

Instrument approach procedures to a runway end are used by landing aircraft to navigate to the airport during instrument conditions when the cloud ceiling is less than 1,000 feet and/or visibility is less than 3 miles. Establishing approaches with the lowest possible weather minimums allow the airport to maximize its operational utility. Each approach type requires differing infrastructure and navigational aids. Approaches with lower visibility minimums typically have additional infrastructure and navigational aid requirements. Types of approach procedures include non-precision approach (NPA), approach with vertical guidance (APV) and precision approach (PA).

This section discusses possible instrument procedure upgrades/options that can be explored for 7SO. FAA airport design standards must be met as shown in **Table 4-XX**. Coordination with FAA Flight Procedures Office is recommended to review the feasibility of implementing any new approach procedure.

Table 4-19– FAA Airport Design Standards for Instrument Approach Procedures

Table 3-4. Standards for Instrument Approach Procedures

Visibility Minimums [1]	**< 3/4 statute mile**	**3/4 to < 1 statute mile**	**≥ 1 statute mile straight-in**	**Circling** [2]
HATh [3]	< 250 ft	≥ 250 ft	≥ 250 ft	≥ 350 ft
TERPS GQS [4]	Clear	Clear	Clear	Not applicable
PA final approach surfaces [5]	Clear	Not Required	Not Required	Not applicable
POFZ (PA & APV only)	Required	Not Required	Not Required	Not applicable
TERPS Chapter 3, Section 3	34:1 clear	20:1 clear	20:1 clear [6]	20:1 clear [6]
ALP [7]	Required	Required	Required	Recommended
Minimum Runway Length	4,200 ft (paved)	3,200 ft [8, 9]	3,200 ft [8, 9]	3,200 ft [8, 9]
Runway Markings (See AC 150/5340-1)	Precision	Non-precision [9]	Non-precision [9]	Visual (Basic) [9]
Holding Position Signs & Markings (See AC 150/5340-1, AC 150/5340-18)	Precision	Non-precision [9]	Non-precision [9]	Visual (Basic) [9]
Runway Edge Lights [10]	HIRL / MIRL	HIRL / MIRL	MIRL / LIRL	MIRL / LIRL (Required only for night minimums)
Parallel Taxiway [11]	Required	Required	Recommended	Recommended
Approach Lights [12]	MALSR, SSALR, or ALSF	Recommended [13]	Recommended [13]	Not Required
Applicable Runway Design Standards, e.g. OFZ	< 3/4-statute mile approach visibility minimums	≥ 3/4-statute mile approach visibility minimums	≥ 3/4-statute mile approach visibility minimums	Not Required
Threshold Siting Criteria To Be Met (Reference paragraph 303)	Table 3-2, row 7	Table 3-2, row 6	Table 3-2, rows 1-5	Table 3-2, rows 1-4
Survey Required [14]	VGS	VGS (PA & APV) NVGS	NVGS [15]	NVGS [16]

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

UPGRADED RUNWAY 16-34 APPROACH

7S0 has a GPS-based APV procedure established for Runway 16 and 34 ends with 357-foot cloud ceiling and 1 ¼ mile visibility minimums. The airport is interested in exploring upgraded approach procedures to accommodate lower instrument minimums to increase airport utility.

The current controlling factor for the higher cloud ceilings (which in turn can raise visibility minimums) is a remote altimeter adjustment of 107 feet. If a certified local altimeter source was installed this restriction could be removed. With the current infrastructure in place the lowest instrument weather minimums would be 250 feet and 1 mile visibility. **It is recommended to upgrade approach procedures to accommodate 250 foot cloud ceilings and 1 mile visibility for both runway ends.** Further coordination with the FAA is required to assess feasibility.

The next development step would be for the airport to establish instrument approach minimums of no lower than ¾ mile. By lowering minimums to 250 feet and ¾ mile, An APV procedure with visibility minimums of no lower than ¾ mile triggers the following requirements:

- The FAA airport design approach surface is widened to 800 feet inner width, expanding upward and outward at a 20:1 slope (20 horizontal feet for each 1 vertical foot).
- The 14 CFR Part 77 Primary Surface expands from 500 feet to 1,000 feet wide centered on runway centerline. New development that penetrates this or its related 7:1 transitional surface is not allowed.
- The 14 CFR Part 77 Approach Surface is widened but the slope remains at 34:1 (34 horizontal feet for each 1 vertical foot).

- Approach Runway Protection Zone (RPZ) expands to 1,000 feet wide inner width and 1,510 feet for the outer width. The length remains the same at 1,700 feet.
- An approach lighting system (ALS) may be needed to achieve ¾ mile visibility minimums depending on prevailing obstructions. An ALS to achieve ¾ mile visibility extends out 1,600 to 1,700 feet from the runway end. ALS installation requires a clear Inner-Approach OFZ at a 50:1 slope.
- Typical lowest cloud ceiling is 250 feet depending on obstructions.

Upgrading approaches to capture lower visibility minimums of ¾ mile requires additional airport design standards to be met, as listed above, including maintaining a compatible FAA Runway Protection Zone beyond the end of the runway and clear airspace surfaces. Land use compatibility constraints exist south of the airport which includes tribal land, multiple structures and Old US Highway 93. Meeting the requirements for ¾ mile visibility minimums is not feasible for the Runway 34 end. **It is recommended to study an upgraded approach procedures to accommodate 250 foot cloud ceilings and 3/4 mile visibility for Runway 16.**

The decision to upgrade Runway 16-34 to accommodate the additional infrastructure needed for lowered instrument approach visibility minimums will be evaluated in the **Chapter 5: Alternatives Analysis**. Further coordination with the FAA is required to conduct a feasibility study for the lowest weather minimums to Runway 16.

Airspace Protection

Airspace is an important resource around airports that is essential for safe flight operations. There are established standards to identify airspace obstructions around airports. FAA grant assurances (obligations) require the airport sponsor to take appropriate action to assure that airspace is adequately cleared to protect instrument and visual flight operations by removing, lowering, relocating, marking or lighting, or otherwise mitigating existing airport hazards and preventing the establishment or creating of future airport hazards. Examples of obstructions include trees, buildings, poles, towers, terrain, mobile objects and aircraft tails. Sufficiently clear airspace near the approach and departure runway ends are vitally important for safe airport operations. An FAA aeronautical study should be completed to determine the operational impacts and necessary mitigation of obstructions (i.e. lowering, lighting, marking, publish operational restrictions).

As of the time of this report, an obstruction analysis is underway to identify obstructions to Part 77 and other airspace surfaces utilizing Aeronautical Survey data collected in July 2016. **There are no airspace penetrations to the existing FAA airport design runway approach (threshold siting) surfaces.** There may be obstacles that penetrate other airspace surfaces that require further study. The full results of this analysis will be identified in the Airport Layout Plan (ALP) drawing set. An Obstacle Action Plan in accordance with 2015 FAA guidance will be developed from these results and identified in the ALP.

AREA AIRSPACE

The existing Class E airspace beginning at 700 feet AGL is considered sufficient to support any enhancement to instrument approach procedures.

PART 77 CIVIL AIRPORT IMAGINARY SURFACES

Title 14 CFR (Code of Federal Regulations) Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace* is used to determine whether man-made or natural objects penetrate these "imaginary" three-dimensional airspace surfaces and become obstructions. Federal Aviation Regulation (FAR) Part 77 surfaces are the protective surfaces most often used to provide height restriction zoning protection around an airport. Sufficiently clear airspace is necessary for the safe and efficient use of aircraft arriving and departing an airport. Part 77 airspace standards are defined by the most demanding approach to a runway. These airspace surfaces include the primary, approach, transitional, horizontal and conical surfaces each with different standards. The slope of an airspace surface is defined as the horizontal distance traveled for every one vertical foot (i.e. 50:1).

Of note are the primary surfaces which should be kept clear of non-essential objects above the runway centerline elevation. The approach surface extends upward and outward from the runway. A slope is defined as the horizontal distance traveled for every one vertical foot. The following table depicts existing, future and ultimate approach airspace surfaces for 7S0:

Table 4-20 – Part 77 Approach Airspace Requirements

Runway End	Approach Standards	Part 77 Code	Inner Width*	Outer Width	Length	Slope
Existing						
16	Non-Precision Other-Than-Utility As low as 1 mile	C	500’	3,500’	10,000’	34:1
34	Non-Precision Other-Than-Utility As low as 1 mile	C	500’	3,500’	10,000’	34:1
Future						
16 or 34	Non-Precision Other-Than-Utility As low as 1 mile	C	500’	3,500	10,000’	34:1
16 or 34	Non-Precision Other-Than-Utility Up to ¾ mile	C	500’	3,500	10,000’	34:1
Ultimate						
16 or 34	Non-Precision Other-Than-Utility Below ¾ mile	D	1,000’	4,000’	10,000’	34:1

*Source: Title 14 CFR Part 77, KLJ Analysis *Inner width is also the Primary Surface width driven by the most demanding approach to a runway.*

New development must be kept below the Part 77 airspace surface elevation. Airspace surfaces must clear public roads by 15 feet, interstate highways by 17 feet, railroads by 23 feet, and private roads by 10 feet or the height of the most critical vehicle.

FAA AIRPORT DESIGN RUNWAY APPROACH/DEPARTURE SURFACES

FAA identifies sloping approach surfaces that must be cleared at an absolute minimum for safety for landing and departing aircraft. These surfaces are identified in Table 3-2 of FAA AC 150/5300-13A, Change 1. These surfaces are intended to be similar to the more complex surfaces identified in Terminal Instrument Procedures (TERPS).

All objects must clear the surface for the applicable runway operational design standard to meet minimum aviation safety standards for a given runway landing threshold location. Approach airspace penetrations typically require the removal of the object, operational restrictions or the runway landing threshold to be shifted or displaced down the runway.

The departure surface applies to instrument departures. It begins at the end of the takeoff distance available (TODA) and extends upward and outward at a 40:1 slope. No new penetrations are allowed unless an FAA study has been completed and a determination of no hazard has been issued. Penetrations to the departure surface may require the obstacle to be published, or require mitigation including increasing the minimum aircraft climb rate or runway length operational restrictions. Per Table 3-2, the following approach/departure surface standards apply:

Table 4-21 – Approach/Departure Surface Requirements

Runway End(s)	Table 3-2 Row	Description	Slope
Existing			
16, 34	3	Approach end of runways expected to accommodate instrument approaches having visibility minimums ≥ ¾ mile, or expected to serve large airplanes (day or night). Includes circling approaches	20:1
16, 34	5	Approach end of runways to accommodate approaches with vertical guidance	30:1
16, 34	6	Departure runway ends for all instrument operations	40:1
Future			
16 or 34	3	*3/4 mile visibility*	20:1
Ultimate			
16 or 34	4	Approach end of runways expected to accommodate instrument approaches having visibility minimums < ¾ mile	34:1

Source: DRAFT AC 150/5300-13A, Change 2 (provided by FAA ADO), KLJ Analysis
Note: Most critical row(s) shown. Only changes from existing shown in future.

Airspace surface obstructions and mitigation options for future runway configurations will be evaluated in **Chapter 5: Alternatives Analysis**. Mitigation options generally include obstruction removal, lighting/marking, declared distances and/or adjustment of the visual guidance slope indicator angle. Other long-term options include reconfiguring the runway or modifying design standards. New development should be clear of airspace surfaces. An Obstacle Action Plan will be developed for existing obstructions.

TERMINAL INSTRUMENT PROCEDURES (TERPS)

The FAA has established standards to develop instrument procedures in the United States. FAA Order 8260.3B, *U.S. Standards for Terminal Instrument Procedures (TERPS)* and related orders outlines these complex standards to develop instrument procedures. Some critical obstruction clearance surface (OCS) standards are integrated into Airport Design including many final approach segments and the departure surface. Other inner airport OCS include the precision obstacle clearance surfaces and the missed approach surfaces. Some TERPS surfaces may even be more restrictive than Part 77 standards. Penetrations to TERPS surfaces result in higher weather minimums or operational restrictions.

The instrument approach minimums to Runway 16 and 34 are as low as possible without a certified local altimeter setting source. The airport is slated to install an AWOS-II in 2017/2018. With the new AWOS-II, the minimums can be lowered to ¾ mile and a HAT of 250.

OTHER DESIGN SURFACES

Other airport design airspace surfaces considered protecting navigational aids and identify airport data to populate FAA databases include the following:

Inner- Transitional Obstacle Free Zones

The inner-transitional OFZ airspace surface is required for future visibility minimums lower than ¾ mile along the sides of the ROFZ. Objects not necessary for airport operations, including aircraft tails cannot penetrate this surface.

Precision Obstacle Free Zone (POFZ)

If a future precision instrument approach with minimums lower than ¾ mile is established, a POFZ is required which begins at the runway threshold as a flat surface 800 feet wide centered on the runway centerline and extending 200 feet to connect to the inner-approach OFZ. As with the OFZ, objects not necessary for airport operations including aircraft or vehicles on the ground cannot penetrate this surface.

VISUAL AIDS

Visual aids at an airport require clear Obstacle Clearance Surface (OCS) to provide sufficient guidance for pilots. These include approach lighting systems and visual guidance slope indicators. For a Precision Approach Path Indicator (PAPI) system, a 31.29:1 sloped surface must be clear. The specific airspace standards for this and for approach lighting systems are defined in FAA Order 6850.2B. Based on existing obstacle data, the visual guidance slope indictor (VGSI) OCS to Runways 16 and 34 appear to be clear. However additional analysis is recommended to accommodate a future upgrade to a PAPI system (4 box system).

FAA AERONAUTICAL SURVEYS

The FAA has implemented Aeronautical Survey requirements per FAA AC 150/5300-18B: *General Guidance and Specifications for Submission of Aeronautical Data to NGS: Field Data Collection and Geographic Information System (GIS) Standards*. FAA airport survey requirements require obstruction data to be collected using assembled aerial imagery for the airport. This data is used in aeronautical publications and to develop instrument approach procedures.

An aeronautical survey is currently in progress with this planning effort as required by the FAA. Imagery was acquired in July 2016 with preliminary obstacle data delivered in November 2016. When safety-critical data is needed to update runway end data or enhance an instrument approach then a new aeronautical survey is required.

Navigational Aids (NAVAIDs)

Airfield NAVAIDs are any ground or satellite based electronic or visual device to assist pilots with airport operations. They provide for the safe and efficient operations of aircraft on an airport or within the vicinity of an airport. The type of NAVAIDS required are determined by FAA guidance based on an airport's location, activity and usage type.

AREA NAVIGATION

The FAA is updating the nation's air transportation infrastructure through the Next Generation Air Transportation System (NextGen) program. New procedures and technology are to be implemented to improve the efficiency and safety of the national air transportation system. By 2020, all aircraft in controlled airspace must be equipped with Automatic Dependent Surveillance-Broadcast (ADS-B) equipment, forming the foundation by moving from group radar and navigation aids to precise tracking using satellite signals.

For area navigation (RNAV), satellite-based NAVAIDs will primarily be used for air navigation with ground-based NAVAIDs used for secondary purposes. Wide Area Augmentation System (WAAS) provides the framework for satellite–based navigation and approach procedures.

7S0 should plan for the use of satellite-based area navigation by establishing RNAV approaches rather than rely on ground-based NAVAIDs. FAA states about 97 percent of the general aviation fleet that routinely flies under IFR has WAAS receivers installed.

RUNWAY APPROACH

Some NAVAIDs are developed specifically to provide "approach" navigation guidance, which assists aircraft in landing at a specific airport or runway. These NAVAIDs are electronic or visual in type. FAA

Order 6750.16D, *Siting Criteria for Instrument Landing Systems* and FAA Order 6850.2B, *Visual Guidance Lighting Systems* defines the standards for establishing these systems.

Visual Guidance Slope Indicator (VGSI)

A VGSI system provides visual descent guidance to aircraft on approach to landing. A Precision Approach Path Indicator (PAPI) system and a Visual Approach Slope Indicator (VASI) are two typical VGSI systems. They are installed on runway ends to enhance visual vertical guidance to the runway end. PAPI systems, a newer technology, consist of a single row of two to four lights. The two light system is for non-jet runways and the four light system is for jet-capable runways.

7S0 should upgrade the existing 2 box PAPI system on Runway 16 and 34 to a 4-box PAPI when the existing system reaches the end of its useful life. All PAPIs should meet obstacle clearance requirements.

Runway End Identifier Lights (REIL)

REILs consist of high-intensity flashing white strobe lights located on the approach ends of runways to assist the pilot in early identification of the runway threshold. Additionally, these are typically installed on runways that are surrounded by a preponderance of other lights or if the runway lacks contrast with surrounding terrain. These are not installed with an approach lighting system.

REILs should be considered if an approach lighting system is not installed. If an approach lighting system is installed then they should not be installed. REILs could be omnidirectional or unidirectional.

AIRFIELD VISUAL

Visual NAVAIDs provide airport users with visual references within the airport environment. They consist of lighting, signage and pavement markings on an airport. Visual NAVAIDS are necessary airport facility components on the airfield, promoting enhancing situational awareness, operational capability and safety. FAA AC 150/5340-30, *Design and Installation of Airport Visual Aids* defines the standards for these systems.

Airport Beacon

The airport beacon serves as the airport identification light so approaching pilots can identify the airport location from sunset to sunrise. The airport beacon’s location at 7S0 adequately serves the airport without known obstructions to its line of sight. The minimum light beam angle is 2 degrees.

Runway Lighting

Runway edge lights are placed off the edge of the runway surface to help pilots define the edges and end of the runway during night and low visibility conditions. Runway lights are classified according to the intensity of light they produce including high intensity (HIRL), medium intensity (MIRL) and low intensity (LIRL). The existing MIRL for Runway 16-34 is required for vertically-guided approaches and meets the standard for future approach upgrades. HIRL is only required for RVR-based minimums which is not planned at 7S0.

Taxiway Lighting

Taxiway edge lighting delineates the taxiway and apron edges. The FAA standard taxiway edge lighting system is Medium Intensity Taxiway Lights (MITL). Retro reflective markers are recommended for all taxiway as a lower-cost method to provide visual guidance at night. **It is recommended that MITLs be installed at a minimum along the taxiway connectors to facilitate turning movements for night operations. A MITL system for the parallel taxiway and apron is a guideline, but is optional.**

Lighting Activation

Runway edge and visual approach lights are activated by the pilot through a Pilot Controlled Lighting (PCL) transmitter system. This system is recommended to be maintained into the future.

AIRFIELD SIGNAGE

Airfield signage is essential for the safe and efficient operation of aircraft and ground vehicles on the airport movement area. Common signs include mandatory instruction signs, location signs, boundary signs, direction/destination signs, information signs and distance remaining signs. General aviation airports such as 7S0 must have mandatory instruction signs placed at holding positions for taxiway/runway intersections. These signs are in good condition and are not recommended to be replaced.

PAVEMENT MARKINGS

Pavement markings help airport users visually identify important features on the airfield. FAA has defined numerous different pavement markings to promote safety and situational awareness as defined by FAA AC 150/5340-1, *Standards for Airport Markings*.

Runway

Runway pavement markings are white in color. The type and complexity of the markings are determined by the approach threshold category to the runway end. The minimum required runway markings for a standard runway are as follows:

- Visual (landing designator, centerline)
- Non-Precision (landing designator, centerline, threshold)
- Precision (landing designator, centerline, threshold, aiming point, touchdown zone, edge)

Runway 16-34 should continue to have non-precision markings maintained, with an upgrade to precision markings completed if approach minimums are upgraded to less than ¾ mile.

Taxiway/Taxilane

Taxiway and taxilane markings are important for directional guidance for taxiing aircraft and ground vehicles. Common taxiway and apron markings include taxiway/taxilane centerline and edge. Taxiway/taxilane centerline markings should be used throughout to define a safe centerline with object clearance. Taxiway/taxilane edge markings should be used to delineate the taxiway edge from the shoulder, apron or some other contiguous paved surface. Taxilane centerline markings should continue through the hangar area at 7S0 to delineate areas where clearance meets FAA wingtip object clearance standards.

Holding Position

Holding position markings are a visual reference to prevent aircraft and vehicles from entering critical areas such as an active runway environment. These markings consist on yellow bars and dashes on a black background. The airport meets required setbacks. If a precision approach is installed then the setback increases to 250 feet for Runway 16-34.

METEOROLOGICAL

Aircraft operating to and from an airport require meteorological aids to provide current weather data. Weather information helps pilots make informed decision about flight operations. Airports have various aids installed providing local weather information.

Surface Weather Observation

The existing Airport-owned SuperAWOS system was installed in 2007 and provides hourly weather observations reported over the UNICOM frequency. This system is entirely automated and provides current wind direction and velocity, temperature, dew point, altimeter, density altitude and visibility.

The SuperAWOS systems are no longer certified by the FAA and the airport plans to transition to an AWOS-II weather observation system. This certified system offers the same reporting capabilities as the existing SuperAWOS system. An AWOS-III would provide additional reporting capabilities such as sky cover and ceiling height however when put through a Benefits-Cost Analysis (BCA) funding may not be feasible. It is important to note that the new system will be broadcast on a discrete frequency.

Weather observing systems are recommended to be kept clear of agricultural operations within 100 feet, clear of objects 15 feet below the sensor height within 500 feet, and clear of objects greater than 10 feet above the sensor within 1,000 feet.

Wind Cone

Wind cones visually indicate the current wind direction and velocity on an airfield. The wind cone at 7S0 is located 250 feet east of Runway 16-34 centerline and lighted for night operations. A 100-foot diameter segmented circle is in place around the wind cone to enhance visibility and provide visual references to aid in landing operations. The lighted wind cone and segmented circle are sufficient for the long-term.

COMMUNICATIONS & ATC

The ability for pilots to communicate with other pilots and air traffic control (ATC) is critical for the safety and efficiency of the overall air transportation system. 7S0 will continue to be an uncontrolled airport. Communications with ATC are made possible through an on-site transmitter allowing communications at lower altitudes. Radar coverage is available starting at approximately 5,000 feet MSL. Coverage with ATC is expected to be enhanced at lower altitudes with the establishment of satellite-based ADS-B infrastructure over time. No airport action is necessary at this time.

Taxiways

Taxiways provide for the safe and efficient movement of aircraft between the runway and other operational areas of the airport. The taxiway system should provide critical links to airside infrastructure, increase capacity and reduce the risk of an incursion with traffic on the runway. The taxiway system should meet the standards design requirements identified in FAA AC 150/5300-13A, Change 1.

SYSTEM DESIGN

FAA has placed a renewed emphasis on taxiway design in their updated airport design standards. Fundamental elements help develop an efficient system to meet demands, reduce pilot confusion and enhance safety. Considerations include:

- Design taxiways to meet FAA design standards for existing and future users considering expandability of airport facilities.
- Design taxiway intersections so the cockpit is over the centerline with a sufficient taxiway edge safety margin.
- Simplify taxiway intersections to reduce pilot confusion using the three-node concept, where a pilot has no more than three choices at an intersection.
- Eliminate “hot spots” identified by the FAA Runway Safety Action Team where enhanced pilot awareness is encouraged.
- Minimize the number of runway crossings and avoid direct access from the apron to the runway.
- Eliminate aligned taxiways whose centerline coincides with a runway centerline.
- Other considerations include avoiding wide expanses of pavement and avoiding “high energy intersections” near the middle third of a runway.

DESIGN STANDARDS

FAA identifies the design requirements for taxiways. The design standards vary based on individual aircraft geometric and landing gear characteristics. The Taxiway Design Group (TDG) and Airplane Design Group (ADG) identified for the design aircraft using a particular taxiway. In addition to taxiway/taxilane pavement width, some of the safety standards include:

- **Taxiway/Taxilane Safety Area (TSA):** A defined graded and drained surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft deviating from the taxiway. The surface should be suitable to support equipment during dry conditions
- **Taxiway Edge Safety Margin (TESM):** The minimum acceptable distance between the outside of the airplane wheels and the pavement edge.
- **Taxiway/Taxilane Object Free Area (TOFA):** An area centered on the centerline to provide enhanced safety for taxiing aircraft by prohibiting parked aircraft and above ground objects except for those objects that need to be located in the OFA for aircraft ground maneuvering purposes.

The following table describes the specific FAA taxiway design standards based on various Airplane Design Group (ADG) classifications for the identified design aircraft at 7S0:

Table 4-22 – FAA Taxiway Design Standards Matrix (ADG)

Design Standard	Actual	Existing*	Ex./Fut./Ult.
Airplane Design Group (ADG)	**ADG-II**	**ADG-I**	**ADG-II**
Taxiway Safety Area	79 feet	49 feet	79 feet
Taxiway Object Free Area	131 feet	89 feet	131 feet
Taxilane Object Free Area	115 feet	79 feet	115 feet
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline	N/A	70 feet	105 feet
Taxilane Centerline to Parallel Taxiway/Taxilane Centerline	N/A	64 feet	97 feet
Taxiway Centerline to Fixed or Movable Object	65.5 feet	44.5 feet	65.5 feet
Taxilane Centerline to Fixed or Movable Object	57.5 feet	39.5 feet	57.5 feet
Taxiway Wingtip Clearance	26 feet	20 feet	26 feet
Taxilane Wingtip Clearance	18 feet	15 feet	18 feet

Source: FAA AC 150/5300-13A, Change 1, KLJ Analysis
*NOTE: Actual evaluates areas served by overall design aircraft type. RED indicates a known deficiency to existing minimum design standards. *Areas serving exclusively small aircraft should be designed to ADG-I standards. The existing and future overall airport design aircraft requires ADG-II standards to be met.*

The following table describes the specific FAA taxiway design standards based on various Taxiway Design Group (TDG) classifications for the identified design aircraft at 7S0:

Table 4-23 – FAA Taxiway Design Standards Matrix (TDG)

Design Standard	Actual	Existing	Fut./Ult.
Taxiway Design Group (TDG)	**ADG-1**	**TDG-1**	**TDG-2**
Taxiway Width	35 feet	35 feet	35 feet
Taxiway Edge Safety Margin (TESM)	7.5 feet	7.5 feet	7.5 feet
Taxiway Shoulder Width	15 feet	15 feet	15 feet
Crossover Taxiway Separation for Reverse Turns (Minimum)	162 feet	162 feet	162 feet
Centerline Turn Radius (90 degrees)	60 feet	60 feet	60 feet

Source: FAA AC 150/5300-13A, Change 1, KLJ Analysis

The existing taxiway system serving Runway 16-34 is 35 feet wide. This meets current overall ADG-II/TDG-1 design standards.

FAA taxiway fillet geometric design standards changed in 2012 with FAA AC 150/5300-13A. These standards should be incorporated at 7S0 during taxiway reconstruction or new construction.

ENTRANCE/EXIT TAXIWAYS

Entrance taxiways provide access to the runway ends for departures. Exit taxiways serve to achieve an efficient flow of traffic to reduce runway occupancy time and increase runway capacity. These taxiways are located along the runway in ideal aircraft deceleration and stop locations. High speed taxiways allow aircraft to exit a runway without having to decelerate to typical taxiway speed. Guidance from FAA AC 150/5300-13A, Change 1 and FAA AC 150/5060-5, *Airport Capacity and Delay* was used for this analysis.

Entrance taxiways should always be oriented 90 degrees to runway centerline to enhance visibility of runway operations. The outer edge of an entrance taxiway must be curved. Each entrance taxiway should have its own taxiway designator. The current taxiway designators should be modified.

Exit taxiways should be aligned at 90 degrees (ideal), 45 degrees or 30 degrees for high-speed exit taxiways. Acute angled taxiways are designed to serve traffic from one direction. The cost of high-speed exits is usually justified only on runways serving approach category C and above, which does not apply at 7S0.

The entrance and exit taxiways at 7S0 meet design standards, no change is needed.

HOLDING BAYS

Runway departure delays can be caused by aircraft awaiting departure clearance or completing pre-flight checks. Holding bays provide space for aircraft away from the taxiway environment and improve capacity and overall flow.

There are no holding bays at 7S0, and while it would be a nice feature to add, one is not recommended for 7S0 over the course of the planning period.

PAVEMENT CONDITION & STRENGTH

Bituminous taxiways have a 2015 PCI rating ranging from 72-74 for all taxiways. Based on the 2015 Pavement Management Report, all pavements on the airport should receive a mill and overlay in the next 1-3 years.

Airside Data Summary

The following exhibits provide summary data of the facility requirements and recommendations associated with each of the runways at the Ronan Airport through the planning period(s) identified in this Master Plan study.

Table 4-24 – Runway 16-34 Data Table

Design Standard	Actual Condition	Facility Requirement or Recommendation		
		Existing	Future	Ultimate
Runway Identification	16-34	16-34	16-34	16-34
Runway Classification	Other-Than-Utility	Other-Than-Utility	Other-Than-Utility	Other-Than-Utility
Aircraft Classification	Large Aircraft	Large Aircraft	Large Aircraft	Large Aircraft
Runway Design Code (RDC)	B/II/5000	B/II/5000	B/II/4000	B/II/4000
Approach Reference Code (APRC)	B/II/5000	B/II/5000	B/II/4000	B/II/4000
Departure Reference Code (DPRC)	B-II	B/II	B/II	B/II
Pavement Strength (Wheel Loading)	20 (S)	20 (S)	20 (S)	20 (S)
Pavement Strength (PCN)	N/A	2	2	2
Pavement Surface Type	Asphalt	Asphalt	Asphalt	Asphalt
Pavement Surface Treatment	None	None	None	None
Effective Runway Gradient	0.31%	2.0% Max.	2.0% Max.	2.0% Max.
Line of Sight Requirements Met	Yes	Yes	Yes	Yes
Percent Wind Coverage (per RDC)	96.06%	96.06%	96.06%	96.06%
Runway Length	4,800 feet	4,800 feet	5,100 feet	5,500 feet
Take Off Run Available (TORA)	4,800 feet	4,800 feet	5,100 feet	5,500 feet
Take Off Distance Available (TODA)	4,800 feet	4,800 feet	5,100 feet	5,500 feet
Accelerate Stop Distance (ASDA)	4,800 feet	4,800 feet	5,100 feet	5,500 feet
Landing Distance Available (LDA)	4,800 feet	4,800 feet	5,100 feet	5,500 feet
Runway Width	75 feet	75 feet	75 feet	75 feet
Displaced Threshold	0 feet	0 feet	0 feet	0 feet
Shoulder Width*	0 feet	10 feet	10 feet	10 feet
Blast Pad Width*	0 feet	95 feet	95 feet	95 feet
Blast Pad Length*	0 feet	150 feet	150 feet	150 feet
Runway Safety Area (RSA) Width	150 feet	150 feet	150 feet	150 feet
RSA Length Past Departure End	300 feet	300 feet	300 feet	300 feet
RSA Length Prior to Threshold	300 feet	300 feet	300 feet	300 feet
Runway Lighting Type	MIRL	MIRL	MIRL	MIRL
Approach RPZ Start from Runway	Road in RPZ (16)	200 feet	200 feet	200 feet
Approach RPZ Length		1,000 feet	1,000 feet	1,000 feet
Approach RPZ Inner Width		500 feet	500 feet	500 feet
Approach RPZ Outer Width		700 feet	700 feet	700 feet
Departure RPZ Start from Runway	Road in RPZ (34)	200 feet	200 feet	200 feet
Departure RPZ Length		1,000 feet	1,000 feet	1,000 feet
Departure RPZ Inner Width		500 feet	500 feet	500 feet
Departure RPZ Outer Width		700 feet	700 feet	700 feet

Design Standard	Actual Condition	Facility Requirement or Recommendation		
		Existing	Future	Ultimate
Runway Marking Type	Non-Precision	Non-Precision	Non-Precision	Non-Precision
14 CFR Part 77 Approach Category	34:1	34:1	34:1	34:1
Approach Type	Non-Precision	Non-Precision	Non-Precision	Non-Precision
Visibility Minimums	1 1/4 mile	1 1/4 mile	3/4 mile	3/4 mile
Type of Aeronautical Survey Req'd	VGA	VGA	VGA	VGA
Runway Departure Surface	Yes	Yes	Yes	Yes
ROFA Width	300 feet	500 feet	500 feet	500 feet
ROFA Length Past Departure End	300 feet	300 feet	300 feet	300 feet
ROFA Length Prior to Threshold	300 feet	300 feet	300 feet	300 feet
ROFZ Length Past Runway	200 feet	200 feet	200 feet	200 feet
ROFZ Width	250 feet	250 feet	250 feet	250 feet
Inner Approach OFZ	N/A	N/A	N/A	N/A
Inner Transitional OFZ	N/A	N/A	N/A	N/A
Precision ROFZ Length	N/A	N/A	N/A	N/A
Precision ROFZ Width	N/A	N/A	N/A	N/A
Threshold Siting Surface (TSS) Type	Cat A/B, 1 mi., Night	Cat A/B, 1 mi., Night	Cat A/B, 3/4 mi., Night	Cat A/B, 3/4 mi., Night
TSS Start from Runway End	200 feet	200 feet	200 feet	200 feet
TSS Length	10,000 feet	10,000 feet	10,000 feet	10,000 feet
TSS Inner Width	400 feet	400 feet	400 feet	400 feet
TSS Outer Width	3,800 feet	3,800 feet	3,800 feet	3,800 feet
TSS Slope	20:1	20:1	20:1	20:1
Visual and Instrument NAVAIDs	GPS, LPV, PAPII	GPS, LPV, PAPI	GPS, LPV, PAPI	GPS, LPV, PAPI
Runway and Taxiway Separation	240 feet	240 feet	300 feet	300 feet
Runway and Parking Separation	300 feet	250 feet	250 feet	250 feet
Runway and Hold Line Separation	200 feet	200 feet	200 feet	200 feet
Taxiway Design Group (TDG)	1	1	2	2
Taxiway and Taxilane Width	35 feet	35 feet	35 feet	35 feet
Taxiway and Taxilane Safety Area	79 feet	79 feet	79 feet	79 feet
Taxiway and Taxilane Separation	N/A	105 feet	105 feet	105 feet
Taxiway and Taxilane Lighting	Reflectors/ None	Reflectors/ None	MITL	MITL

*Note:*Recommended for runways with regular jet traffic.*
Source: FAA AC 150/5300-13A - Change 1, Airport Design, KLJ Analysis

General Aviation

General Aviation (GA) includes all civil aviation activities except for commercial service. Providing necessary facilities and access for general aviation users at 7S0 will continue to grow as Lake County grows. Also since Polson cannot grow anymore, increasing emphasis will be put on developing Ronan.

Aircraft Storage

Aircraft storage requirements are driven by operational requirements, aircraft size, local climate and owner preferences. For based aircraft, the harsh winters in upper Montana drive all owners to seek aircraft storage facilities rather than outdoor parking on an aircraft parking apron. Owners prefer to have covered, secure storage for their aircraft with space for other aeronautical facilities including an office or maintenance/storage areas. Most of the based aircraft at 7S0 are stored in aircraft storage hangars, because of the local climate. Transient aircraft travel to airports for up to a few days at a time. These aircraft typically park on the aircraft apron or seek temporary indoor aircraft storage, especially during adverse weather conditions.

A facility space model was developed to estimate aircraft storage hangar size needs. The model uses the based aircraft fleet mix forecast and estimates a size per aircraft type to determine recommended facility space. The 7S0 based aircraft forecasts estimate another six (6) based aircraft through the planning period (PAL 4) consisting of a fleet mix of 4 single-engine/other, 1 multi-engine and 1 jet.

BASED AIRCRAFT

Almost all of the 27 based aircraft and 1 ultralight aircraft are currently stored in approximately 36,050 square feet of available aircraft storage space. Hangar #9 (see Figure 2-2) with 4,200 square feet of hangar space is assumed to be used for transient aircraft only. The following assumptions were made about aircraft storage space requirements:

- Single-Engine Piston/Other/Ultralight: 45' x 35' storage area (1,575 SF)
- Multi-Engine/Turboprop: 55' x 45' storage area (2,475 SF)
- Turbojet: 65' x 55' storage area (3,575 SF)
- Helicopter: 45' x 45' storage area (2,025 SF)
- Additional 20 percent for general aeronautical storage and supplies

Using these assumptions with based aircraft forecasts, a projected need for based aircraft storage space is determined. It is important to understand that this projection provides a broad estimate of needed space into the future for facility planning. Actual space needs are demand-driven. For example, the presence of an FBO may require additional space for aircraft maintenance.

Table 4-25– Based Aircraft Storage Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Based Aircraft Storage Space (SF)						
Aircraft Storage Space	*64,850**	55,350	59,508	55,756	60,253	61,886
Capacity/Deficiency	-	**9,500**	**5,432**	**514**	**3,983**	**5,416**

*Source: KLJ Analysis. Note: RED indicates a deficiency to existing capacity. *Includes Hangar #6 (poor condition)*

The above analysis suggests sufficient aircraft storage space exists to accommodate based aircraft needs only until PAL 2.

The recommended hangar types to accommodate aircraft storage depend on airport and aircraft owner preferences and financial position. There are two main hangar types:

- T-Hangar: Nested small aircraft storage units within a rectangular building.

- Conventional Hangar: Commonly known as “box” hangars are square/rectangular in shape.

Hangars are constructed with public or private funds as demand warrants.

Aircraft Parking Apron

General aviation aircraft parking is utilized by transient or based aircraft. With all the based aircraft at 7S0 stored in hangars, the necessary aircraft parking is for transient aircraft requiring parking for a short period of time ranging from a few minutes to a few days. Itinerant aircraft will require either covered aircraft storage (based or transient) or apron parking space.

SIZE, CONFIGURATION & LOCATION

The apron size is driven by the number and size of maneuvering and parked aircraft. The purpose of this analysis is to determine the triggering point for additional general aviation apron space using the aviation activity demand forecasts. Assumptions include:

- Use of annual itinerant operations fleet mix based on the aviation forecasts.
- Average busy day, assumes larger itinerant aircraft operate on a non-peaking schedule year-round, plus a 15 percent busy factor.
- 30 percent of single-engine, small multi-engine and other aircraft types will require apron space upon arrival.
- 80 percent of turboprop, turbojet and helicopter landings will require apron space upon arrival.
- Peak month (10.78 percent of annual operations) and design day (3.33 percent of monthly operations) are based on the aviation forecasts.
- Remainder of arriving aircraft will require a transient or based aircraft hangar.

Apron size is driven by the size of the design airplane and size of the aircraft parking positions required. A standard tie-down position accommodates one small aircraft. Larger aircraft occupy additional space and can be accommodated with a nested tie-down configuration. The following factors are used according to ACRP Report 113, *Guidebook on General Aviation Facility Planning*:

- Single-Engine/Multi-Engine/Other: 1.00
- Helicopter: 2.00
- Large Multi-Engine/Turboprop: 2.50
- Turbojet: 3.00

The number of total and equivalent aircraft parking positions required at 7S0 is identified below. **Through PAL 1, an additional two equivalent aircraft tie-down spaces are required to meet demand. An additional six equivalent tie-down spaces are required to accommodate six parked aircraft through PAL 4.**

Table 4-26– Transient Aircraft Parking Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Aircraft Parking Positions						
Itinerant Operations	-	4,000	4,169	4,303	4,425	4,636
Average Busy Day Operations	-	12.6	13.1	13.6	13.9	14.6
Average Busy Day Arrivals	-	6.3	6.6	6.8	7.0	7.3
Total Transient Park Aircraft	-	35	35	35	35	35
Capacity/Deficiency	**-**	**28**	**28**	**28**	**27**	**27**

*Source: KLJ Analysis. Note: RED indicates a deficiency to existing capacity. *Tie-downs do not allow ADG-II parking*

Apron size must accommodate both the required aircraft parking positions and maneuvering standards. Aircraft maneuvering at 7S0 is required to accommodate safety setbacks for FAA Airplane Design Group

(ADG) II wingspans. The current apron configuration meets maneuvering but not parking standards for the design aircraft.

Based on this assessment, the existing apron is sufficient to accommodate the existing and projected need. However as stated in Chapter 2, there are times in the summer and during fire season when the apron is full of transient aircraft and firefighting aircraft. It is suggested that the airport take note of the time when the apron is full. This documentation will help justify using airport funds to expand the apron.

PAVEMENT CONDITION & STRENGTH

The main bituminous apron has a 2015 PCI rating of 70. Based on the 2015Pavement Management Report, the main apron will require a mill and overlay in the next 1-2 years. The pavement strength of 20,000 pounds should be maintained.

Pilots Lounge Building

The size of the pilots lounge building is based on the number of pilots and types of services needed at the airport. Although additional facilities can be provided, at a minimum the pilots lounge building at a general aviation airport should include the following services:

- Passenger Waiting Area
- Restrooms
- Vending
- Pilots Lounge/Flight Planning
- Mechanical room
- Storage Room
- Circulation

Not all of the building areas noted above are eligible for FAA funding. An FAA funding eligibility determination will be based on review of the project when development is imminent. Most are eligible for State funding participation as a General Aviation Administration building is a minimum service objective at non-airline service airports.

The pilots lounge building should be located adjacent to the transient aircraft parking apron with good visibility to the airfield, and also be in close proximity to the automobile parking and waiting area. **The existing pilots lounge building located in a perfect spot and should not be relocated.**

The estimated planning-level size of the pilots lounge building is based on peak hour total airport operations, 2.5 passengers per peak hour operation and 100 square feet of space per passenger as identified in ACRP Report 113. These figures provide an estimate of the number of passengers to arrive, depart and generally flow through the terminal.

Table 4-27 – Arrival/Departure Terminal Building Size Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Arrival/Departure Building Size (SF)						
Peak Hour Operations	-	2.9	3.0	3.1	3.2	3.4
Number of Passengers	-	2.5	2.5	2.5	2.5	2.5
Total Building Size	*625*	732	761	784	805	841
Capacity/Deficiency	**-**	**107**	**136**	**159**	**180**	**216**

Source: KLJ Analysis. Note: RED indicates a deficiency to existing capacity.

The existing pilots lounge building does not meet the existing passenger needs. A slightly larger building is required.

Pilot Convenience

Pilot convenience elements for the general aviation pilots and passengers were reviewed. The proximity of the aircraft apron to the pilots lounge building is ideal to minimize exposure time. There is a pilot's briefing area however it is located in close proximity to passenger waiting areas. The automobile parking location adjacent to the pilot's lounge building which is ideal to minimize outdoor exposure time. An on-site airport courtesy car is available for pilots.

Support Facilities

Support facilities are necessary for the airport owner to maintain a safe and efficiently run airport supporting airport operations and the travelling public.

Airport Administration

7S0 is owned and operated by the City of Ronan and Lake County. The Airport Board works with City staff and consultants to ensure proper operations and maintenance of the airport. This arrangement is expected to continue to be sufficient. A small administration space should be considered in any future pilots lounge or equipment storage building, however it may not be eligible for FAA funding.

Airport Maintenance & Snow Removal

The airport maintenance equipment is located next to the airport access road and is 200 square feet in size. Typical equipment is used to cut grass or control snow and ice.

Snow and ice control equipment typically required includes a carrier vehicle (i.e. dump truck or tractor), snow plows, spreaders, sweepers, and blowers. For non-winter operations, grass cutting is accomplished with a carrier vehicle (i.e. tractor) and mower attachment. Smaller equipment is also used to facilitate snow removal or grass cutting. Equipment should be stored in a dedicated heated building for timely access and protection from the weather. North facing building doors should be avoided if possible to minimize prolonged snow and ice accumulation.

Total general maintenance space (MES) needs are determined by type of equipment planned to be stored. According to ACRP Report 113, *Guidebook on General Aviation Facility Planning*, the following space assumptions are made to estimate the size of an MES building:

- 3 equipment bays (dump truck, tractor w/ mower, equipment/material storage)
- 1 support bay for general storage at a medium airport (250 to 500 acres in size)
- 600 SF for each equipment storage bay
- 600 SF for each support equipment bay

Table 2-28– Mechanical Equipment Storage Building Size Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
MES Building Size (SF)						
Equipment Storage Bays	*20000*	3	3	3	3	3
Equipment Bay Size	-	1,800	1,800	1,800	1,800	1,800
Support Bays	*0*	1	1	1	1	1
Storage Bay Size	-	600	600	600	600	600
Total MES Building	*2000*	2,400	2,400	2,400	2,400	2,400
Capacity/Deficiency	**-**	**400**	**400**	**400**	**400**	**400**

Source: KLJ Analysis. Note: RED indicates a deficiency to existing capacity.

The MES building is adequate for the existing and future needs of the airport, based on conversations with airport personnel. Even though the recommended size is 400 feet larger the airport functions fine with the current space.

Fueling Facilities

The City of Ronan owns the airport fuel facility storing and dispensing 100 octane low led (AVGAS) and jet fuel (JET-A). Each fuel tank is underground with a 12,000 gallon capacity. Self-service fuel dispensing units are available 24-hours a day with a credit card. Aircraft access the fuel facility in a designated apron space.

FUEL STORAGE

Fuel storage needs are driven by having sufficient supply to meet demand and by the size of the fuel delivery truck. An ideal fuel farm should provide a tank capacity of 12,000 gallons to accommodate a full tanker truck (8,000 gallons) to minimize the cost of deliveries.

Table 4-29 – Fuel Storage Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
AVGAS Fuel Storage (Gallons)						
Annual Piston Operations	-	9,208	8,479	9,632	9,812	10,279
Annual AVGAS Gallons	-	13,000	13,382	13,598	13,853	14,512
Recom'd AVGAS Tank Size	*12,000*	12,000	12,000	12,000	12,000	12,000
Capacity/Deficiency	-	**1,000**	**1,300**	**1,600**	**1,850**	**2,500**
JET-A Fuel Storage (Gallons)						
Annual Turbine Operations	-	642	776	945	1,058	1,098
Annual JET-A Gallons	-	30,000	36,277	44,141	49,441	51,297
Recom'd JET-A Tank Size	*12,000*	12,000	12,000	12,000	12,000	12,000
Capacity/Deficiency	-	**18,000**	**24,000**	**32,000**	**37,000**	**39,000**

Source: KLJ Analysis. Note: RED indicates a deficiency to existing capacity.

Actual fuel consumption is based on many factors including local fuel price and operator preferences. The aviation industry trend is for growth in turbine-powered aircraft requiring JET-A fuel and in light-sport aircraft that require typical automobile gasoline (MOGAS). Self-fueling is allowed, therefore individuals may bring their own fuel to the airport provided they follow operational requirements set forth by the airport. The industry is also exploring the use of alternative fuels that may replace AVGAS.

FUEL DISPENCING

7S0 already offers 24-hour self-service fuel pumps for Jet-A and 100LL. This design is sufficient for the planning period. The location should be compatible with any configuration changes to the apron. No fuel trucks are expected to be needed for an airport of this size.

Fencing, Security & Wildlife

Security is an important consideration when operating a safe airport. Transportation Security Administration (TSA) published a *Security Guidelines for General Aviation Airports* document in 2004 providing recommended airport design guidelines.

The first line of security protection infrastructure is a perimeter fence. Perimeter fencing is not a requirement for non-certificated airports such as 7S0. Its installation would help prevent unauthorized persons from entering the airfield. A minimum 6-foot high fence with added barbed wire is generally recommended at a minimum for security. Airfield access points should be minimized, however those that are needed should be controlled. Ideally, automated controlled access gates would be installed at the apron, hangar area and east access entry points. Locked field gates would be installed at other airfield access points. Currently the airport has a partial permiter farm fence that is 4 feet high.

Controlling wildlife on or near the airport helps mitigate existing hazards and prevent the creation of potential new hazards to aircraft. The airport can take steps to help increase safety of the airfield as identified in the Wildlife Hazard Management Plan (WHMP). **The WHMP recommends the airport take steps to construct a minimum 10-foot high wildlife fence to control entry by mammals.** This project is eligible for FAA funds to discourage unauthorized access to the airfield by people, vehicles or wildlife.

Utilities

The airport is not currently connected to public water, sanitary sewer or natural gas utilities. The City of Ronan provides water, sanitary sewer and storm sewer service network within city limits, but not to the Airport. The edge of city limits is located nearly two miles west of the airport. The airport currently has an existing well and drain fields. If the City decides to install utilities in the vicinity of the airport it would be recommended that the airport hook up to the new lines.

DEICING

Deicing operations are critical to ensuring safe flight operations during winter weather. Deice fluid runoff has potential environmental implications when discharged into airport stormwater. This activity is regulated through Federal and State stormwater discharge permits.

No deicing operations occur today; aircraft are stored in a heated hangars. No larger-scale deicing operations are expected based on airport maintenance operations, fleet mix and expected airport businesses. Typically a large FBO handling a large volume of transient corporate traffic would offer deicing capabilities. Any new deicing operations would have to be incorporated into an approved airport stormwater permit for compliance to be achieved.

AGRICULTURAL SPRAYING AREA

Considering the nature of the Ronan area, a designated agricultural spraying area should be developed. There is currently no spray pads at the airport. The existing sprayers utilize areas on the airport, but od not have any catch systems for chemical overflow or spillage.

It is recommended that an agricultural spray pad be constructed for the Ronan Airport. There are several factors for aerial application that should be consider for the design and construction for the spray facility. To begin, aerial applicators require an aerial application area (AAA) which should consist of an apron that possesses the following features:

- Constructed of Portland cement concrete
- Underlain with an impervious membrane
- Sloped toward a waste collector

Landside Facilities

Ground Access, Circulation & Parking

GROUND ACCESS & CIRCULATION

The overall design objective is to provide ground vehicles with access to and from the terminal building and hangar facilities using a primary access road. To achieve this, access points should be secured to the apron, hangar area and any field access points to reduce undesired automobile access. The number of hangar access points should be limited to reduce the possibility of vehicle/aircraft incidents which improves safety. Fuel delivery trucks should have access to tanks without entering airside operations areas. Access roads should be paved to reduce the likelihood of foreign object debris (FOD) on the airside areas where it may become a hazard to aircraft.

Central public airport access is provided via a paved access road from Old US 93th Avenue. The pavement strength should be sufficient to accommodate a plow truck, fuel tanker and emergency equipment. The alignment of the access road should continue to provide controlled access to airside facilities.

Apron access is provided at the end of the access road. **All access points should be secured, with the higher activity access points secured with a controlled access gate.** Ideally access points should require a turn from the end of a roadway to discourage inadvertent airfield access. Fuel tanks are currently accessed in the public area away from the active air operations area.

There is one unpaved hangar access path connected to Old US 93.

There are no dedicated internal access roadways located outside of runway and taxiway safety areas to access airport facilities. This is typical for a lower activity airport such as 7S0.

Walking distances were reviewed from a passenger convenience perspective. Currently both the main landside automobile parking lot is located directly adjacent to the arrival/departure building. This location is ideal to minimize passenger and visitor exposure to the outdoor elements.

AUTOMOBILE PARKING

Automobile parking at general aviation airports should accommodate landside access needed to serve aeronautical facilities. Facilities requiring automobile parking include the arrival/departure terminal building, aircraft storage hangars, administration, maintenance equipment storage buildings and FBOs. Vehicles should be discouraged from parking in airside areas. Both public and exclusive-use parking lots may be needed to serve all needs. Automobile parking lots should be sized for the demand and have appropriate number of handicapped accessible spaces. Circulation patterns and pick-up and drop-off points should also be considered. Lighting is recommended for night-time use and security.

Parking stalls adjacent to the main apron are not marked. Pavement markings are recommended to maximize capacity and promote adequate pick-up and drop-off circulation in front of the apron. Most tenants at 7S0 park their vehicle next to their hangar.

A method to calculate total automobile parking needs is to evaluate the types of facilities planned for the airport. According to ACRP Report 113, *Guidebook on General Aviation Facility Planning*, the following space assumptions are made to estimate the demand for total parking stalls:

- 1 space per 1,000 SF of hangar floor space
- 1 space for 50 percent of T-Hangar units
- 1 space per passenger
- 1 space per 200 SF of FBO/Airport Administration office space (5 minimum)
- 1 space per maintenance vehicle bay
- 1 space per 750 SF of maintenance/shop space
- 1 handicapped space per 25 spaces up to 100

Table 4-30 – Automobile Parking Requirements

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
Hangar Building Spaces	43	47	52	56	61
Pilot Lounge Spaces	7	8	8	8	8
FBO Building Spaces	0	0	0	0	5*

Airport Administration Spaces	0	0	0	0	0
Maintenance Parking Spaces	3	3	3	3	3
Total Automobile Parking Needs	**53**	**58**	**63**	**67**	**77**
Capacity/Deficiency	**21**	**26**	**31**	**35**	**45**

Source: KLJ Analysis. Note: RED indicates a deficiency to existing capacity.
**Assumes 1,000 SF of FBO Office Space*

Additional dedicated automobile parking spaces are recommended to meet both hangar and pilot lounge needs.

Public Transportation

There is little local demand for public transportation for users of 7S0. A courtesy car is currently available.

Summary

This chapter identifies safety, capacity and development needs for the Ronan Airport based on forecasted activity levels. These recommendations provide the basis for formulating development alternatives in **Chapter 5: Alternatives Analysis** to adequately address recommended improvements. The following summarizes the facility recommendations:

Airside Facilities

- Maintain Runway 16-34 to accommodate regular use of Beechcraft King Air B-200 aircraft with RDC B-II/Small standards.
- Plan to accommodate regular use of business jet aircraft such as a Cessna Citation XLS+ with RDC B-II/Large standards as demand warrants, possibly as soon as PAL 1.
- Plan to accommodate a 5,100-foot long and 75-foot wide Runway 16-34 within PAL 1 to meet the needs of existing aircraft.
- Plan to accommodate a 5,500-foot runway in the planning horizon
- As a result of the 5,100-foot (5,500 foot) runway length, take steps to lower the instrument approach minimums of Runway 34 or 16 to 250-foot cloud ceiling and 3/4 mile visibility. Review Alternatives.
- Upgrade Runway 16-34 VGSI systems to a 4-box PAPI system.
- Install retro-reflective taxiway markers at a minimum at taxiway turns.
- Install AWOS-II
- Establish a stand-alone communications frequency for the AWOS.
- Rehabilitate all pavement over the next 5 years.

General Aviation Facilities

- Accommodate additional based aircraft hangar storage by PAL 2.
- Expand the aircraft apron to accommodate maneuvering and parking in Design Group II aircraft as needed.

Support Facilities

- Provide space for the storage and distribution of future alternative aircraft fuels.
- Plan for an ultimate airport perimeter security and wildlife fence.
- Upgrade airport well water and sanitary sewer mound system as new facilities are constructed.
- Construct an agricultural spray pad.

Landside Facilities

- Construct paved access road for the aircraft storage hangar area.
- Consider constructing controlled access gates for the hangar, apron and east access points.
- Plan to accommodate 21 additional dedicated automobile parking spaces by PAL 1, with up to 45 by PAL 4 to meet all anticipated automobile parking needs.