3

3 FORECAST OF AVIATION 4 (2018 UPDATE)

3.1 INTRODUCTION

This chapter presents the aviation activity forecasts for the Yakima Air Terminal/McAllister Field (YKM). The aviation demand forecasts identify the 20-year aeronautical activity levels. The forecast projections are used to assess the type, timing, and allocation of future Airport infrastructure, equipment, and service needs to support Master Plan facility recommendations, alternatives, and airport project funding strategies.

Forecasts have been prepared for the following activity elements:

Airline Passengers

- Base Passenger Forecast (Existing Airlines)
- Outlook Passenger Forecast Scenario (New Airline/Destination)

Commercial Aircraft Operations

- Airline Scheduled Carriers (Base and Outlook Scenario)
- Air Cargo/Freight Scheduled Carriers

- Air Taxi (FAR Part 135)

General Aviation Operations

- Total Aircraft Operations
- Flight Training Outlook Forecast

Military Operations

Based Aircraft

Operational Mix

- Itinerant and Local Operations
- Annual Instrument Operations

Peak-Period Operations

Critical Aircraft

- FAA Aircraft Category
- Critical Aircraft Designation

FAA Terminal Area Forecast (TAF) Comparison

Forecast Summary

3.2 FORECAST OUTCOMES

Figure 3-1 summarizes the preferred forecast levels and growth rates by activity component. Overall, the YKM aviation activity is projected to increase about one to two percent annually throughout the 20-year forecast period. The principal factors shaping the Airport's aviation demand forecasts are:

- The Yakima economy exhibits expansion and a future demand for aeronautical services
- Airline passenger demand growing with YKM air carrier service improvements
- Airline operations expand with potential new air carrier destination and transition to jets
- Air cargo activity is stable, and showing consistent annual growth
- General aviation business growth is occurring, largely through tenant expansion
- Continued transition towards higher-performance turbine aircraft
- Attraction for flight training, with the potential for substantial flight training increases

Figure 3-1: Forecast Summary

Demand Forecast Component (Annual Activity Totals)		Baseline Year Condition	20-Year Forecast	20-Year Forecast	Preferred Forecast Scenario	Preferred Forecast Scenario Direction
		2018	2040-Low Scenario	2040-High Scenario		
BASE FORECAST (PREFERRED FORECASTS)						
Airline Passengers (Enplaned-Boarded)		73,342	82,600	92,600	High	
Total Annual Aircraft Operations		39,444	41,500	48,600	High	
Commercial Operations		7,422	8,900	10,600	High	
General Aviation Operations		30,217	30,900	36,200	High	
Military Operations		1,805	1,805	1,805	FAA TAF	
Based Aircraft		131	121	173	High	
OUTLOOK SCENARIO FORECASTS (ADDITIVE ACTIVITY LEVELS - NOT INCLUDED IN BASE FORECAST)						
Airline Passengers (Enplaned-Boarded)		73,342	24,600		Outlook Scenario	
Flight Training Operations		2,954	10,000 to 15,000		Outlook Scenario	

Source: Consultant Forecast Projection, December 2018.

3.3 FORECASTING PROCESS

The forecasts quantify a realistic expectation of future aviation demand, as substantiated from YKM factors and aviation industry trends. The forecasts are prepared consistent with technical and procedural guidance from Federal Aviation Administration (FAA) Advisory Circular (AC)

150/5070-6B, Airport Master Plans. This process uses FAA data and methods to project aviation activity and to select a single preferred forecast for FAA approval and to carry-forward throughout the Master Plan.

Forecast Timeline: The YKM Master Plan forecast period covers a 20-year planning horizon (2020 to 2040) with 2018 as the existing baseline year. Forecasts are identified for three planning phases: the short-term (2020-2024); the mid-term (2025-2029); and the long-term (2030-2040); consistent with the 2015 YKM Master Plan 5-year forecast year increments. Forecasts reflect the FAA fiscal year from October to September, unless otherwise noted.

Forecast Process: The YKM Master Plan forecasts consider airport, community, and aviation industry factors to develop realistic projections. The forecasts follow FAA-acceptable statistical methods, including times-series trend, regression, comparative analysis, and market share techniques.

Forecast projections are developed for a low (constrained) and high (unconstrained) scenario, which establish boundaries for the minimum and maximum demand potential. The forecast scenarios are supported by qualitative and quantitative factors, reported for each forecast element to show possible upward and downward influences for the 20-year demand levels. This process is used to develop an appropriate forecast technique, to show a direct forecast correlation and causation, and achieve a high statistical confidence and assert forecast sustainability.

Unconstrained Forecast (High Range): Leaning towards an unfettered demand, not overly influenced by constraining demand factors.

Constrained Forecast (Low Range): Leaning towards factors restricting the projected demand and facility implementation.

Base Forecast: The prior 2015 YKM Master Plan forecast chapter projections were evaluated and re-assessed using 2018 activity levels and current YKM forecast trends. The 2015 YKM Master Plan forecast methods and outcomes, which were based on 2010 activity data, have been adjusted and modified to reflect YKM up-to-date forecast events. The Base Forecast results in the selection of a preferred forecast scenario for the YKM Master Plan.

Outlook Forecast: An outlook forecast has been prepared for: 1) airline passengers to a new destination, and 2) general aviation flight training operations. The outlook forecast is scenario-driven projection, in the event the activity is unfolds or is realized within the 20-year forecast period. The outlook forecast is supplemental to the Base Forecast, and can be used for Planning Activity Levels (PALS) in determining Facility Requirements and Alternatives Analysis.

FAA Terminal Area Forecasts (TAF) Forecasts

> **FAA TAF:** The official FAA record of historic and projected airport activity, as prepared annually by the FAA for all airports in the *National Plan of Integrated Airport Systems (NPIAS)*.

The *FAA Terminal Area Forecasts* (TAF) serve as the baseline for historical and forecast Airport activity. The TAF is prepared annually by the FAA as the official forecast of aviation activity for airports included in the FAA *National Plan of Integrated Airport Systems (NPIAS)*. The TAF forecasts are prepared for 1) passenger enplanements, 2) annual aircraft operations, and 3) total based aircraft. The TAF for the current-year activity tends to lag by one to two years in reporting actual levels. The TAF forecasts are developed in an unconstrained top-down manner without input of local forecast drivers, as the TAF forecast methodology for individual airports is not published.

3.4 FORECAST OF AIRLINE PASSENGERS

3.4.1 Overview

The airline passenger forecast quantifies passenger demand and is used to establish the airline aircraft operations forecast. The airline forecast directly influences airfield infrastructure, airline terminal area layout, air carrier building space allocation, aircraft apron parking, and auto parking/access.

3.4.2 YKM Airline Service

The following summarizes YKM airline service and activity levels:

- Airlines serving YKM in 2017/2018:

  Alaska Airlines/Horizon Air (Scheduled Mainline):

  Destination: SEA (Seattle-Tacoma International Airport)
  Flights (Scheduled): 3.8 Average Daily Departures | 27 Weekly | 1,404 Annual
  Aircraft: Bombardier Q400 Turboprop (76 seats)

  Sun Country Airlines (Scheduled Charter):

  Destination/Flight Frequency: IFP (Laughlin, Nevada)
  Flights: 1 to 2 Average Monthly Departures | 18 Annual Departures
  Aircraft: Boeing 737 (Narrowbody jet transport with 120 to 140 seats)

  Swift Airlines (Scheduled Charter):

  Destination: ENV (Wendover, Nevada)
  Flights: 1 Average Monthly Departure | 12 Annual Departures
  Aircraft: Boeing 737 (Narrowbody jet transport with 120 to 140 seats)

3.4.3 Historical Trends

Table 3-1 is a historical summary of airline passengers between 1990 and 2018, as measured by enplaned passengers at YKM. The highest passenger level was in 1991, with 95,779 enplanements. Since 2010, the enplaned passengers have increased 18,333 (2,292 per year), a 33.3 percent overall growth and a 3.66 percent annual growth rate.

In 2018, YKM Airport recorded 73,342 enplaned passengers, with 144,783 total enplaned and deplaned passengers. Alaska Airlines (Horizon Air) had 72,089 annual enplanements (98 percent) and the scheduled charter operators total 1,253 annual enplanements (2 percent). The YKM annualized passenger load factor ranges between 70 and 85 percent, with a high exceeding 90 percent. The ratio of enplaned to deplaned passengers is a 50-50 percent split of total passengers. December and January are historically the peak-passenger months, with an average of 5,000 to 6,000 monthly enplanements.

Table 3-1: Historical Enplaned Passengers (FY 1990 to 2018)

Year	FAA TAF	YKM Enplaned Passengers (FAA Boardings)			
		Scheduled Airline	Scheduled Charter	**Total Enplaned**	Total Period Change
1990	69,428	--	--	**69,428**	--
1995	85,018	80,717	4,301	**85,018**	15,590
2000	86,370	85,266	1,104	**86,370**	1,352
2005	57,319	55,756	1,567	**57,319**	-29,051
2010	55,009	54,439	1,798	**55,911**	-1,408
2015	60,114	64,107	1,807	**65,914**	10,003
2016	70,728	72,293	1,085	**73,378**	7,464
2017	71,679	72,070	1,012	**73,082**	-296
2018	73,342	72,089	1,253	**73,342**	260
Total Change	18,333	17,651	-545	17,431	--
Annual Change	2,292	2,206	-68	2,179	--
% Total	33.3%	32.4%	-30.3%	31.2%	--
% Annual	3.66%	3.57%	-4.41%	3.45%	--

Notes: Table includes scheduled passengers service; does not account for FAA Part 135 on-demand air taxi passengers | 'Enplaned Passenger' and 'Passenger Boardings' defined as the same | FAA TAF source was published in February 2019 | 2010 to 2018 enplaned data from YKM Airport records for calendar year | The total and percent annual change is calculated from 2010 to 2018
Source: Consultant Forecast Projection, December 2018.

3.4.4 YKM Airline Market Analysis

In 2010, a YKM True Market Estimate air service report was conducted to assess passenger demand and air service city markets. This report identified that the YKM catchment area consists of portions of Yakima, Lewis, King, and Kittitas Counties, with a combined population of 270,700

residents. In 2007/2008, the catchment area generated 223,792 annual Origin and Destination (O&D) passengers; in which YKM captures approximately 64 percent (223,792 catchment area passengers ÷ 144,000 total passengers); as the remaining air travelers drive to other surrounding commercial airports (SEA-Seattle, PSC-Pasco, and PDX-Portland).

According to the YKM True Market Estimate, air travelers tend to rely on PSC over SEA due to convenient, reliable, and costs. The YKM to PSC drive distance is 90 miles (approximately 1.5 hours) and the YKM to SEA drive is 120 miles (approximately 2.5 hours). SEA offers more flight options, but is more costly for vehicle parking and during the winter months the drive over the Cascade Mountain range can be unreliable. Flight connections through SEA can be challenging due to YKM flight frequency and times, and YKM flights are subject to unpredictable cancellations. Shuttle bus service between Yakima and Seattle also transports passengers to SEA.

Regional Airline: An air carrier providing service primarily via aircraft with 89 or less seats and whose routes serve mainly as feeders to the mainline carriers. Provides scheduled passenger service of five or more round trip flights per week on at least one route according to published flight schedules.

Charter Airline: Providing scheduled airlines service to point-to-point on-demand destinations, operating transport category aircraft under FAA Part 119 and 121 certification. Service is typically less than five or more round trip flights per week.

3.4.5 Yakima Regional Socioeconomic Profile

Socioeconomic data provides an understanding of demographic profiles and commerce trends. The purpose of this data is to quantify community development characteristics, and to identify socioeconomic indicators connected with YKM activity patterns. In accordance with FAA Advisory Circular 5070-6B guidance, the key indicators for aviation forecasting purposes are population, employment, and per capita personal income. The following are economic index projections (Woods & Poole) for Yakima County, including the percent annual change:

- Population: 256,500 in 2018 to 305,000 in 2040 (0.85% change)
- Employment: 137,900 in 2018 to 170,000 in 2040 (0.99% change)
- Per Capita Income (PCI): $10,900 in 2018 to $15,000 in 2040 (1.50% change)
- Gross Regional Product (GRP): $7.79 in 2018 to $11.40 in 2040 (1.91% change)
- Gross Domestic Product (GDP): $17.39 in 2018 to $25.80 in 2040 (1.99% change)

3.4.6 Regional/Charter Airline Industry Trends

YKM is primarily served by regional and low-cost charter airline service. Overall, the regional airline sector has experienced nationwide market share contraction and shrinking aircraft seat capacity, resulting in declining passengers, load factors, and yields (fare paid per mile). The *FAA Aerospace Forecasts* projects a competitive and profitable regional airline industry, characterized by increasing air travel demand and stable airfares. Quantified by available aircraft seat miles and revenue passengers, the regional airlines are forecast by the *FAA Aerospace Forecasts* to expand

between 1.8 to 2.2 percent annually over the next 20 years, assuming continued national economic growth. The regional turboprop fleet will shrink by two-thirds in the short-term due to replacement of the smaller 50-seat regional jets with more fuel efficient 70 to 90-seat jets. The FAA projects a decline in the size and number of aircraft under 30 seats operated for rural regional markets, as turboprop and jet transport aircraft production has shifted to the over 40-seat market.

3.4.7 Airline Passenger Forecast Resources

Forecast data was collected from YKM records (monthly airline activity records), Airport interviews, FAA data (Terminal Area Forecasts and the *FAA Aerospace Forecasts*), United States Department of Transportation (USDOT) website data, and aviation industry publications. Community and socioeconomic data were also collected for Yakima County.

3.4.8 Forecast Factors

The following are airline service and passenger demand factors used in developing the passenger enplanement forecast scenarios:

- YKM airline service has been consistent and growing. Since 2000, five air carriers have served YKM (Alaska Airlines/Horizon Air, Sun Country, Swift Airlines, Delta, SeaPort Airlines), showing the ability for YKM to attract traveler demand under various types of airlines. Since 1990, enplaned passengers had reached nearly 100,000, as the 9/11 attack precipitously impacted passenger levels; dropping 30 percent. In the past 10 years, since 2008, YKM passenger enplanements historically averaged 63,000 (125,000 total enplaned and deplaned passengers). The ratio of enplaned-to-deplaned passengers is consistently within 1 percent of a 50-to-50 percent split of total passengers.
- Airline service and passenger demand is very much influenced by economic conditions. The Yakima commerce, which is heavily invested into agriculture and emerging tourism, will likely result in YKM experiencing a growing passenger demand as coinciding with Yakima economic expansion and population growth.
- Airline service and reliability is very important to the City. YKM is diligently pursuing opportunities to expand regional airline jet service, with a new airline and/or airport destination expected by 2023. The preferred destination would be San Francisco and/or reintroduction of eastbound service, such as to Salt Lake City (SLT) or Denver (DEN) as regional jet destinations are typically within 1,000 miles of a hub airport due to airline operating economics. The introduction of a new destination or airline would be expected to increase YKM passenger levels by 10,000 to 20,000 enplanements; as evidence of Delta service at YKM from 2007 to 2009. Delta Airlines introduced service to the SLC hub under a ticket guarantee program, in which YKM passenger volumes grew by 15,700 enplaned passengers and did not substantially impact the SEA passenger levels. In

addition, multiple flight destinations served from YKM would likely diminish passenger disruptions resulting from flight cancellations.

- Although unlikely and not forecast, YKM scheduled air service could potentially experience prolonged declines or cease as the result of catastrophic economic conditions and/or changing airline practices. Alaska Airlines/Horizon Air service is forecast through the 20-year forecast period. If discontinued, another air carrier would be expected to serve YKM; perhaps with service to SEA or another comparable city/airport hub destination.
- YKM air service marketing and facility improvements are being advanced. The FLYYKM marketing program and a 2015 Small Community Air Service Development (SCASD) grant has been implemented, to generate passenger awareness of YKM flight advantages. Terminal building improvements are planned in 2024 which is expected to encourage additional passenger use.

The following are airline service events which could influence YKM forecast levels:

- **Added Mainline Service:** Additional Alaska/Horizon Air flight frequency is projected over the 10-year forecast period, with up to 4 additional weekly departure flights, or an additional 208 annual departures. However, the current Bombardier Q400 regional turboprop is expected to be phased-out of the Horizon Air fleet between 2025 to 2030. A transition to an equivalent regional turboprop (70 to 90 seats) or a regional transport jet (70 to 100 seats) is anticipated as part of the YKM forecast, as the larger aircraft transition may influence YKM passenger demand and result in a change to daily/weekly flight frequency.
- **Added Charter Service:** Additional scheduled charter flights are projected, increasing from an average of 30 to 40 annual departures. Point-to-point travel has been the low-cost charter model, and is also becoming the mainline airline model.
- **New Airline/Destination (Outlook Scenario):** New YKM airline destinations (city markets) are projected by 2023 (within 5 years of 2018); with a new destination anticipated to have 6 to 14 weekly departure flights.

3.4.9 Forecast of Enplaned Passengers

Multiple passenger enplanement forecasts were developed using various statistical techniques, resulting in 10 projections ranging between 75,000 to 127,000 annual enplanements by 2040. From the 10 enplanement projections, two were selected as the most reasonable for defining the low (constrained) forecast scenario and the high (unconstrained) forecast scenario. Following discussions with the Airport Staff, the high scenario was accepted as the preferred forecast to carry forward into the Master Plan. The forecast scenarios are described below:

Low Forecast Scenario: This forecast used the combined 20-year annualized County population (0.09%) and per capita income (1.53%) growth rate projections to forecast

passengers. This method assumes passengers will increase directly proportional with the Yakima regional growth rates. This is a static forecast approach, assuming that airline service and passenger demand factors remain unchanged from current conditions. Alaska Airlines/Horizon Air would continue being the primary air carrier. This scenario resulted in enplaned passengers increasing to 82,568 (9,226 total and 419 per year), a 12.6 percent overall growth and a 0.54 percent annual growth rate. This forecast is reasonable in consideration of low to moderate economic expansion.

High Forecast Scenario (Preferred): This forecast method calculates passengers through the new mainline and charter airline service events anticipated over the 20-year planning period, including: 1) additional flight frequency by the mainline carrier (26 to 30 weekly flights) and scheduled charter operators (28 to 40 annual flights), and 2) load factor increases by the mainline carrier (80% to 90% percent) and increased enplanements-per-flight by the scheduled charter air carriers (70 to 90 passengers per flight). This scenario resulted in enplaned passengers increasing to 92,600 (17,800 total increase and 890 per year increase), a 24.3 percent overall growth and a 1.07 percent annual growth rate. This forecast is reasonable in consideration of a greater YKM passenger catchment/driving market share with SEA and PSC, YKM air service improvements (flight frequency, service/fare promotions, transition to regional jets); and remains within historical YKM enplanement levels experienced since 2000.

Planning Activity Level (Outlook Scenario Forecast): The outlook forecast is a scenario of introducing new airline service to a west-coast destination, anticipated to start during 2020 to 2030. As an outlook forecast, this would be a supplemental projection additive to the low or high forecast scenario. The outlook forecast calculated enplaned passengers using the following inputs: 1) destination to a west-coast hub airport within 1,000 miles of YKM, 2) 50 to 70-seat regional jet aircraft, 3) a graduated load factor increasing from 55 to 70 percent, 4) an average of 2 to 3 daily departure flights, 5) an average of 3 to 5 flight-days per week. This projection would result in a bump to YKM passengers, adding 8,000 to 15,000 enplanements during the initial service introduction, then growing with changes in flight schedule frequency. This scenario projects 24,600 enplaned passengers by 2040, or an average of 900 additional passengers per year.

FAA Terminal Area Forecasts (FAA TAF): Total 20-year airline enplaned passengers increase from 72,902 in 2020 to 98,649 in 2040 (25,747 passengers), a 35 percent overall growth and a 1.52 percent annual growth rate.

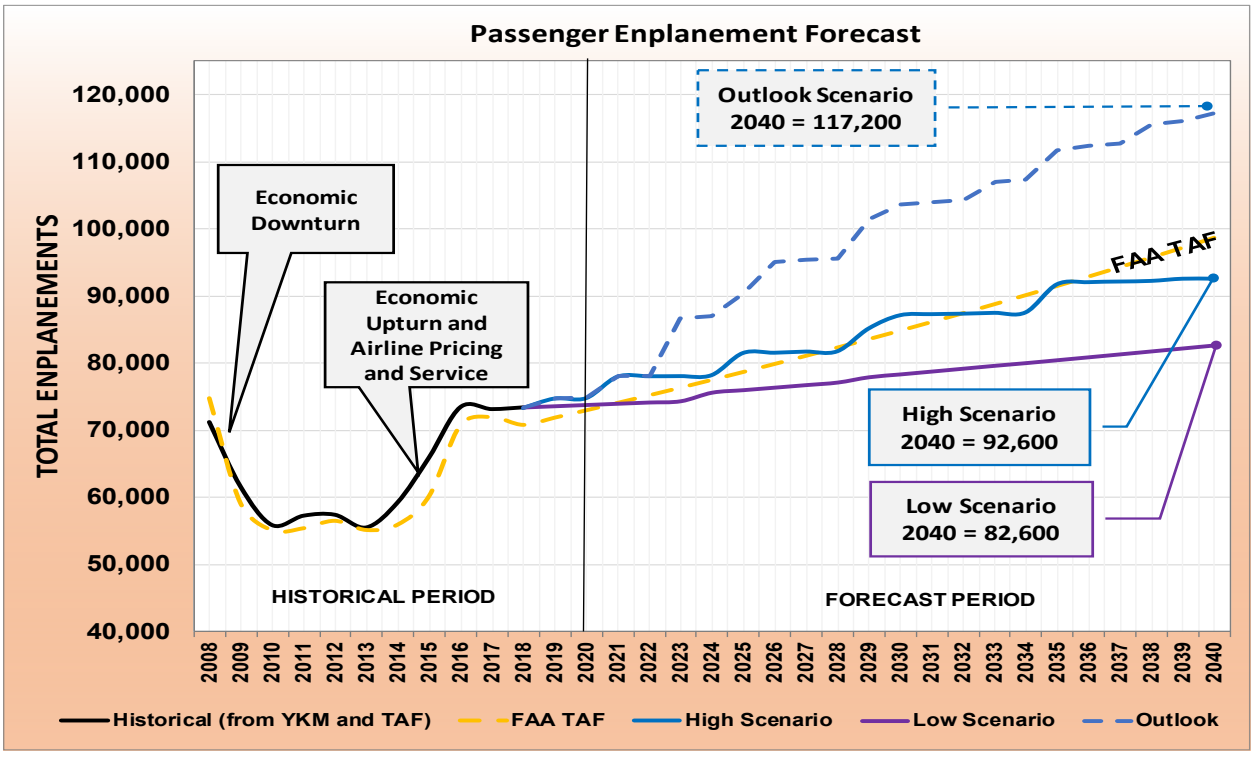
Table 3-2 and Figure 3-2 is a summary of the passenger forecasts for the low, high, and outlook scenarios, including the FAA TAF projection.

Table 3-2: Passenger Enplanement Forecast Scenarios

Forecast Year	Forecast Scenarios		Outlook Scenario	Planning Activity Level Outlook Scenario		FAA TAF
	Low	High		Low + Outlook	High + Outlook	
2018	73,342	73,342	0	--	--	70,736
2020	73,700	74,800	0	73,700	74,800	72,902
2025	75,900	81,600	8,800	84,700	90,400	78,616
2030	78,300	87,200	16,400	94,700	103,600	84,787
2035	80,400	91,800	20,000	100,400	111,800	91,451
2040	82,600	92,600	24,600	107,200	117,200	98,649
20-Year Change	8,900	17,800	24,600	33,500	42,400	25,747
% Total Change	12%	24%	180%	45%	57%	35%
% Annual Change	0.57%	1.07%	7.09%	1.89%	2.27%	1.52%

Note: FAA TAF published in February 2019 | Enplaned-to-deplaned passengers forecast at 50-50 percent.
Source: Consultant Forecast Projection, December 2018.

Figure 3-2: Enplaned Passenger Forecast Scenarios



Source: Consultant Forecast Projection Exhibit, December 2018.

Table 3-3 is a summary of the 'preferred' and 'outlook' passenger enplanement forecast scenario by enplaned, deplaned, and total passengers. The 'high' passenger enplanement scenario is the recommended forecast to carry-forward in the master plan as the preferred passenger enplanement projection. The preferred forecast reaches 92,600 enplaned passengers by 2040. However, YKM has historically exceeded 90,000 passenger enplanements and has been able to serve multiple airlines and multiple destinations. Therefore, the outlook forecast is considered as a supplemental planning activity level for alternate planning consideration. The 20-year outlook forecast includes an additional 24,600 enplaned passengers, reaching 117,200 total enplaned passengers by 2040.

Table 3-3: Preferred Passenger Enplanement Forecast

Preferred Forecast	Enplaned Passengers (Preferred Master Plan)	Deplaned Passengers (Preferred Master Plan)	Total Passengers (Preferred Master Plan)
2018	73,300	73,300	**146,600**
2020	74,800	74,800	**149,600**
2025	81,600	81,600	**163,200**
2030	87,200	87,200	**174,400**
2035	91,800	91,800	**183,600**
2040	92,600	92,600	**185,200**
Outlook Scenario	**Enplaned Passengers (Outlook)**	**Deplaned Passengers (Outlook)**	**Total Passengers (Outlook)**
2018	0	0	**0**
2020	0	0	**0**
2025	8,800	8,800	**17,600**
2030	16,400	16,400	**32,800**
2035	20,000	20,000	**40,000**
2040	24,600	24,600	**49,200**
Preferred + Outlook	**Enplaned Passengers (Preferred + Outlook)**	**Deplaned Passengers (Preferred + Outlook)**	**Total Passengers (Preferred + Outlook)**
2018	73,300	73,300	**146,600**
2020	74,800	74,800	**149,600**
2025	90,400	90,400	**180,800**
2030	103,600	103,600	**207,200**
2035	111,800	111,800	**223,600**
2040	117,200	117,200	**234,400**

Note: Deplaned passengers projected at 50 percent of total passengers.
Note: Preferred master plan forecast is the 'high' scenario projection
Note: Outlook projection considered as an alternate planning activity level (PAL).
Source: Consultant Forecast Projection, December 2018.

3.5 FORECAST OF ANNUAL OPERATIONS

3.5.1 Overview

> **Aircraft Operation:** (defined as takeoffs and landings; each flight consists of two operations)

The following section describes the 20-year forecast of annual aircraft operations. The forecasts include operations by 1) commercial, 2) general aviation and 3) military traffic. The aircraft operations forecast directly influences the planning of airfield infrastructure and facilities, in addition to terminal/landside space allocation and access.

Table 3-4 is a historical summary of total airport operations between 1990 and 2018, as measured by annual aircraft operations. Significant changes occurring since 2010 include:

- Loss of based general aviation aircraft, and impact of operations when the Noland Decoto Through-the-Fence Agreement was terminated in 2011, resulting in the repositioning of 38 based aircraft; as aircraft were either retained at YKM or relocated to other airports.
- Transition of Central Washington University (CWU) flight training operator from Midstate Aviation to IASCO Flight Training (IFT) that occurred in 2014-2015, which caused a drop in general aviation traffic (flight training) at YKM.
- Historically, total annual operations reflect activity recorded during YKM Air Traffic Control Tower (ATCT) hours of operation. The Airport estimates 5 percent of the total operations are conducted during ATCT non-operating hours. For comparison, the 5 percent adjustment is recognized in Table 3-4.

Table 3-4: Historical Airport Operations

Calendar Year	Commercial	General Aviation	Military	Total (YKM ATCT Reported)	Adjusted Total (5% ATCT Adjustment)
1990	15,842	44,681	7,035	**67,558**	70,936
1995	18,523	50,638	5,346	**74,507**	78,232
2000	15,755	39,470	3,878	**59,103**	62,058
2005	10,177	37,363	2,112	**49,652**	52,135
2010	7,237	36,424	2,244	**45,905**	48,200
2015	5,142	29,754	1,873	**36,769**	38,607
2016	5,737	29,513	1,565	**36,815**	38,656
2017	6,092	28,565	1,701	**36,358**	38,176
2018	7,422	30,217	1,805	**39,444**	41,416

Note: Total are YKM Air Traffic Control Tower (ATCT) actual reported.
Note: Adjusted Total includes 5 percent adjusted of annual activity based on YKM ATCT non-operating hour reporting.

3.5.2 Forecast of Commercial Airline Operations

Air carrier operations include take-offs and landings of scheduled commercial air carrier aircraft having more than 60 passenger seats, which includes all of the scheduled airline activity at YKM. The following is a summary of air carrier operation activity levels.

YKM Airport records show 2,535 actual airline operations in 2018; including 2,477 by the mainline carrier (Alaska/Horizon Air) and 58 by the scheduled charters (Sun County and Swift Airlines). Based on the YKM airline daily departure/arrival schedule (27 weekly departure flights), excluding flight cancellations, there would be approximately 2,850 annual airline operations (27 departures x 52 weeks x 2 operations). Approximately 100 YKM airline flights (200 airline operations) are cancelled annually as the result of airline pilot-crew shortages, SEA traffic flow management, inclement weather, and aircraft mechanical. The 2,850 level is used as the baseline total for forecasting airline operations, as it accounts for the actual YKM airline flight schedules and true passenger demand.

The ratio of passenger enplanement demand to the aircraft seat capacity, expressed as the load factor, is typically used as the flight frequency gauge to forecast air carrier operations. When the air carrier load factor is consistently above 80 to 90 percent, the number of flights offered and/or larger aircraft with greater seating capacity is typically adjusted to serve the high-demand markets or routes. However, even with high load factors, airlines have been challenged to add flights to regional markets like YKM, due largely to pilot shortages and SEA traffic flow management.

The forecast of air carrier operations considered the following factors:

- Additional Alaska/Horizon Air flight frequency is projected at YKM, from 26 to 32 weekly departure flights over the 20-year forecast period, or an additional 416 annual operations. The transition from the 76-seat Q400 turboprop to a regional jet aircraft is projected during 2025 to 2030, with the jet aircraft (anticipated to be the Embraer EMB 170/175 or MRJ70/90 Series) possibly influencing the weekly flight schedule frequency.
- Outlook Forecast: A new YKM airline destination (airport/city market) is projected by 2025; with new service conservatively projected to have 6 to 14 weekly departure flights, which equates to nearly 1,400 annual airline operations.

Table 3-5 summarizes the historical and 20-year forecast of airline aircraft operations, for the preferred scheduled and outlook scenario passenger enplanement forecast. The airline operations forecast was calculated from the application of flight schedules and passenger load factors per aircraft departure.

Table 3-5: Forecasts of Annual Airline Operations

Year	Scheduled Airline (Mainline)	Scheduled Airline (Charter)	Scheduled Airline Total	Outlook Scenario (New Service)	Total Scheduled + Outlook
2018	2,530	60	**2,590**	--	2,590
2020	2,810	60	**2,870**	0	2,870
2025	3,020	70	**3,080**	620	3,710
2030	3,120	70	**3,190**	1,090	4,280
2035	3,220	70	**3,300**	1,250	4,540
2040	3,220	80	**3,300**	1,400	4,700

Note: Totals subject to rounding. | Note: Mainline is Alaska/Horizon Air or similar | Charter is Sun County, Swift Airlines and similar | 'New Service' scenario is an outlook projection which considers new YKM airline/destination service.
Source: Consultant Forecast Projection, December 2018.

3.5.3 Forecast of Commercial Air Cargo Operations

YKM has the following scheduled commercial air cargo operators and activity levels:

- **Empire Airlines** operates a feeder route for FedEx primarily using the Cessna Caravan 208 single-engine turboprop aircraft (three daily morning flights from Spokane with departures to Spokane and other cities in Washington State). The ATR 42/72 twin-engine turboprop aircraft is used during the peak holiday seasons when cargo increases. On average, Empire flights total 1,600 annual aircraft operations at YKM, or an average of 2.2 flights per day.
- **Ameriflight** operates as a feeder service to UPS using the Embraer 120 twin-turboprop aircraft (operate one flight per day arriving from Boeing Field each morning with a departure in the afternoon). On average, Ameriflight air cargo flights total 900 annual aircraft operations at YKM, or an average of 1.2 flights per day.

Combined, the scheduled air cargo operators account for 2,500 annual operations. YKM has other non-scheduled air cargo and freight flights, which appear to be reported as air taxi operations.

The forecast of air cargo operations considered the following factors:

- YKM air cargo/freight volumes are anticipated to experience steady growth dependent on regional commerce and retail patterns; as no significant changes in YKM air cargo volumes (tonnage) are expected.

- YKM air cargo is expected to be served by two integrated cargo operators (FedEx and UPS), operating similar turboprop aircraft to existing or similar inter-city airport destinations.
- YKM air cargo flights are projected to experience additional flight frequency, resulting from seasonal peak-period express package volumes and supplemental daily flights during the peak season; however, cargo trucks will continue being used to supplement large seasonal cargo volumes.
- The Yakima agricultural industry is not expected to rely extensively on air cargo/freight for the shipment of crops and produce, as even high-valued and time-sensitive farming products will continue relying on truck and railroad transport.

Table 3-5 summarizes the historical and 20-year forecast of air cargo operations. The FAA TAF does not forecast air cargo operations.

3.5.4 Forecast of Commercial Air Taxi Operations

Table 3-6 summarizes the 20-year forecast of air taxi operations. Air taxi includes flights conducted for non-scheduled passenger and cargo purposes, FAR Part 135 on-demand charter, fractional ownership, and medical flights; predominately using general aviation aircraft with fewer than 30 seats. YKM has three based FAR Part 135 charter outfits using fixed wing and helicopters, in addition to air taxi flights by transient commercial charter operators based at other airports.

Table 3-6: Forecast Summary of Preferred Commercial Operations

Year	Scheduled Airline	Scheduled Air Cargo	Air Taxi (Part 135)	Total Commercial
2018	2,530	2,540	2,350	**7,420**
2020	2,870	2,620	2,460	**7,950**
2025	3,080	2,810	2,770	**8,660**
2030	3,190	3,010	3,110	**9,310**
2035	3,300	3,200	3,500	**9,990**
2040	3,300	3,400	3,930	**10,630**

Note: 2018 airline and air cargo operations are based on Airport Staff records. | Note: 2018 air taxi operations reflect Airport Staff estimates based on Part 135 based aircraft and activity levels. | Note: FAA TAF record of commercial operations did not account for YKM commercial air cargo activity.
Source: Consultant Forecast Projection, December 2018.

3.5.5 Forecast of General Aviation Operations

3.5.5.1 Overview

General aviation represents the largest and most significant segment of the national air transportation system; accounting for 96 percent of all civilian airports, 97 percent of all civilian aircraft, 75 percent of all airport operations, and over 65 percent of all certified pilots. With nearly 70 percent of all general aviation flying conducted for business purposes, general aviation provides an important transportation link with commerce throughout the Yakima Valley.

3.5.5.2 Industry Trends

A review of industry trends, by general aviation market segment, provides insight into drivers of past change and emerging forecast directions. Nationwide, the general aviation industry is experiencing prolonged slow growth, and an aircraft fleet continuing to undergo transition in production and utilization. In terms of aircraft production and flight hour utilization, the piston fleet is declining by -0.5 percent annually, while the turbine (turboprop and business jet) fleet is growing at 2.5 percent annually; with turbine aircraft production exceeding piston aircraft production.

3.5.5.3 YKM General Aviation Operations

YKM reported 28,650 total general aviation aircraft operations in 2018, consistent with levels experienced since 2010. General aviation operations account for nearly 80 percent of the total YKM aircraft operations.

The forecast of general aviation operations considered the following factors:

- The Yakima area population is growing at 0.85 percent annually and commerce is growing 1.5 to 2.5 percent annually. Community growth is expected to translate into additional YKM activity and higher utilization; brought about by the expansion of YKM tenants involved in providing aeronautical services and the proposed southside hangar development. The Yakima agricultural industry relies heavily on general aviation air taxi services.
- The FAA Aerospace Forecast projects a 0.8 percent annual growth in the total general aviation aircraft fleet hours flown. This increase is realistic at YKM.
- General aviation activity at YKM is vibrant and stable. The Operations Per Based Aircraft (GA OPBA), which is the ratio of annual general aviation operations to total based aircraft, consistently measures and is forecast to remain between 150 and 200. The YKM turbine (turboprop and business jet) activity is expected to increase proportionally higher than the piston fleet, as reflective of turbine industry aircraft production and utilization trends.

YKM piston aircraft traffic will experience growth, including the proliferation of sport/light utility aircraft, as perpetuated by CubCrafters sales and training.

- The proposed southside hangar redevelopment would add 5 to 15 based aircraft, which could reasonably translate into an additional 1,500 to 2,500 annual operations.
- Flight training at YKM, largely associated with Central Washington University (CWU), is expected to increase as their flight program grows and they add additional aircraft to their fleet; future flight training activity could be substantial if CWU bases training facilities at YKM.

3.5.5.4 General Aviation Flight Training Operations

Flight training activity accounts for about 20 percent of the local general aviation traffic, or an estimated 2,500 to 3,500 annual operations per year, largely generated by flight training operators at YKM (McCormick's, Yakima Aerosport, and CubCrafters) and from the Central Washington University (CWU) program based at Bowers Field in Ellensburg, Washington. YKM provides an Air Traffic Control Tower (ATCT) facility useful for pilot training purposes during visual and instrument conditions, with nearly all flight training conducted during ATCT operating hours. The based flight training is generated through FAR Part 91 flight training/proficiency activity. The CWU flight training is largely generated by cross-county and ILS instrument training.

Base Forecast: Flight training growth at YKM would likely result from future CWU expansion of student pilot enrollments, curriculum expansion, and potential changes to the flight program and locations, which have the potential to impact YKM in the event CWU further utilizes or establishes training facilities at YKM in the future. Flight training activity during the 20-year forecast period is forecast to range between 3,000 to 4,000 annual aircraft operations at YKM. Flight training is expected to increase at YKM through 2025, principally in response to the airline industry demand for supplying professional pilots to meet domestic and international fleet acquisitions and to counter pilot shortages resulting from mandatory age retirements.

Outlook Scenario: As an outlook forecast scenario, CWU is evaluating their flight program and looking at YKM to either establish a satellite campus or move their entire flight program. Although no agreements have been finalized, either situation would greatly increase YKM operations. If CWU establishes flight training facilities at YKM, flight training operations would increase substantially. As an industry standard, each flight training aircraft operates between 300 and 600 hours annually and conducts 2,200 to 2,800 operations per year.

3.5.5.5 Summary of General Aviation Operations Forecast

The following documents the general aviation forecast methodologies:

- **Low Scenario:** This forecast approach uses the OFM low growth rate to project future general aviation operations. This results in 30,820 general aviation operations by 2040, an annualized is 0.1 percent growth rate. This forecast approach was dismissed from further consideration because it does not reflect the upward operational factors beyond 2018.
- **High Scenario:** This forecast approach uses the FAA 20-year general aviation fleet hours flown growth rate as derived from the FAA Aerospace Forecasts (FAA Table 29). This results in 34,252 general aviation operations by 2038, an annualized is 0.9 percent growth rate. This forecast approach assumes that influences at YKM will be positive for general aviation operations. Accordingly, this scenario reflects the growth in the YKM community, and the south side hangar development.
- **FAA Terminal Area Forecast (2019):** Total 20-year general aviation operations increase from 28,890 in 2020 to 31,350 in 2040 (2,460 total change), a 8.5 percent overall growth and a 0.41 percent annual growth rate.
- **Preferred Forecast Summary and Reasonableness (High Scenario):** Following discussions with the Airport Staff, the high scenario was accepted as the preferred forecast to carry forward into the Master Plan. The high forecast scenario more closely aligns with the YKM forecast factors. In addition, the high forecast scenario is consistent with a growing Yakima region and economy. The high forecast scenario exceeds the 2018 FAA TAF as attributed to: 1) planned southside hangar development, 2) continued increases in flight training, 3) FBO growth and aircraft acquisitions, 4) potential through-the-fence hangar occupancy. Table 3-7 shows the general aviation forecast scenarios.

Table 3-7: General Aviation Operations Forecast

		Low Scenario			High Scenario (Preferred)		
Year	FAA TAF	Itinerant	Local	Total	Itinerant	Local	**Total**
2010	38,170	18,154	20,016	38,170	18,154	20,016	38,170
2015	30,020	15,636	14,385	30,021	15,636	14,385	30,021
2018	28,650	16,958	13,259	30,217	16,958	13,259	**30,217**
2020	28,890	16,730	13,080	29,810	17,240	13,480	**30,710**
2025	29,480	16,830	13,160	29,990	17,950	14,030	**31,980**
2030	30,090	17,050	13,330	30,380	18,690	14,620	**33,310**
2035	30,710	17,220	13,460	30,680	19,470	15,220	**34,690**
2040	31,350	17,300	13,520	30,820	20,270	15,850	**36,130**
Change	2,460	570	440	1,010	3,030	2,370	5,420
Annual	123	29	22	51	152	119	271
% Total	8.5%	3.4%	3.4%	3.4%	17.6%	17.6%	17.6%
% Annual	0.41%	0.17%	0.17%	0.17%	0.81%	0.81%	0.82%

Note: FAA TAF published in February 2019.
Source: Consultant Forecast Projection, December 2018.

3.5.6 Forecast of Military Operations

Military activity is generated by the Yakima Training Center and traffic conducted by aircraft based at military/guard facilities throughout the State of Washington, and beyond. YKM reports 1,800 annual military operations in 2018, with 900 operation by local traffic and 900 itinerant operations associated with training exercises and flight training/proficiency.

Military activity is estimated to be 30 percent by fixed-wing planes and 70 percent by helicopters. The fixed-wing planes most frequently include the P3 Orion (4-engine turboprop), C-130 Hercules (4-engine turboprop), and C-17 (4-engine jet). The helicopters predominately include the Sikorsky Blackhawk based at the Yakima Training Center. The military, through an agreement with Airlift NW, provides Medevac flights out of YKM on a regular basis using the Blackhawk.

Military operations were not forecast as part of the YKM Master Plan, but are anticipated to remain about 2,000 annual operations, which is consistent with the FAA TAF. Military operations have been included, separately, as part of the total YKM airport operations, as FAA Advisory Circular 150/5000-17 states that facility planning should include consideration of military aircraft or other federally-owned aircraft operating at the airport.

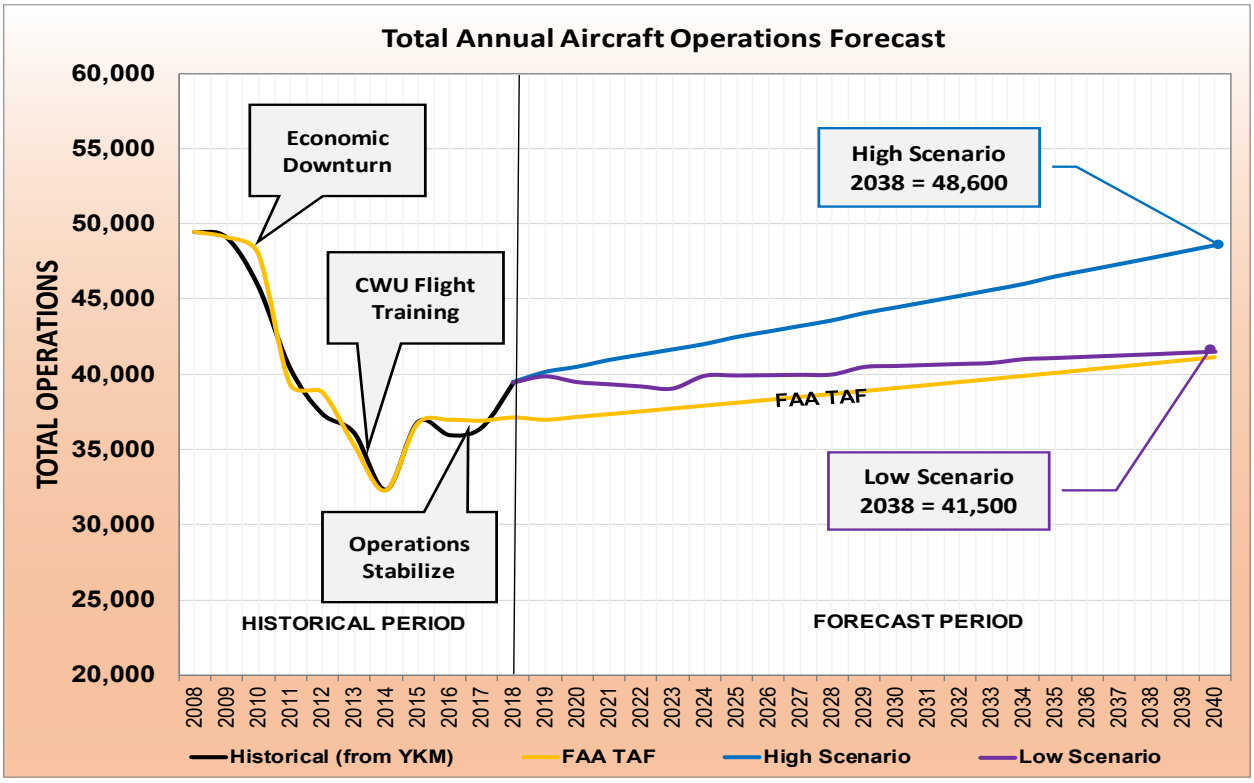
Table 3-8 and Figure 3-3 summarizes the preferred annual aircraft operation scenarios, by user group, including the 20-year forecast change.

Table 3-8: Summary of Preferred Total Airport Operation Forecasts

Year	Commercial Airline	Commercial Air Cargo	Commercial Air Taxi	General Aviation	Military	Total Annual Operations
2018	2,530	2,540	2,350	30,220	2,000	**39,640**
2020	2,870	2,620	2,460	30,710	1,810	**40,470**
2025	3,080	2,810	2,770	31,980	1,810	**42,450**
2030	3,190	3,010	3,110	33,310	1,810	**44,420**
2035	3,300	3,200	3,500	34,690	1,810	**46,490**
2040	3,300	3,400	3,930	36,130	1,810	**48,560**
Total	430	780	1,470	5,420	0	8,090
Annual	22	39	74	271	0	405
% Total	15.0%	29.8%	59.8%	17.6%	0.0%	20.0%
% Annual	0.70%	1.31%	2.37%	0.82%	0.00%	0.92%

Note: Totals subject to rounding.
Source: Consultant Forecast Projection, December 2018.

Figure 3-3: Total Operations Forecast Scenarios



Source: Consultant Forecast Projection Exhibit, December 2018.

3.6 OPERATIONAL MIX FORECASTS

The follow section is a forecast of operational activity components derived from the preferred aircraft operational forecast. These forecast components are used to establish the peaking and critical aircraft forecast.

3.6.1 Forecast of Itinerant and Local Operations

On average, about 55 percent of the total YKM operations are transient/itinerant and 45 percent local. Future levels of local and itinerant activity were forecast using this distribution, as shown in Table 3-9.

Table 3-9: Forecast of Local and Itinerant Operations

Year	Transient/ Itinerant Operations	Transient/ Itinerant (% Total)	Local Operations	Local Operations (% Total)	Total Airport Operations
2018	**21,690**	55%	**17,750**	45%	**39,440**
2020	**22,260**	55%	**18,210**	45%	**40,470**
2025	**23,350**	55%	**19,100**	45%	**42,450**
2030	**24,430**	55%	**19,990**	45%	**44,420**
2035	**25,570**	55%	**20,920**	45%	**46,490**
2040	**26,710**	55%	**21,850**	45%	**48,560**

Note: 2010, 2015, 2018 activity from FAA TAF. | Note: Totals subject to rounding
Source: Consultant Forecast Projection, December 2018.

3.6.2 Forecast of Airport Instrument Operations

Table 3-10 summarizes the YKM 20-year forecast of instrument operations. An instrument operation is defined as any arrival or departure from an airport by aircraft operating in accordance with an Instrument Flight Rule (IFR) flight plan or with the provision of IFR separation from other aircraft by a terminal control facility; or, any contact with the ATCT by aircraft operating under an IFR flight plan. At YKM, instrument account for an estimated 28 percent the total flights.

Table 3-10: Forecast of Instrument Operations

Year	Total Airport Operations	Percent Instrument Operations	Total Annual Instrument Operations
2018	39,440	26.7%	**10,520**
2020	40,470	26.7%	**10,790**
2025	42,450	26.7%	**11,320**
2030	44,420	26.7%	**11,850**
2035	46,490	26.7%	**12,400**
2040	48,560	26.7%	**12,950**

Note: Percent Instrument Operations calculated from 2018 OPSNET
Source: Consultant Forecast Projection, December 2018.

3.7 OPERATIONAL PEAKING FORECASTS

Aircraft operational forecasts are used to assess Airport capacity needs, level of service, and space allocation requirements for airspace, airfield, and terminal purposes; as determined by various operational peaking components. Peak activity levels are derived from annual aircraft operations, broken-down by month, day, and hour periods. Per FAA AC 150/5060-5 *Airport Capacity and Delay* guidance, the average-day-peak-month (ADPM) is used to define the busy period, to avoid constructing facilities for capacity rarely used. Three key peak aviation indicators are:

- **Peak Month**: Defined as that month in the calendar year when the highest overall activity levels occur. The term "design month" is interchangeable with peak month. The peak month for YKM typically occurs during July and August, with the percent of peak month activity dependent on the type of traffic (commercial, general aviation and military).
- **Average Day**: Defined as the average day within the peak month. This indicator is developed by dividing the peak month activity by 30.4 days.
- **Design Hour**: Defined as the peak hour within the average day, typically ranging between 10 and 20 percent of the average day activity.

Table 3-11 summarizes operational peaking forecast during the 20-year period, including the peaking percentage. Aircraft operational forecasts are used to assess Airport capacity needs, level of service, and space allocation requirements for airspace, airfield, and terminal purposes; as determined by operational peaking components.

Table 3-11: Forecast of Peak-Period Activity

Year	Annual Activity	Peak Month Percent (%)	Peak Month	Average Day/ Peak Month (30.4 Days)	Peak Hour Percent (%)	Peak Hour
Enplaned Passengers						
2018	**73,300**	10%	**7,330**	**241**	35%	**84**
2020	**74,800**	10%	**7,480**	**246**	35%	**86**
2025	**81,600**	10%	**8,160**	**268**	35%	**94**
2030	**87,200**	10%	**8,720**	**287**	35%	**100**
2035	**91,800**	10%	**9,180**	**302**	35%	**106**
2040	**92,600**	10%	**9,260**	**305**	35%	**107**
Commercial Operations						
2018	**7,420**	8%	**594**	**20**	15%	**2.9**
2020	**7,950**	8%	**636**	**21**	15%	**3.1**
2025	**8,660**	8%	**693**	**23**	15%	**3.4**
2030	**9,310**	8%	**745**	**25**	15%	**3.7**
2035	**9,990**	8%	**799**	**26**	15%	**3.9**
2040	**10,630**	8%	**850**	**28**	15%	**4.2**
General Aviation Operations						
2018	**30,217**	11%	**3,324**	**109**	25%	**27.3**
2020	**30,710**	11%	**3,378**	**111**	25%	**27.8**
2025	**31,980**	11%	**3,518**	**116**	25%	**28.9**
2030	**33,310**	11%	**3,664**	**121**	25%	**30.1**
2035	**34,690**	11%	**3,816**	**126**	25%	**31.4**
2040	**36,130**	11%	**3,974**	**131**	25%	**32.7**
Military Operations						
2018	**1,805**	11%	**199**	**7**	25%	**1.6**
2020	**1,805**	11%	**199**	**7**	25%	**1.6**
2025	**1,805**	11%	**199**	**7**	25%	**1.6**
2030	**1,805**	11%	**199**	**7**	25%	**1.6**
2035	**1,805**	11%	**199**	**7**	25%	**1.6**
2040	**1,805**	11%	**199**	**7**	25%	**1.6**

Note: FAA TAF record of commercial operations did not include YKM commercial air cargo activity.
Source: Consultant Forecast Projection, December 2018.

3.8 OPERATIONAL MIX FORECAST

The aircraft operations forecast directly influences airfield and airspace utilization, taxiway system geometry, and airport infrastructure assets. Aircraft operations, defined as either a takeoff or a landing, determine the year-by-year total number of annual operations. The FAA classifies aircraft operations by single-engine piston, multi-engine piston, jet, helicopter, and other (includes experimental and light sport aircraft weighing less than 1,300 pounds).

The following assumptions were used in forecasting future operational fleet mix:

1. YKM scheduled air carrier service will transition towards more transport jet aircraft service, brought about by the retirement/replacement of turboprop aircraft and through the introduction of new airline service.
2. YKM air cargo flights will continue to consist of single and twin-turboprop aircraft, transitioning to more and larger twin-turboprop aircraft.
3. YKM general aviation traffic will continue to experience greater activity by higher-performance turbine aircraft (turboprop and jet), brought about by additional based turbine aircraft and greater utilization by turbine aircraft used for business and air taxi flights. Business jet activity, using FAA TMFSC data, averages 125 operations per month at YKM, or 1,500 to 2,000 operations per year. Small cabin jets (Category B) conduct an estimated 1,100 annual operations (60%), medium cabin jets (FAA Category C) conduct 550 annual operations (30%), and the large cabin jets (FAA Category D) conduct 190 annual operations (10%). The large-cabin business jets operating at YKM include the Gulfstream 400/500 Series and Bombardier Global Express Series. The transition towards more traffic by medium and large business jets at YKM is evidence of business jet utilization and manufacturing production (GAMA Annual Factbook).
4. YKM is a designated alternate airport for diverted SEA flights. On average, 2 to 3 flights a month divert to YKM due to poor weather or traffic flow conditions; or about 72 annual operations. Diversions include twin narrowbody transport jets such as the Boeing 737 700/800 Series (FAA Category C). These irregular operations at YKM are expected to continue as SEA becomes more congested.
5. YKM is used by Boeing Corporation for flight tests of transport-manufactured aircraft; including the B-737, B-767, B-777 and B-747 Series. On average, 2 to 6 Boeing flights per month use YKM; or about 144 annual operations. The Boeing activity is expected to increase at YKM, particularly with expanding Boeing B-737 MAX aircraft production levels.

Table 3-12 is a summary breakdown of annual operations by FAA aircraft category. This fleet mix forecast shows the future FAA critical aircraft category will continue to remain an AAC C and a ADG III; or a C-III Airport Reference Code.

Table 3-12: Forecast of Operations by Aircraft Type and FAA Category

FAA Aircraft Category	2018 Operations	2017/2018 % Operations	2040 Operations	2040 % Operations	Critical Aircraft Group
Total	**39,444**	**100.0%**	**48,557**	**100.0%**	
AAC A	23,470	59.6%	27,810	55.8%	
AAC B	8,380	21.3%	10,990	22.0%	
AAC C	**3,280**	**8.3%**	**5,800**	**11.6%**	**Existing /Future**
AAC D	300	0.8%	410	0.8%	
Helicopter	3,940	10.0%	4,850	9.7%	
ADG I	23,470	59.6%	27,810	55.8%	
ADG II	9,020	22.9%	11,920	23.9%	
ADG III	**2,860**	**7.3%**	**5,200**	**10.4%**	**Existing/Future**
ADG IV	80	0.2%	90	0.2%	
Helicopter	3,940	10.0%	4,850	9.7%	

Note: Totals subject to rounding. Bold denotes AAC and ADG Critical Aircraft classification.
Table Activity Sources: YKM Airport activity for ARC/RDC was documented from 1) interview with YKM Air Traffic Control Tower, 2) YKM Airport Staff interviews with key YKM tenants, 3) FAA OPSNET, 4) YKM ATC monthly operational reporting records, 5) FAA TFMSC data.
Source: Consultant Forecast Projection, December 2018.

3.9 AIRPORT CRITICAL AIRCRAFT FORECAST

This section describes the YKM critical aircraft forecast, as derived from the operational fleet mix forecast. The critical aircraft classification is assigned to each runway based on aircraft physical and performance characteristics to determine the applicable FAA standards to plan safe and efficient airport facilities. The critical aircraft is defined as that type (or combination of types) that regularly use, or are expected to use the airport. Regular use is defined as 500 or more annual operations. Below are the critical aircraft classifications as defined by FAA Advisory Circular 150/5300-13 *Airport Design:*

AAC: Aircraft Approach Category: alphabetic letter designating approach speed (knots).
ADG: Airplane Design Group: a roman numeral designating wingspan and tail height (feet).
TDG: Taxiway Design Group: number and alphabetic letter designating wheel configuration.

3.9.1 Runway Critical Aircraft Forecast

The following section describes the critical aircraft forecast for the Airport, Runway 9/27 (primary runway designation), and Runway 4/22 (crosswind, secondary, or additional runway designation).

The critical aircraft is the most demanding combination of similar aircraft conducting 500 regular-use annual operations, in reference to FAA aircraft classifications used for the Airport Reference Code (ARC) and Runway Design Code (RDC). The critical aircraft for primary runway also serves as the Airport's critical aircraft.

3.9.2 Primary Runway 9/27 Critical Aircraft Forecast

The following is the AAC and ADG critical aircraft determination for the primary runway based on existing and future activity levels, and other YKM unique factors. Figure 3-4 shows the critical aircraft characteristics.

AAC Determination: There were 3,186 total operations (3,024 civilian) by AAC C aircraft in 2017/2018; that number is projected to reach 5,825 total operations (5,525 civilian) in 2040. This exceeds the FAA regular use threshold; therefore, the AAC 'C' is justified.

ADG Determination: There were 2,828 total operations (2,666 civilian) by ADG III aircraft in 2017/2018; that number is projected to reach 5,770 total operations (5,070 civilian) by 2040. This exceeds the FAA regular use threshold; therefore, the AAC 'III' is justified.

Existing Critical Aircraft: The existing critical aircraft is the Bombardier Q400, which is a twin-turboprop transport aircraft currently operated by Alaska Airlines/Horizon Air. The Q400 conducts 2,500 operations annually on Runway 9/27. The Bombardier Q400 has a FAA ARC C-III and TDG-5 classification (Q400 operated with Category C approach speed in mountainous areas). Other similar aircraft frequently operating on the primary runway include:

- Boeing 737 Series (Scheduled Charter Flights, Manufacturer Flight Testing, Diversions)
- MD-80 Series (Scheduled Charter Flights, Diversions)
- Large Business Jets (Gulfstream G-400/500/600 and Bombardier Global Models)
- P-3 Orion and C-130 Hercules (Military Training)

Future Critical Aircraft: The future critical aircraft is a narrowbody jet aircraft, representative of the Embraer EMB 170/175 transport regional jet, with a FAA ARC C-III and TDG-2 classification. According to Alaska Airlines, the EMB 170/175 is a likely replacement for the Q400. Based on conversations with Alaska Airlines Fleet Management Department, the Q400 is being phased-out on the longer-distance routes and is anticipated to be retired from the fleet between 2025 and 2030, with no replacement turboprops identified. Although there are high-density and stretched versions of the Q400 being considered by the aircraft manufacturer, Alaska Airlines has not announced interest in new versions of the Q400. Depending on the Alaska Airlines regional airline affiliate, which is currently Horizon Air and SkyWest Airlines, the EMB 175 and Mitsubishi MRJ 70/90 would likely be the replacement jet for the Q400, phased-in on the

higher-capacity YKM flights. Other similar regional jets include the CRJ 700/900/1000, EMB E-Jet, Airbus 220, Comac C919. The EMB 175 and MRJ 70/90 have similar dimensional and seating-capacity to the Q400, but are heavier and have more demanding performance and ground maneuvering/turning requirements. The EMB 175 was selected as the future critical aircraft because it is already in the Alaska Airlines/SkyWest fleet.

In addition, commercial, general aviation, and military aircraft larger and more demanding than the Q400 and EMB 175 operate at YKM, but are not forecast to conduct more than 500 operations per year. The Boeing-737 Series, with combined charter service, Boeing test flights, and SEA diversions, is forecast to operate at YKM between 250 and 300 operations per year.

For future planning purposes, the Airport's FAA design standards should accommodate aircraft with an AAC approach speed less than 141 knots, an ADG aircraft wingspan up to 117 feet, and a tail height up to 44 feet.

Figure 3-4: Runway 9/27 Critical Aircraft (Existing and Future)

Existing Critical Aircraft

Aircraft Design Characteristics:	
Aircraft Type:	Turboprop Transport
FAA ARC/TDG:	C-III; TDG 5
Approach Speed:	129 Knots
Wingspan:	93'
Length:	107'8"
Tailheight:	27.4'
Maximum Weight:	65,200 Pounds
Seating Configuration:	70 to 76 Passengers
Cockpit to Main Gear (CMG)	45.8'
Wheelbase	45.8'
Main Gear Width (MGW)	33.2'

Future Critical Aircraft

Aircraft Design Characteristics:	
Aircraft Type:	Regional Jet Transport
FAA ARC/TDG:	C-III; TDG 2
Approach Speed:	138 Knots
Wingspan:	85'
Length:	103'9"
Tailheight:	31.9'
Maximum Weight:	82,700 Pounds
Seating Configuration:	77 to 88 Passengers
Cockpit to Main Gear (CMG)	42.0'
Wheelbase	37.5'
Main Gear Width (MGW)	17.0'

Source: Consultant Forecast Projection, December 2018.

3.9.3 Runway 4/22 Critical Aircraft Forecast

The following is the AAC and ADG critical aircraft determination for Runway 4/22 based on existing and future activity levels.

AAC Determination: There were 1,200 total operations (1,200 civilian) by AAC B aircraft in 2018; that number is projected to reach 1,600 total operations (1,600 civilian) in 2040. This exceeds the FAA regular use threshold; therefore, the AAC 'B' is justified.

ADG Determination: There were 650 total operations (650 civilian) by ADG II aircraft in 2018; that number is projected to reach 900 total operations (900 civilian) by 2040. This exceeds the FAA regular use threshold; therefore, the AAC 'II' is justified.

Existing Critical Aircraft: The existing critical aircraft is represented by the Embraer 120 Brasilia (EMB-120), which is a twin-turboprop currently used for air cargo at YKM, and similar to other single and twin-turboprops used for commercial flights. The EMB-120 and similar turboprop aircraft conduct an estimated 600 operations annually on Runway 4/22. The EMB-120 has a FAA ARC B-II and TDG-2 classification. The turbine (turboprop and business jet) aircraft frequently operating on Runway 4/22 include:

- Embraer 120 Brasilia (air cargo twin-turboprop)
- ATR 42 (air cargo twin-turboprop)
- Cessna Caravan 208 Series (air cargo single-turboprop)
- Pilatus PC-12 (charter and air medical evacuation single-turboprop)
- Swearingen Metro SW3/SW4 (air cargo twin-turboprop)
- Beechcraft 99 (air cargo twin-turboprop)
- King Air 90/100/200/300 Series (charter and business pressurized twin-turboprop)
- Light/small/medium cabin business jets – based and itinerant
- ST-2 (US Forest Service aerial firefighting single-turboprop)

Future Critical Aircraft: The future Runway 4/22 critical aircraft is a twin turboprop with a FAA ARC B-II and TDG-2 classification. The critical aircraft is represented by the Beechcraft King Air 200/300/1900 Series, which is a large twin-turboprop aircraft (aircraft over 12,500 pounds maximum takeoff weight) currently based at YKM and operates on Runway 4/22 for commercial and business/corporate purposes, including scheduled air cargo, on-demand medical air lift. Figure 3-5 shows the Runway 4/22 critical aircraft characteristics.

Figure 3-5: Runway 4/22 Critical Aircraft (Existing and Future)

Existing Critical Aircraft

Aircraft Design Characteristics:	
Aircraft:	Embraer Brasilia 120
Aircraft Type:	Twin Engine Turboprop
FAA ARC/TDG:	B-II; TDG 2
Approach Speed:	113 Knots
Wingspan:	65'
Length:	66'
Tailheight:	22'
Maximum Weight:	26,400 Pounds
Seating Configuration:	2 Crew + 10± Passengers
Cockpit to Main Gear (CMG)	22'
Wheelbase	23'
Main Gear Width (MGW)	23'

Note: Aircraft dimensions and performances vary per model configuration.

Future Critical Aircraft

Aircraft Design Characteristics:	
Aircraft:	Beechcraft King Air 350/1900
Aircraft Type:	Twin Engine Turboprop
FAA ARC/TDG:	B-II; TDG 2
Approach Speed:	113 Knots
Wingspan:	58'
Length:	57'
Tailheight:	16'
Maximum Weight:	17,200 Pounds
Seating Configuration:	2 Crew + 10± Passengers
Cockpit to Main Gear (CMG)	16'
Wheelbase	24'
Main Gear Width (MGW)	17'

Note: Aircraft dimensions and performances vary per model configuration.

Source: Consultant Forecast Projection, December 2018.

3.10 FORECAST OF BASED AIRCRAFT

The based aircraft forecast is quantified by total civilian aircraft stored at YKM as part of a lease or parking rental-term agreement. The forecast includes total based aircraft by aircraft type (piston, turboprop, jet, helicopter) and engine number (single, twin). The forecast directly influences the planning of airside and terminal area facilities, space allocation, property assets, and access.

3.10.1 Local Factors

The following are forecast factors for based aircraft:

- YKM hangar-waiting list exceeds hangar availability (FBO hangar waiting list is proprietary). Tenants are seeking new hangars for all aircraft types, including piston, turboprop, and business jets.

- Airport tenants will drive new and additional based aircraft. YKM tenants involved with providing pilot/aircraft services and charter flights will continue to rely on higher performance aircraft and upgrade new technologies, a trend already evident with recent aircraft acquisitions and upgrades. Sport aviation will grow and potentially evolve further, particularly with CubCrafters building approximately 50 sport aircraft per year at YKM, and generating activity related to pilot training/proficiency, repairs, and support services.
- Airport is pursuing redevelopment and expansion of the southside hangar/FBO area. The proposed expansion concept would add 7 hangars and an estimated 5 to 15 additional based aircraft.
- The Seattle/Puget Sound Region airports are experiencing operational and land development constraints, which could cause spillover to the YKM as people seek options to operate at less crowded facilities, lower rents (hangars), and better flying weather. This is a trend already evident at YKM.
- Aging based aircraft, particularly the two to four-seat piston aircraft, will likely continue relocation and/or attrition as the result of aircraft sales, regulatory requirements, and operating costs.

3.10.2 Forecast of Based Aircraft

The based aircraft forecast are total civilian aircraft stored at YKM as part of a lease or parking rental-term agreement. The Airport reported 131 total based aircraft in 2018; comprised of 107 single-engine piston (82%), 8 multi-engine (6%), 7 turboprops (5%), 6 business jets (5%), and 3 helicopters (2%). The forecast includes total based aircraft by aircraft type (piston, turboprop, jet, helicopter) and engine number (single, twin). The forecast directly influences the planning of landside facilities, space allocation, property assets, and access. Historical records of the number of aircraft based at YKM since 2000 were examined as part of this master plan.

- **FAA Terminal Area Forecast (FAA TAF):** Total 20-year based aircraft increase from 132 in 2020 to 175 in 2040 (2.2 annual average), a 32 percent overall growth and a 1.4 percent annual growth rate. When indexed to the actual 132 based aircraft in 2018, the adjusted FAA TAF results in 178 based aircraft by 2038.
- **Low Scenario:** This forecast approach uses the FAA 20-year fleet growth rates applied to separate aircraft categories (single piston, multi piston, turboprop, jet, helicopter, other) as derived from the *FAA Aerospace Forecasts* (Table 28). The annual growth rates are: -1.0 percent for single engine piston, -0.4 percent for multi-engine piston, 1.7 percent for single turboprop, 1.7 percent for multi turboprop, 2.2 percent for light/small cabin business jets, 2.2 percent for medium/large cabin business jets, 1.5 percent for helicopters, and 1.1 percent for other aircraft. In addition, aircraft production rates published by the General

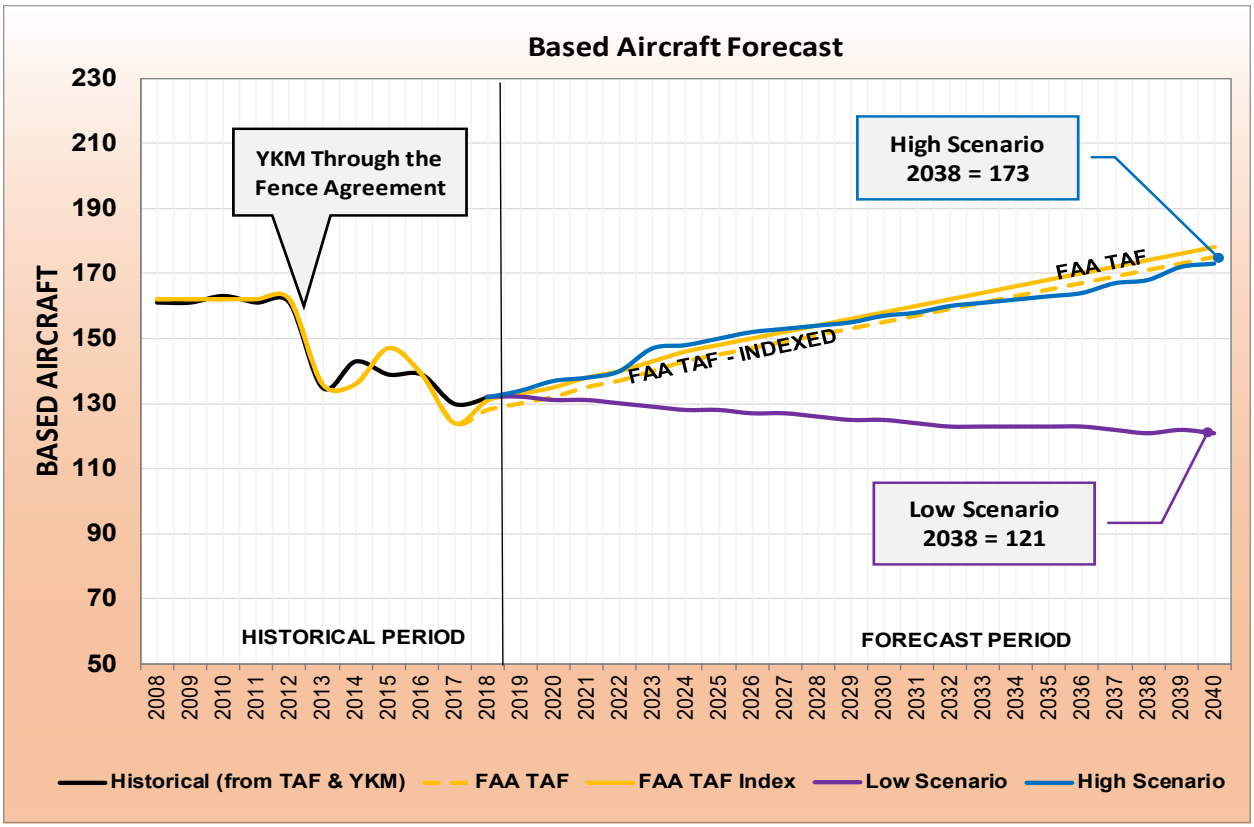
Aviation Manufacturing Association (GAMA) were reviewed to provide an understanding of delivery trends for specific fixed-wing and helicopter aircraft models.

- **High Scenario:** This forecast approach uses the Washington Office of Financial Management (OFM) medium growth rate to project future based aircraft. This forecast assumes the construction of additional hangars being planned for the next two to five years. This forecast approach assumes that influences at YKM will be positive for based aircraft. In addition, aircraft production rates published by the General Aviation Manufacturing Association (GAMA) were reviewed to provide an understanding of delivery trends for specific fixed-wing and helicopter aircraft models. Accordingly, this scenario reflects the following YKM forecast factors:

- **Preferred Forecast Summary and Reasonableness (High Scenario):** The high forecast scenario more closely aligns with the YKM forecast factors and hangar construction demand. In addition, the high forecast scenario is consistent with a growing Yakima region and economy. The high forecast scenario does not exceed the FAA TAF.

Figure 3-6 and Table 3-13 summarizes the preferred based aircraft forecast scenarios.

Figure 3-6: Based Aircraft Trend and Forecast Scenarios



Source: Consultant Forecast Projection Exhibit, December 2018.

Table 3-13: Forecasts for Total Based Aircraft

Year	2015 Preferred (Average)	FAA TAF	FAA TAF (Indexed to 2018)	Low Scenario	High Scenario (Preferred)
2018	175	128	131	131	131
2020	185	132	135	131	137
2025	196	145	148	128	150
2030	208	155	158	125	157
2035	N/A	165	168	123	163
2040	N/A	175	178	121	173
Total	--	43	43	-10	36
Annual	--	2.2	2.2	-0.5	1.8
% Total	--	32.6%	31.9%	-7.6%	26.3%
% Annual	--	1.42%	1.39%	-0.40%	1.17%

Note: FAA TAF published in February 2019. | Note: TAF indexed to actual 2018 based aircraft reported by the Airport.
Source: Consultant Forecast Projection, December 2018.

3.10.3 Based Aircraft Fleet Mix

The following is a forecast of the based aircraft mix type category and FAA classification. The FAA classifies aircraft operations by single-engine piston, multi-engine, jet (includes jets and turboprops), helicopter, and other (includes experimental and light sport aircraft weighing less than 1,300 pounds). The following defines the aircraft fleet mix categories:

- **Single-Engine/Piston (SE)**: Includes single-engine piston, piston light sport aircraft (LSA) weighing more than 1,300 pounds, and single-engine turboprop.
- **Multi-Engine/Piston (ME)**: includes multi-engine piston and multi-engine turboprop aircraft; excludes business jets.
- **Jet:** Includes business/corporate jet aircraft and very light jets (VLJ).
- **Rotor:** Includes piston and turbine-powered helicopters.

It is expected that this fleet will evolve based on changes in the aircraft manufacturing, delivery, and use trends being experienced nationally. Naturally the fleet will continue to be dominated by small private aircraft used as personal or business aircraft. However, the increasing reliance on jet aircraft by the corporate sector in general will be felt in Yakima as the population and economy continues to evolve. The recommended YKM fleet mix forecast for the benchmark years is presented in Table 3-14 below.

Table 3-14: Based Aircraft Fleet Mix Forecast

Year	Single Engine Piston		Multi Engine Piston		Turbine (Turboprop+Jet)		Rotor		Total	
	%	No.	%	No.	%	No.	%	No.	%	No.
2018	81.7%	107	6.1%	8	9.9%	13	2.3%	3	100%	**131**
2020	81.7%	112	6.1%	8	9.9%	14	2.3%	3	100%	**137**
2025	81.7%	123	6.1%	9	9.9%	15	2.3%	3	100%	**150**
2030	81.7%	128	6.1%	10	9.9%	16	2.3%	4	100%	**157**
2035	81.7%	133	6.1%	10	9.9%	16	2.3%	4	100%	**163**
2040	81.7%	141	6.1%	11	9.9%	17	2.3%	4	100%	**173**

Source: Consultant Forecast Projection, December 2018.

3.11 FAA TAF FORECAST COMPARISON

The YKM Master Plan forecasts are used to evaluate the type, size, and location of capital improvements. This serves as the basis for Plan decision-making and recommendations, used to analyze facility requirements, to assess alternatives, and to prioritize project improvements.

Forecast of FAA Planning Activity Levels

The preferred forecasts project anticipated demand levels. Based on various circumstances, certain aspects of forecast demand may deviate from the projected timeline or may not materialize as planned. Therefore, because actual year-to-year activity can deviate from forecast projections, the YKM should monitor the relationship between forecast demand and actual activity levels. As recommended by FAA Advisory Circular 150/5070-6B, the Airport should track planning activity levels, rather than specific years, to guide the thresholds for triggering Airport project improvements. This approach considers constrained and unconstrained forecasts, as a matter of reviewing the operational factors and events implicit in the forecast to determine if differing assumptions regarding those factors have affected the forecast results.

FAA Terminal Area Forecasts (TAF) Consistency

The FAA reviews and approves Master Plan forecasts. Table 3-15 summarizes and compares the preferred 20-year Master Plan forecasts with the currently approved FAA TAF (dated February 2019), in terms of consistency with FAA forecast tolerances. The Master Plan forecasts are considered consistent with the TAF if the forecasts differ by less than 10 percent in the five-year forecast period, and 15 percent in the 10-year forecast period. The FAA bases primary

considerations in forecast review and approval on forecasts using reasonable planning assumptions, current data, and appropriate forecast methods.

The Master Plan forecasts, once approved by the FAA, are commonly accepted as the future FAA TAF forecast, and later used for environmental and financial planning purposes. The forecasts require review and approval by the FAA, as conducted per *FAA Review and Approval of Aviation Forecasts* dated June 2008.

Table 3-15A: FAA TAF Forecast Comparison

Year	Master Plan (Preferred Forecast)	FAA TAF	FAA TAF Indexed	Airport/TAF (Difference)	Airport/TAF % Difference (2018 TAF)
Enplaned Passengers (FAA Boardings)					
2018	73,342	70,736	--	2,606	**3.7%**
2020	74,800	72,902	--	1,898	**2.6%**
2025	81,600	78,616	--	2,984	**3.8%**
2030	87,200	84,787	--	2,413	**2.8%**
2035	91,800	91,451	--	349	**0.4%**
2040	92,600	98,649	--	-6,049	**-6.1%**
Total Annual Airport Operations					
2018	39,440	37,136	--	2,304	**6.2%**
2020	40,470	37,171	--	3,299	**8.9%**
2025	42,450	38,115	--	4,335	**11.4%**
2030	44,420	39,088	--	5,332	**13.6%**
2035	46,490	40,097	--	6,393	**15.9%**
2040	48,570	41,137	--	7,433	**18.1%**
Total Based Aircraft					
2018	131	128	131	3	**2.3%**
2020	137	132	135	5	**3.8%**
2025	150	145	148	5	**3.4%**
2030	157	155	158	2	**1.3%**
2035	163	165	168	-2	**-1.2%**
2040	173	175	178	-2	**-1.1%**

Note: FAA TAF published in February 2019. | Note: Red Text notes forecast beyond FAA TAF tolerances.
Source: Consultant Forecast Projection, December 2018.

3.12 FORECAST SUMMARY

The following summarizes the YKM Master Plan forecasts:

- YKM forecast components increase about one to two percent annually throughout the 20-year forecast period; consistent with the YKM FAA Terminal Area Forecasts and the FAA *Aerospace Forecasts*.

- The Runway 9/27 critical aircraft to remain a FAA C-III Category; critical aircraft expected to transition from a turboprop to a regional jet beyond 2030.

- The Runway 4/22 critical aircraft is a FAA B-II Category; based on activity levels, the critical aircraft is a twin-turboprop used for commercial air cargo, medical emergency, and general aviation business charter flights.