MADRAS MUNICIPAL AIRPORT
AIRPORT MASTER PLAN

This chapter is a preliminary working draft prepared for review by City of Madras staff and the Airport Master Plan Update - Planning Advisory Committee (PAC). The chapter will be submitted to the Federal Aviation Administration (FAA) and the Oregon Department of Aviation (ODA) for formal review after local review is completed, and is therefore, subject to change.

Chapter 3

Aviation Activity Forecasts

COVID-19 IMPACTS ON AVIATION ACTIVITY FORECASTS

This forecast was prepared during the first full year of the COVID-19 pandemic. The disruption of airport activity experienced throughout the U.S. airport system related to COVID-19 in 2020 is unprecedented and has led to a significant decline in activity that is not consistent with recent historic trends. Although the limits of the current disruption have yet to be defined, it is believed that the underlying elements of demand within general aviation will remain largely intact until all public health constraints are fully addressed and economic conditions gradually return to normal.

Two notable conditions are defined in these forecasts:

1. 2019 activity is used as the base for the updated twenty-year aviation activity forecast. 2019 represents a reasonable "pre-COVID" indication of current conditions and it was the last full calendar year of activity available at the time the forecasts were prepared. To simplify the projection, the 2019 data was carried forward to 2020, representing base year activity in the 2020-2040 master plan forecast window. The twenty year forecasts are provided in five-year increments beginning in 2025.

2. The forecasts assume that current COVID-19 impacts on aviation activity at Madras Municipal Airport will not affect the 2025 forecast, or beyond.

Federal Aviation Administration (FAA) forecast approval will be based in reference to the data and methodologies used and the conclusions at the time the document was prepared. However, consideration must still be given to the significant impacts of COVID-19 on aviation activity. As a result, there is lower than normal confidence in future growth projections.

FAA approval of the forecast does not provide justification to begin airport development. Justification for future projects will be made based on activity levels at the time the project is requested for development, rather than this forecast approval. Further documentation of actual activity levels reaching the planning activity levels will be needed prior to FAA participation in funding for eligible projects.

Introduction – Key Takeaways

The evaluation of current and future activity at Madras Municipal Airport has documented several important takeaways that are critical in understanding the unique composition of the Airport's air traffic and the significant changes that have occurred since the last master plan was completed in 2010.

The current activity and updated activity forecasts for Madras Municipal Airport documented in this chapter are significantly higher than any existing data or forecasts, including the previous airport master plan, the Oregon Aviation Plan v6.0 forecasts, the current FAA Terminal Area Forecast (TAF), and the current FAA 5010-1 Airport Record Form. The major change in activity experienced at the Airport over the last ten years reflects several key events that coincided with a focused effort by the City of Madras to actively seek and accommodate new airport users.

Recent significant events at Madras Municipal Airport include:

- The relocation/development of the Erickson Aero Tanker maintenance base added ten transport category aircraft (Airplane Design Group III and IV) and their associated aircraft operations to the Airport's current baseline activity.
- The addition of the Erickson Aircraft Collection museum increased the Airport's active based aircraft count by 25 aircraft, generating more than 500 annual operations by a wide range of aircraft types.
- USDA-FS coordinated wildfire aircraft assets and support crews are regularly dispatched to the Airport for several weeks during Oregon's fire season. The majority of activity is generated by Type I-III helicopters and fixed-wing support aircraft. This activity accounted for about 4 percent of the estimated Airport operations in 2019, but the volume of flight activity is subject to fire demands and could increase/decrease in any given year.
- Multiple large flight schools based at other nearby airports dispatch an average of 20 to 25 aircraft per day to Madras Municipal Airport for a variety of fixed-wing and helicopter flight training. Transient flight school aircraft accounted for more than 44 percent of the estimated Airport operations in 2019.
- Skydive Awesome!, a locally-based skydiving operator, operates one aircraft seasonally with an average of 6 to 12 flights per day on active jump days, accounting for more than 4 percent of the estimated Airport operations in 2019.

Introduction - Overview

This chapter provides updated aviation activity forecasts for Madras Municipal Airport (S33) for the twenty-year master plan horizon (2020-2040). The most recent Federal Aviation Administration (FAA) approved aviation activity forecasts for Madras Municipal Airport were developed in the 2010 Airport Master Plan.

The forecasts presented in this chapter are consistent with the current and historic role as a local general aviation airport. The forecasts are unconstrained and assume the City of Madras (City) will be able to make the facility improvements necessary to accommodate the anticipated demand unless specifically noted. The City will consider if any unconstrained demand will not or cannot be reasonably met through the evaluation of airport development alternatives later in the master plan.

Madras Municipal Airport is capable of accommodating a full range of general aviation activity, including business class turboprops, business jets and helicopters. The Airport also accommodates significant transport category aircraft activity associated aerial firefighting. This level of capability expands the Airport's role beyond local community and accommodates users throughout the region. Madras Municipal Airport is designated a **Category IV – Local General Aviation** airport in the 2019 Oregon Aviation Plan (OAP v6.0). The definition for Category IV airports is: *"These airports support primarily single-engine general aviation aircraft but are capable of accommodating smaller twin-engine general aviation aircraft. These airports support local air transportation needs and special-use aviation activities."*

In the federal airport system National Plan of Integrated Airport Systems (NPIAS), Madras Municipal Airport is classified as a **"Local" Nonprimary General Aviation** airport. The system role of Local airports is defined as follows: *"Supplement local communities by providing access to markets within a State or immediate region. Local airports are most often located near larger population centers, but not necessarily in metropolitan or micropolitan areas. Most of the flying at local airports is by piston aircraft in support of business and personal needs. These airports typically accommodate flight training, emergency services, and charter passenger service."*

FAA Forecasting Process

The FAA provides aviation activity forecasting guidance for airport master planning projects. FAA Advisory Circular (AC) 150/5070-6B, Airport Master Plans, outlines seven standard steps involved in the forecast process:

1. Identify Aviation Activity Measures: The level and type of aviation activities likely to impact facility needs. For general aviation, this typically includes based aircraft and operations.
2. Previous Airport Forecasts: May include the FAA Terminal Area Forecast (TAF), state or regional system plans, and previous master plans.
3. Gather Data: Determine what data are required to prepare the forecasts, identify data sources, and collect historical and forecast data.
4. Select Forecast Methods: There are several appropriate methodologies and techniques available, including regression analysis, trend analysis, market share or ratio analysis, exponential smoothing, econometric modeling, comparison with other airports, survey techniques, cohort analysis, choice and distribution models, range projections, and professional judgment.
5. Apply Forecast Methods and Evaluate Results: Prepare the actual forecasts and evaluate for reasonableness.
6. Summarize and Document Results: Provide supporting text and tables as necessary.
7. Compare Forecast Results with FAA's TAF: Follow guidance in FAA Order 5090.5, Field Formulation of the National Plan of Integrated Airport Systems and Airport Capital Improvement Program. In part, the Order indicates that forecasts should not vary significantly (more than 10 percent) from the TAF. When there is a greater than 10 percent variance, supporting documentation should be supplied to the FAA. The aviation demand forecasts are then submitted to the FAA for their approval.

KEY ACTIVITY ELEMENTS

As noted above, general aviation airport activity forecasting focuses on two key activity segments: based aircraft and aircraft operations (takeoffs & landings). Detailed breakdowns of these activity segments include:

- Aircraft fleet mix;
- Peak activity;
- Distribution of local and itinerant operations; and
- Determination of the critical aircraft (also referred to as the design aircraft).

The critical aircraft represents the most demanding aircraft type or family of aircraft that uses an airport on a regular basis (a minimum of 500 annual takeoffs & landings per year). The critical aircraft is used to establish a variety of FAA design categories, which then establish design standards for airfield facilities. FAA airport design standard groupings reflect the physical requirements of specific aircraft types and sizes. Design items, such as runway length evaluations, are determined by the requirements of current/future critical aircraft. The activity forecasts also support the evaluation of several demand-based facility requirements including runway and taxiway capacity, aircraft parking, and hangar capacity.

Population and Economic Conditions

Historically, downturns in general aviation activity often occur during periods of weak economic conditions while growth typically coincides with favorable economic conditions. The historic depth of the 2008 Great Recession dramatically impacted local communities and rippled throughout general aviation. However, the 10-year period of sustained economic growth leading into 2020 significantly improved conditions favorable to general aviation.

The FAA's current long-term Aerospace Forecast, Fiscal Years 2020-2040 was released in 2019. The forecast reflects overall strength in both the U.S. and regional economies and sustained, modest growth in aviation activity over the long-term. The FAA Aerospace Forecast has not yet been updated to reflect COVID-19. It is anticipated that the FAA's 2021-2041 forecast will reflect areas of depressed general aviation activity in the near term. It is reasonable to assume that general aviation will return to pre-COVID activity levels later in the forecast period, before resuming previously-forecast growth. It appears that long-term growth in general aviation, although positive, may be tempered by the impacts of COVID-19 for the foreseeable future..

POPULATION

The population within an airport's service area, in broad terms, affects the type and scale of aviation facilities and services that can be supported. Changes in population often reflect broader economic conditions that may also affect airport activity. The service area for Madras Municipal Airport extends beyond the local community of Madras and includes greater Jefferson County, consistent with the Airport's status as the only NPIAS airport in Jefferson County. While the Madras Urban Growth Boundary (UGB) area represents about 27 percent of county population, it is apparent that the Airport is also affected by county-wide population. For the purpose of forecasting aviation activity, an evaluation of both Jefferson County and City of Madras population trends provides the best indication of future trends directly affecting the Airport.

2010-2019

Jefferson County's population grew by about 9.8 percent (net gain of 1,840 residents) since the 2010 Census. Annual population growth between 2010 and 2019 (1.04% average annual growth rate (AAGR)) trailed the statewide population growth (1.12% AAGR). During this period, Madras grew by 5.5% overall (net gain of 299 residents), trailing county-wide growth with average annual growth of 0.60 percent. Recent historic population data and average growth rates for Jefferson County, its incorporated cities, unincorporated areas, and Oregon are summarized in **Table 3-1.**

TABLE 3-1: JEFFERSON COUNTY POPULATION SUMMARY (HISTORIC)

	AAGR[1]	2010	2015	2016	2017	2018	2019
Oregon	1.12%	3,831,074	4,013,845	4,076,350	4,141,100	4,195,300	4,236,400
Jefferson County	1.04%	21,720	22,445	22,790	23,190	23,560	23,840
Madras UGB	0.60%	6,046	6,265	6,275	6,300	6,345	6,380
Culver UGB	1.56%	1,357	1,395	1,410	1,420	1,480	1,560
Metolius UGB	1.68%	710	710	740	740	740	825
Unincorporated (Outside UGBs)	1.15%	13,607	14,075	14,365	14,730	14,995	15,075

Source: U.S. Census Bureau (2010), PSU Population Research Center (2015-2019) 1. AAGR 2010-2019
[1]Portland State University Population Research Center (PSRC), U.S. Census 2010, 2000

The Population Research Center at Portland State University (PRC-PSU) prepares long-term population forecasts for the state of Oregon, counties, and cities. The current PSU Coordinated Population Forecast for Jefferson County, its established Urban Growth Boundaries (UGB) for incorporated cities, and the area outside UGBs (2015-2065) was published in June, 2015. The forecast uses a 2010 base year and provides projections from 2015 to 2065 with time points at 5-year intervals starting in 2015. The 2040 projection coincides with the end of the current airport master planning period (2020-2040) and provides relevant information about long term expectations for the population of the Madras UGB and the rest of Jefferson County.

The long term forecast projects an increase in Jefferson County population (27.0% overall through 2040; AAGR 0.96%), with the strongest growth forecast in the Madras and Culver UGBs (38 percent and 54 percent growth respectively; 1.3 and 1.75 percent average annual growth. The forecast is summarized below:

> "Total population in Jefferson County as a whole as well as within its sub-areas will likely grow at a slightly faster pace in the first 20 years of the forecast period (2015 to 2035) relative to the last 30 years [original figure reference]. The tapering of growth rates is largely driven by an aging population—a demographic trend which is expected to lead to declining natural increase (births minus deaths). As natural increase declines population growth will become increasingly reliant on net in-migration.
>
> Even so, Jefferson County's total population is forecast to increase by more than 5,100 over the next 20 years (2015-2035) and by nearly 11,000 over the entire 50-year forecast period (2015-2065). The Madras UGB will likely show slightly stronger population growth—relative to the 2000s—in the initial 20 year forecast period, but population growth is expected to slow during the last 30 years. Population within the Culver UGB is expected to grow at a much slower rate—relative to the 2000s—in the initial 20-year forecast period. Population growth in Culver is also expected to taper throughout the last 30 years of the forecast period. The area outside UGBs is forecast to grow at a steadier, although lower rate than the UGBs throughout the forecast period."

POPULATION

The modest forecast in population growth for Madras and Jefferson County will contribute to conditions favorable to sustained growth in employment and aviation activity at Madras Municipal Airport.

The State of Oregon population is forecast to increase at annual rate of approximately 0.92 percent during the same period, reaching an overall population of over 5 million. A detailed summary of the population forecasts for the State, County, UGBs, and the area outside UGBs is presented in **Table 3-2.**

EMPLOYMENT

TABLE 3-2: POPULATION FORECAST SUMMARY

	AAGR[1]	2010	2020	2025	2030	2035	2040
Oregon	0.92%	4,013,845	4,288,000	4,497,000	4,694,000	4,878,000	5,044,000
Jefferson County	0.96%	22,806	24,161	25,669	26,935	27,973	28,961
Madras UGB	1.31%	7,484	8,070	8,700	9,268	9,815	10,356
Culver UGB	1.75%	1,407	1,506	1,731	1,901	2,035	2,171
Metolius UGB	0.93%	724	734	776	824	869	913
Outside UGB Areas	0.65%	13,191	13,850	14,461	14,942	15,254	15,521

Source: Population Research Center, Portland State University, June 2015.
[1]AAGR 2015-2040

State of Oregon Employment Department (OED) data indicates the total employment for Jefferson County in 2019 was 6,942. Average income among all industries was $40,436, compared to the Oregon average of $55,019. Employment counts and average annual wages for Jefferson County are summarized in **Table 3-3.**

Pre-COVID, Jefferson County employment growth by industry sector has remained relatively stable since 2010, as the region came out of the Great Recession. As noted in the 2010 master plan, Central Oregon was particularly hard hit in the recession, with prolonged double-digit unemployment rates impacting all three local counties throughout 2009 and 2010. Seasonally adjusted unemployment in Jefferson County fell steadily from a high of nearly 12 percent in 2009 to the recent low of 3.4 percent in late 2019.

In the period from 2010 t0 2019, nonfarm employment in Jefferson County increased at an average of 1.37% per year, with nearly all employment sectors experiencing growth. The leading employment sectors in Jefferson

TABLE 3-3: JEFFERSON COUNTY EMPLOYMENT & WAGES

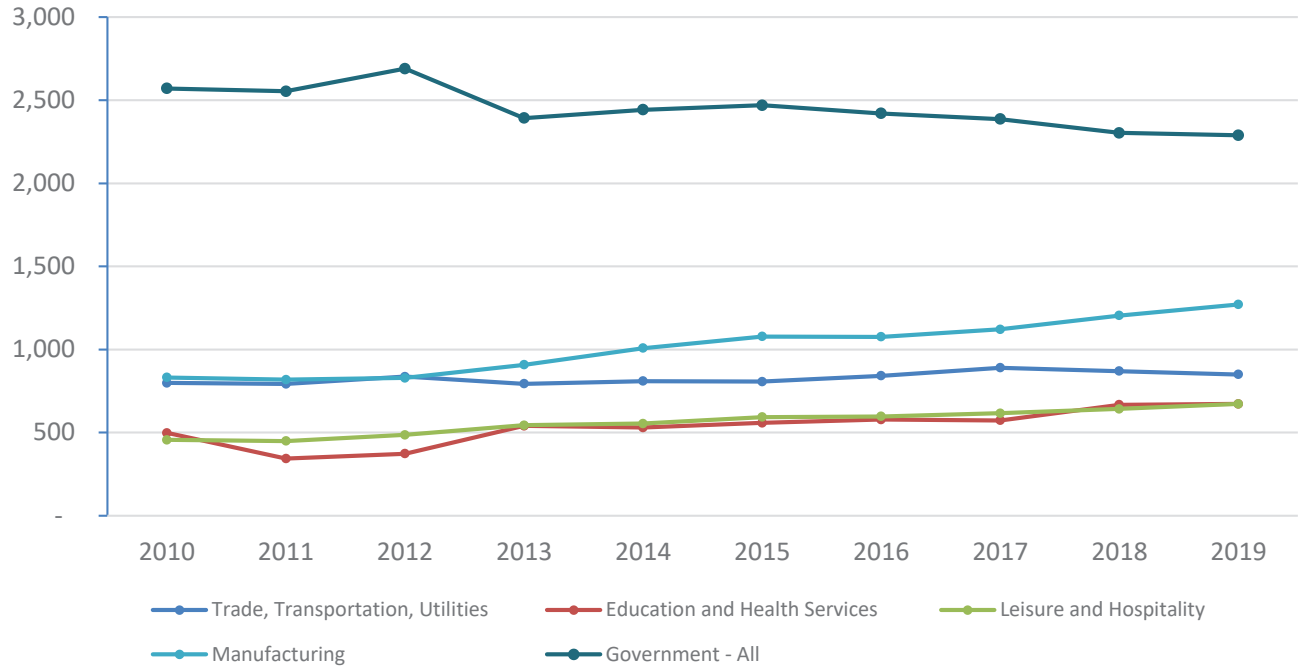
	Employment	Average Wages	
	Jefferson County	Jefferson County	Oregon
2010	6,041	$33,130	$41,669
2011	5,858	$33,220	$43,077
2012	6,179	$33,852	$44,229
2013	6,170	$34,194	$45,008
2014	6,359	$34,949	$46,516
2015	6,630	$35,796	$48,322
2016	6,657	$36,561	$49,467
2017	6,714	$38,002	$51,117
2018	6,939	$39,818	$53,053
2019	6,942	$40,436	$55,019

Source: Oregon Employment Department, QCEW

County are depicted in **Figure 3-1.** The largest net increase in jobs was Manufacturing (+439), followed by Leisure and Hospitality (+217) and Education and Health Services (+175). Government employment declined by about 11 percent (-282 jobs) during this period. Government accounted for 43 percent of total nonfarm employment in 2010, but declined to 33 percent in 2019. Despite this trend, Government still represents the single largest employment sector in the county.

COVID-19 Note: The sharp spike in unemployment in the second quarter of 2020 eased somewhat in the third quarter, pulling back from a high of 14.9 percent to 8 percent in September. The effects of the 2020 economic decline and any subsequent slowing, remain unknown factors that are not yet reflected in OED employment forecasts.

FIGURE 3-1: JEFFERSON COUNTY EMPLOYMENT & WAGES



Source: Oregon Employment Department, QCEW

Currently available OED ten-year forecasts predict that Oregon will see a 9 percent increase in employment between 2019 and 2029. For the three-county region of Crook, Deschutes, and Jefferson, OED projects 12 percent growth over the same period with industry employment expected to increase by 12,560. The projected growth in employment significantly outpaces statewide growth expectations, but it is important to note that each of the three local counties have unique industry compositions which may produce some variation in performance within the overall upward trend. The three-county projected employment numbers are presented in **Figure 3-2.**

FIGURE 3-2: PROJECTED EMPLOYMENT NUMBERS BY INDUSTRY

Industry Employment Forecast, 2019-2029
Crook, Deschutes, and Jefferson Counties

	2019	2029	Change	% Change
Total employment	107,430	119,990	12,560	12%
Total payroll employment	101,280	113,120	11,840	12%
Total private	87,080	97,540	10,460	12%
Natural resources and mining	1,560	1,740	180	12%
Mining and logging	310	270	-40	-13%
Construction	7,240	8,700	1,460	20%
Manufacturing	7,620	8,160	540	7%
Durable goods	5,110	5,400	290	6%
Wood product manufacturing	1,880	1,670	-210	-11%
Nondurable goods	2,510	2,760	250	10%
Trade, transportation, and utilities	17,970	19,180	1,210	7%
Wholesale trade	2,640	3,070	430	16%
Retail trade	12,860	13,320	460	4%
Transportation, warehousing, and utilities	2,470	2,790	320	13%
Information	2,060	2,450	390	19%
Financial activities	5,120	5,280	160	3%
Professional and business services	10,900	12,680	1,780	16%
Private educational and health services	15,570	18,730	3,160	20%
Health care and social assistance	14,460	17,350	2,890	20%
Health care	12,130	14,580	2,450	20%
Leisure and hospitality	15,000	16,080	1,080	7%
Accommodation and food services	12,490	13,350	860	7%
Other services	4,040	4,540	500	12%
Government	14,200	15,580	1,380	10%
Federal government	1,370	1,350	-20	-1%
State government	1,370	1,600	230	17%
Local government	11,460	12,630	1,170	10%
Local education	5,410	6,060	650	12%
Self-employment	6,150	6,870	720	12%

Source: Damon.M.Runberg@oregon.gov, 541-706-0779
Oregon Employment Department, Workforce and Economic Research Division
Published: October 1, 2020

INSTRUMENT FLIGHT ACTIVITY

The FAA tracks flight activity for aircraft operating under instrument flight rules (IFR) in the national airspace system using Traffic Flow Management System Counts (TFMSC). The TFMSC data captures all filed civil aircraft instrument flight plans by originating or destination airports. Military aircraft are not included in the FAA instrument flight plan data.

For non-towered airports such as Madras Municipal Airport, TFMSC data provides the only tabulated operational data specifically attributed to the airport. Although instrument flight plans account for only a small percentage of aircraft operations at most non-towered airports, they often reliably capture the majority of activity generated by turbine business-class aircraft, which operate predominantly on IFR flight plans. At Madras Municipal Airport, this data provides the best indication of business class turbine aircraft activity for the purposes of defining the design aircraft.

TFMSC data for Madras Municipal Airport was obtained and analyzed for 2010-2019. The data is summarized in **Table 3-4** by Airport Reference Code (ARC). See Table 3-10 presented later in this chapter, for information of ARC categories and typical aircraft types.

TABLE 3-4: MADRAS MUNICIPAL AIRPORT INSTRUMENT FLIGHT PLAN DATA

Aircraft Reference Code (ARC)	2010	2015	2016	2017	2018	2019	6-year Average
A-I	128	62	126	172	204	364	176
A-II	16	24	52	58	66	66	47
B-I	38	70	76	114	96	92	81
B-II	42	34	62	60	56	46	50
C-I	16	6	4	6	0	2	6
C-II	0	4	0	8	4	6	4
C-III	4	4	2	8	12	8	7
D-I	0	0	2	0	0	0	<1
D-II	0	0	0	2	0	0	<1
D-III	0	4	2	6	0	0	2
	244	**208**	**326**	**434**	**438**	**584**	**374**

Source: FAA TFMSC

The review of TFMSC data for the Airport provides an effective gauge of business aviation activity, since the majority of these aircraft are operated on instrument flight plans. As noted in Table 3-4, the combined volume of instrument flight plan-generated ADG II or larger aircraft activity currently falls below the FAA's threshold of 500 annual operations required to meet the "Regular Use" definition for critical or design aircraft. Updated projections of aircraft activity by airport reference code and runway design category are provided later in the chapter. This information will be used in the Facility Requirements Chapter to define current and future design standards for the airport.

Current Aviation Activity

Since actual air traffic counts are not available for Madras Municipal Airport, an updated estimate of current aircraft operations (takeoffs and landings) was needed provide a reliable baseline for the updated aviation activity forecasts. The updated activity assessment described in this section reveals significant increases in air traffic that were not anticipated in the last master plan forecasts, and are not reflected in current FAA activity data. The updated activity summary is provided in Figure 3-9, presented later in this section. Quantifying this activity will improve the accuracy of the new master plan forecasts, but will also require updates to existing FAA data sets for the Airport as part of the forecast review and approval process.

For Madras Municipal Airport, an updated based aircraft count was completed by airport management in June 2020. The updated count (97 aircraft) is significantly higher than the current FAA Airport Record Form (5010-1) of 64 aircraft. The updated count of 'validated' based aircraft in the FAA aircraft registry database and is currently being coordinated between the Airport and FAA. Updates to the FAA 5010 and the Terminal Area Forecast (TAF) are also needed for consistency.

A current estimate of aircraft operations was prepared using operator-provided data, the 2020 updated based aircraft count, and standard FAA methodology for estimating air traffic at non-towered airports. Airport records and data provided by individual specialized operators at Madras Municipal Airport (flight training, skydiving, agricultural aircraft/aerial applicator, aerial wildfire response, and Erickson aircraft (Aero Tanker and Collection) was organized to define current aircraft operations levels for each identifiable group of airport users. Interviews with individual operators were conducted to verify current activity levels.

In addition to specialized operator activity, an updated estimate of the activity commonly found at similar size general aviation airports was developed using an FAA-recommended operations per based aircraft (OPBA) formula. Consistent with FAA NPIAS guidance for Local General Aviation airports, the recommended multiplier of 350 OPBA was used. This ratio was applied to the current count of 55 (non-duplicated) based aircraft not included the specialized operator categories noted above.

FLIGHT TRAINING

Madras Municipal Airport accommodates a variety of flight training activities that currently make up more than half of the airport's annual operations. While the Airport has always generated flight training activity, the addition of several new users since the last master plan update has significantly expanded the volume of flight training at the Airport. In addition, based on current estimates, more than 80 percent of flight training activity at the Airport is generated by aircraft based at other airports, with about 20 percent of activity generated by local operators. Additional specialized training for aerial wildfire operations, including heavy-lift helicopters, aerial tankers, and military para-rescue operations are included in the respective operations categories. Current general aviation flight training operations, including fixed wing aircraft and small helicopters are summarized below.

BERG AIR (LOCAL FBO)

Berg Air, the local fixed base operator (FBO), reports that they normally operate four or five single-engine piston aircraft in its flight training/aircraft rental fleet with an average of 8 active students (private, instrument, and commercial). The operator reports an average of 4 to 5 flights per day, 6 days per week, year-round. The flight activity includes pattern work (touch and goes), local area flight training, and itinerant flight training (cross country flights, etc.).

2019 Berg Air Flight Training Activity (S33): 4,960 Annual Operations

Based on a low end estimate of 4 flights per day, and an average of 2 takeoffs and 2 landings per flight, the local flight training activity generates approximately 96 operations per week, and 4,960 operations annually at S33.

HILLSBORO AERO ACADEMY (HAA)

Hillsboro Aero Academy (HAA) is an FAA Part 141 and 61 flight school with a central Oregon base located at Redmond Airport – Roberts Field (RDM), 25 nautical miles south of Madras. HAA originally established its central

Oregon base at Prineville Airport in 2012, but moved to RDM in late 2017 to better accommodate its expanded flight operations. HAA's primary training focus at RDM is supplying pilots for foreign airlines (primarily China and South Korea), with a small amount of domestic pilot training. HAA currently operates a fleet of 30 single-engine and multi-engine piston aircraft at RDM with 100 to 150 active flight students and 30 certified flight instructors (CFI).

An increase in HAA aircraft operating at Madras Municipal Airport was identified during the data collection phase of the master plan as a significant new source of activity. HAA staff were then interviewed to define their current level of flight activity at Madras Municipal Airport:

- An average of 15 to 20 aircraft per day are dispatched to Madras (S33) 7 days per week, year-round;
- The aircraft generate an average of 2 landings per flight, which reflects a variety of flight training requirements. The flight activity includes pattern work (touch and goes), local area flight training, and instrument flight training;
- The current activity split is 75% single-engine piston and 25% multi-engine piston; and
- The majority of flight training is conducted in VFR conditions, day and night.

HAA indicates that the current ratio of students / instructors / aircraft at the RDM base is near optimal in efficiency and there are no current plans to expand operations. Apron capacity at RDM is also cited as factor limiting near term growth in HAA's fleet.

2019 HAA Flight Training Activity (S33): 21,840 Annual Operations

Based on an average of 15 flights per day, with 2 takeoffs and 2 landings per flight, the flight training activity generates approximately 60 operations per day, 420 operations per week, and 21,840 operations annually at S33.

The impact of HAA's flight training operations on an individual airport may be best illustrated in the FAA air traffic control tower counts for RDM.[1] General Aviation local and itinerant aircraft operations at RDM increased by 151 percent between 2017 and 2019, the first two years of HAA's relocation to RDM. This growth coincided with, but significantly outpaced an increase in overall airport operations (+97%) during the two-year period.

The introduction of HAA flight training activity at Madras Municipal Airport in the last several years illustrates a similar order of magnitude change compared to the activity that existed when last master plan was completed in 2010. The current level of HAA flight training activity at Madras Municipal Airport exceeds all aircraft operations estimated for the Airport in 2009, and previously forecast through 2029.

LEADING EDGE AVIATION (LEA)

LEA is a fixed base operator (FBO) and FAA Part 141 and 61 flight school based at Bend Municipal Airport, 35 nautical miles south of Madras. LEA provides both fixed wing and helicopter flight training with a current fleet of 21 piston aircraft (13 fixed-wing and 8 helicopters). The flight school currently has 230 active flight students and 49 certified flight instructors (CFI). Current flight activity includes an average of 12 fixed-wing flights and 11 helicopter flights per week dispatched to Madras Municipal Airport from their Bend base, year-round. Fixed-wing aircraft average 2 landings per flight and helicopters average 1 landing per flight. LEA reports "It is challenging for our airplanes to get to S33 and back during a single [two-hour] flight block. When airplanes do go to S33 for training it is usually for instrument training or a landing point along a cross country flight route."

2019 LEA Flight Training Activity (S33): 3,640 Annual Operations

Fixed Wing: Based on an average of 12 flights per week, and 2 takeoffs and 2 landings per flight, the flight training activity generates approximately 48 operations per week, and 2,496 operations annually at S33.

Helicopter: Based on an average of 11 flights per week, and 1 takeoff and 1 landing per flight, the flight training activity generates approximately 22 operations per week, and 1,144 operations annually at S33.

1 FAA OPSNET Report RDM 11/4/20

AERIAL FIREFIGHTING

Photo Credit: Oregon Army National Guard

Madras Municipal Airport is used on a regular basis to support aerial response during wildfire season. The US Madras Municipal Airport regularly supports large transient helicopter operations associated with wildfire response and related flight training. The majority of the flight activity occurs mid-to-late summer as fire risk reaches maximum levels. Specialized helicopter training often occurs outside the summer fire season.

The fire response activity at the Airport varies from year to year based on the severity of fires in the region and the required aircraft response. The facilities at Madras Municipal Airport are uniquely capable of accommodating a large number of fire helicopters and their ground support operations, without disrupting other airport activity.

The City of Madras has an emergency facilities and land use agreement with the USDA Forest Service that allows fire operations (aircraft parking and operations areas) and water tender use to be quickly established at the Airport. A common operational response involves positioning several Type I-III helicopters (see examples in **Figure 3-3**) for quick response to active fires. Aircraft and other assets are redeployed by fire managers when local conditions change or as other fires are prioritized for aircraft response.

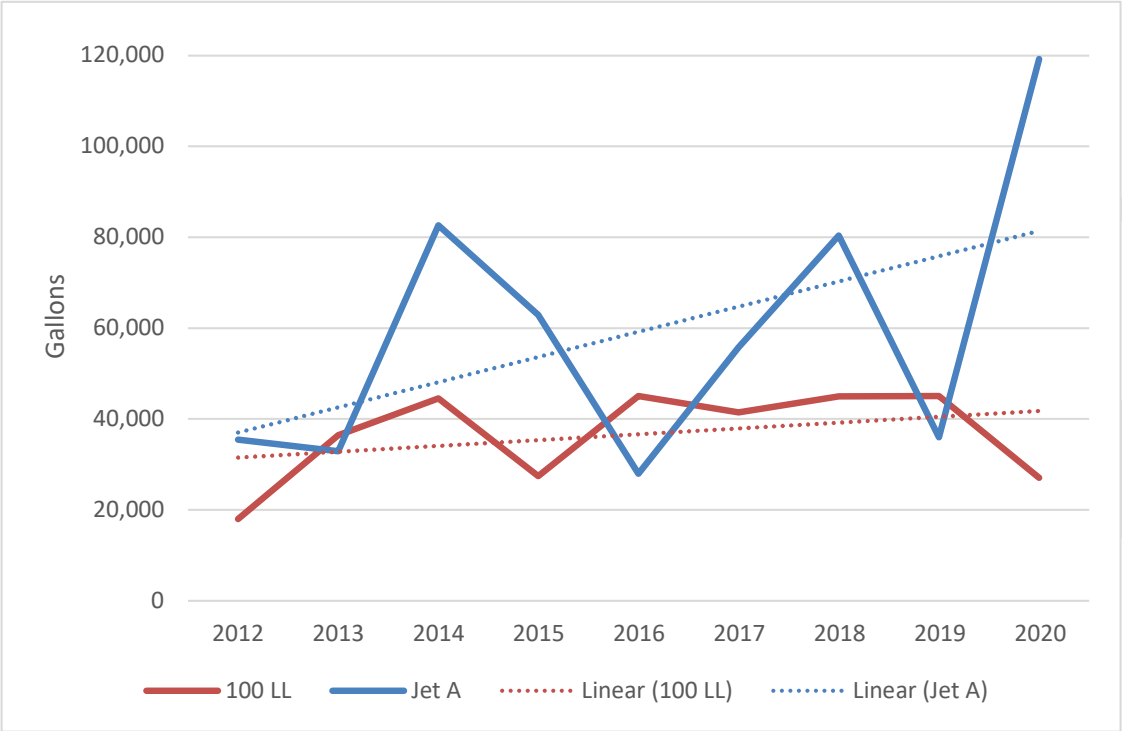
FIGURE 3-3: USFS AERIAL FIREFIGHTING HELICOPTER CATEGORIES

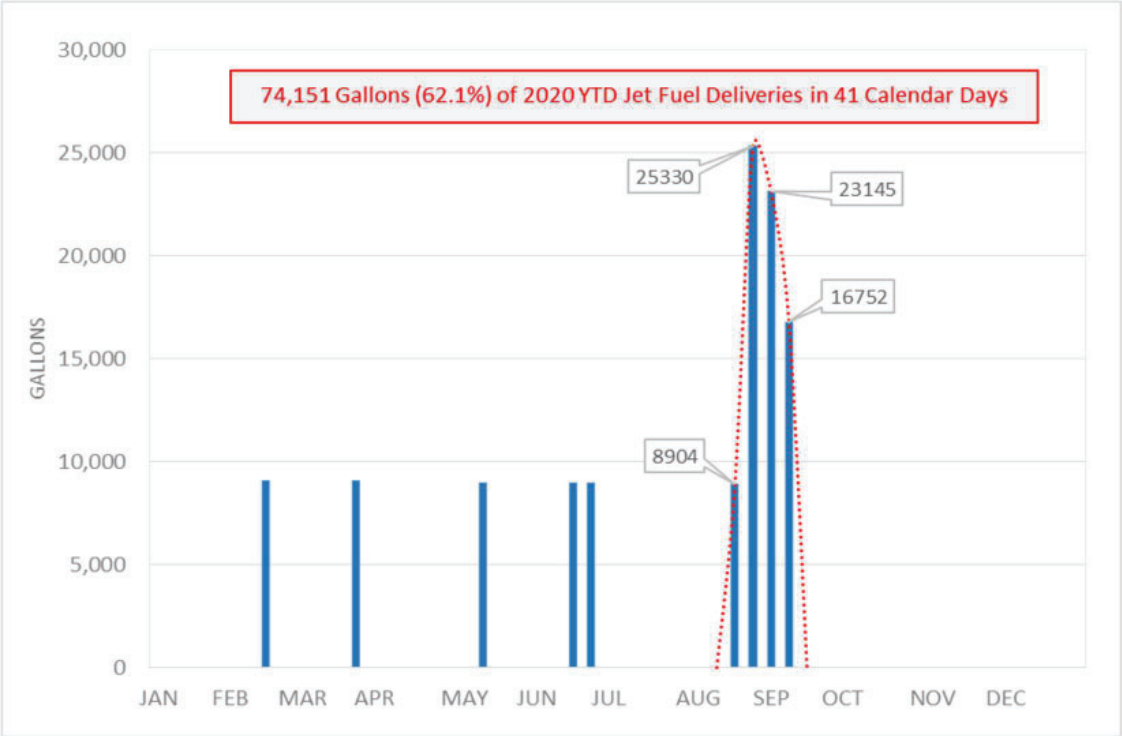
Type I	Type II	Type III
		
Aircraft Types: Heavy Lift Internal Tanks or External Water Buckets Examples: Kaman K-Max, Sikorsky S-61, S-64, S-70, Boeing Vertol/Chinook	**Aircraft Types:** Medium External Water Buckets, Rappelling, and Crew Transport Examples: Bell 205, 212, UH-1H	**Aircraft Types:** Light Crew Transport, External Water Buckets Examples: Bell 206, 407, MD500D

Source: Century West Engineering, Images: Wikipedia

The majority of aircraft involved in fire response activity at Airport are turbine powered and use jet fuel. A review of recent historic jet fuel delivery records at Madras Municipal Airport highlights two unique things about its fire related activity. **Figure 3-4** presents two graphs that illustrate the wide fluctuations in jet fuel activity experienced at the Airport in recent years, and for 202 alone. The visible spikes in fueling activity closely correlate to area fire conditions and increased aircraft movement at the Airport.

FIGURE 3-4: MADRAS MUNICIPAL AIRPORT – 2020 YTD JET FUEL DELIVERIES





Source: City of Madras Records

The first graph confirms the variability of fire events over several years based on significant shifts in jet fuel delivery volumes at the Airport. In recent years, jet fuel volume at the Airport has ranged from 30,000 to 40,000 gallons in a typical 'low event' fire year. In contrast, 2020 was a very active fire year in central Oregon, which led to significant fueling and helicopter flight activity at the Airport. 2020 year-to-date (YTD) jet fuel delivery volume (through 9/10/20) at the Airport totaled 119,234 gallons, an increase of 232 percent over 2019's 12-month total. The second graph shows an extreme peak in deliveries that occurred over a four week period from mid-August to mid-September, accounting for more than 60 percent of the YTD volume. This peak coincided with a period when the Airport had more than a dozen helicopters on site, with as many as 17 helicopters operating on the field in a single day. Airport management reports that their 12,000-gallon bulk jet fuel storage capacity was frequently exhausted and required near daily restocking during this period. Airport records indicate that 11 separate deliveries of jet fuel occurred during a 22-day period, totaling more than 74,000 gallons.

Based on available information, an estimate of 'typical' fire helicopter operations at the Airport was developed for use in the master plan. The estimate of fire activity was developed using conservative averages that balance the broad range of flight activity (none to high volume) observed at the Airport in recent years. The factors affecting annual Airport activity for this segment include the number of active fire days, the number of aircraft dispatched, and the number of flight dispatches for each aircraft. The actual volume of flight activity for each fire varies greatly and depends on factors including the distance from the Airport to the fire, access to fuel (either at the Airport or remotely positioned to allow fueling closer to the fire), and the operational range of each aircraft.

For planning purposes, an estimate of current flight activity was developed for a window of 30 active days during the extended fire season. An average of 10 operational fire helicopters per fire day is assumed. This mid-range estimate allows for both the observed peak days (15+ aircraft) and days with lower activity (1-5 aircraft). It is assumed that each helicopter makes 4 trips per day with one Airport takeoff and one landing per trip. Based on these assumptions, annual helicopter wildfire activity at Madras Municipal Airport is estimated at 2,400 operations. Additional off-season USDA-FS aircraft and pilot carding (air attack, water bucket, reconnaissance, etc.) related flight training at the Airport is estimated at 80 operations. This segment of activity is presented in **Figure 3-5.**

It is recommended that 2,480 annual fire helicopter operations be maintained as a fixed number in the updated aviation activity forecasts at Madras Municipal Airport. The estimate provides a reasonable operational level for planning purposes, while recognizing that traffic volumes may be expected to fluctuate above and below this level in any given year.

Baseline Annual Wildfire-Related Helicopter Activity (S33): 2,480 Annual Operations

Based on an average of 30 active fire day, 10 helicopters, 4 flights per day, with 1 takeoff and 1 landing per flight, the fire related activity generates approximately 2,480 operations annually at S33.

ERICKSON AERO TANKER

The Erickson Aero Tanker (Aero Air, LLC) facility at Madras Municipal Airport performs major maintenance on its fleet of large air tankers (fire bombers). The fleet currently includes a total of 10 aircraft (7 MD-87 jet aircraft and 3 Douglas DC-7 piston twins). The aircraft are maintained on site and dispatched as needed through contracts with the USDA-Forest Service (USDA-FS) and other agencies both domestically and internationally. Tanker activity at Madras Municipal Airport includes dispatch and recovery flights, maintenance flights, test flights, flight crew training, and USDA-FS check rides.

Photo Credit: Mike Houska

Flight activity data provided by Erickson lists a total of 576 tanker operations at the Airport starting in 2012, through the end of 2019. On an annual basis, the Airport accommodated an average of 47 MD-87 and 25 DC-7 operations per year during this period. Erickson representatives indicate that the current level of tanker flight activity at the Airport is expected to increase based on a planned realignment of maintenance work currently conducted in Arizona and future fleet expansion. It was reported in October, 2020 that Erickson was awarded a $70.5 million contract to provide four MD-87 fire bombers under exclusive use contracts, with two additional aircraft available on call for emergency use.

Photo Credit: Century West Engineering

The fire bomber aircraft are classified as transport category aircraft by FAA. Although current and projected traffic volume does not reach the FAA's 500 annual operations threshold required for designation as the critical (design) aircraft, the unique operational requirements of the aircraft, combined with their essential role in the federal wildfire large tanker program, highlights the need to effectively incorporate their facility needs into the master planning for the Airport.

2019 Erickson Aero Tanker Activity (S33): 72 Annual Operations (ADG III/IV)

ERICKSON AIRCRAFT COLLECTION

The Erickson Aircraft Collection is an air museum open to the public featuring a collection of rare (flying condition) aircraft. The Collection currently includes 25 aircraft (16 single engine piston, 8 multi-engine piston, and 1 jet), varying in size from Airplane Design Group (ADG) I to III. Flight activity data provided by the Erickson Collection lists a total of 2,296 operations at the Airport starting in 2016, through the end of 2019. On an annual basis, the Airport accommodated an average of 574 Erickson Collection operations per year during this Pre-COVID period, including 87 annual operations generated by ADG II or larger aircraft. The majority of the flight activity is related to appearances at the Airshow of the Cascades and other major events.


Photo Credit: Century West Engineering

2019 Erickson Aircraft Collection Activity (S33): 574 Annual Operations (ADG I-III)

SKYDIVE AWESOME!

Skydive Awesome! is a full service skydiving school based at Madras Municipal Airport. The school currently operates a single Cessna 182 on an April to October season, depending on weather conditions. Flight activity data provided by the operator indicates an average of 6 flights per day during weekdays and 12 flights per day on weekends on a 5 day per week schedule, resulting in approximately 42 flights (84 operations) per week. Over its typical 30-week season, Skydive Awesome! generates approximately 2,520 annual operations at the Airport.

2019 Skydive Awesome! Activity (S33): 2,520 Annual Operations (ADG I)

AERIAL APPLICATOR

Madras Municipal Airport has one locally based aerial applicator (Cat-Ag Aviation, LLC) providing spray services with an Ayers Thrush S2Rsingle-engine turboprop (ADG A-II). Flight activity data provided by the operator indicates that 1,500 annual operations are consistently generated at the Airport.

2019 Local Aerial Applicator Activity (S33): 1,500 Annual Operations (ADG II)

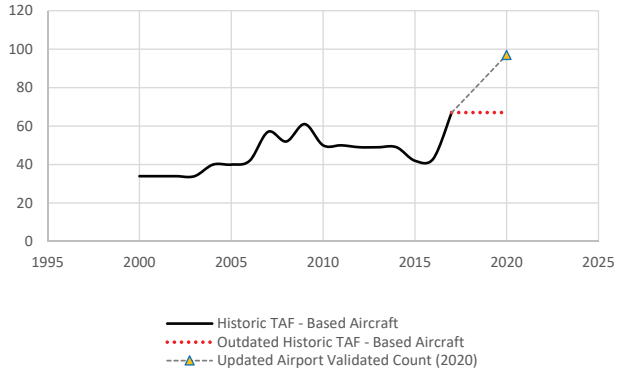
FIGURE: 3-5 AIRPORT ACTIVITY SUMMARY

Page 17 in the Existing Conditions Analysis provides a summary of previous estimates of Aircraft Operations and Based Aircraft from available source. The following activity summary provides an updated assessment that will serve as the baseline for the new aviation activity forecasts for the 2020-2040 Airport Master Plan Update.

Based Aircraft and Operations

Aircraft Type	Updated Airport Count[1] (2020)	Airport Master Record[2] (12 months ending 6/18/2020)	2010 AMP Base Year (2009)[3]
Single Engine	71	38	58
Multi Engine	17	7	2
Jet	8	8	0
Helicopter	1	1	0
Glider	0	0	1
Military	0	0	0
Ultra-Light	0	0	1
Total Based Aircraft	**97**	**54**	**62**
Annual Operations	**56,992**	**10,735**	**13,020**

1. Airport Management Updated Valdiated Count (6/2020)
2. Airport Master Record (5010) 12 Months Ending August 27, 2019
3. Airport Master Plan – Madras Municipal Airport (December 2010, Century West Engineering)



Operations Estimate (2019)

Operations Estimate (2019)

Operator	A/C Type	ARC	Annual Operations
Local Aerial Applicator	Thrush (SETP)	A-II	1,500
Skydive Awesome!	C-182 (SEP)	A-I	2,520
Transient Helicopter Fire & Training Operations [3]	K-Max, S-64 (HELI)	Heli	2,480
Local Flight Training[1]	C-172, C-182 (SEP)	A-I	4,960
Transient Flight Training[2]			
Fixed Wing	C-152, C-172 (SEP)	A-I	18,846
Fixed Wing	PA-44 (Seminole) (MEP)	A-I	5,450
Helicopter	R22, R44 (HELI)	Heli	1,100
Other Local & Transient Activity[4]	SE Piston (SEP)	A-I	18,268
	ME Piston (MEP)	A-I	154
	ME Piston (MEP)	B-I	231
	Turboprop (SETP)	A-I	58
	Turboprop (METP)	B-I	19
	Turboprop (SETP)	A-II	135
	Turboprop (METP)	B-II	77
	Jet (JET)	B-II	100
	Jet (JET)	C-I	2
	Jet (JET)	C-II	6
	Jet (JET)	C-III	8
	Helicopter (HELI)	Heli	193
Military[5]	Helicopter (HELI)	Heli	200
	Lockheed C130 (METP)	C-IV	40
Erickson Aero Tanker	DC-7 (MEP)	B-IV	25
	MD-87 (Jet)	C-III	47
Erickson Collection	Antique (SEP)	A-I	487
	Antique (MEP)	B-II	43
	Antique (MEP)	A/B-III	35
	Antique (JET)	C-II	9
TOTAL OPS - ALL			56,992
TOTAL OPS - A-I			50,743
TOTAL OPS - B-I			250
TOTAL OPS - A-II			1,635
TOTAL OPS - B-II			219
TOTAL OPS - C-I			2
TOTAL OPS - C-II			15
TOTAL OPS - A/B - III			35
TOTAL OPS - C - III			55
TOTAL OPS - B/C - IV			65
TOTAL OPS - HELI			3,973
TOTAL OPS - ALL A/C			**56,992**
TOTAL OPS – ADG II and Greater			**2,024**
TOTAL OPS – AAC B and Greater			**607**

1. Estimated activity reported by Berg Air
2. Estimated activity reported by Hillsboro Aviation Academy, Leading Edge Aviation
3. Includes private contract and agency aircraft seasonal training and active fire response; military aircraft listed separately
4. Operations are estimates using 350 OPBA applied to based aircraft counts (non duplicated aircraft)
5. Includes Oregon Army National Guard (HELI) and Oregon Air National Guard (C130)

Updated Aviation Activity Forecasts

The historic based aircraft and operations numbers contained in the FAA Terminal Area Forecast (TAF) for Madras Municipal Airport are derived from estimates provided through airport management updates to the 5010 Airport Master Record. As noted earlier, an updated count of 97 based aircraft at Madras Municipal Airport was verified by airport management in 2020 and is currently in the process of being validated in the FAA's National Aircraft Registry (www.basedaircraft.com) and updated in the FAA 5010 Airport Record. The updated based aircraft count and master plan estimate of 2019 aircraft operations will be used as the base for all new forecasts presented in this chapter.

It is recognized that the documented increase in both based aircraft and aircraft operations deviates significantly from the Airport's historic activity. This increase in activity is not reflected in the 2010 airport master plan forecasts, nor is it reflected in current Oregon Aviation Plan or FAA data or forecasts.

The significant increase in baseline activity for the Airport will result in master plan forecasts that significantly deviate from the FAA TAF. The recommended master plan forecast will be compared to the TAF (APO TAF Detail Report 2019-2045, Issued January 2020) when presented to FAA for review and approval. However, it appears that both the based aircraft and aircraft operations forecast will exceed the FAA's allowable 10 percent deviation threshold, which may prompt adjustments to the TAF. Additional information about the TAF based aircraft and operations comparison is presented at the end of the chapter.

BASED AIRCRAFT

Five new based aircraft forecasts were developed based on previously established and new models. Growth trends established by those models were applied to the updated based aircraft count presented earlier (see Figure 3-9). The based aircraft forecast models that were developed, including the recommended model, are summarized below and in **Table 3-5,** and they are depicted on **Figure 3-6.**

Terminal Area Forecast (TAF) 11-year (modified) Historic Trend

The TAF historic based aircraft totals for Madras Municipal Airport from 2007 to 2018, although low, appear to trend in growth rate terms, relatively consistently with actual based aircraft counts and documented hangar construction at the Airport. Data anomalies (repeated years with no changes in aircraft totals) both before and subsequent to this period make valid assessments of those years challenging. Based on these factors, a modified 11-year (2007-2018) historic TAF trend analysis was developed for Madras Municipal Airport, which reflects an annual growth rate of 1.48 percent.

The Modified TAF 11-Year Historic Trend Model, when applied to the updated base year count of 97, projects 130 based aircraft at the Airport in 2040. The increase of 33 aircraft (34%) over the planning period, reflects an average annual growth rate of 0f 1.48 percent.

Modified FAA Aerospace General Aviation (GA) Fleet Model

The FAA performs assessments of U.S. aviation activity through the FAA Aerospace Forecast. The twenty- year forecasts are updated annually by evaluating recent events and established trends affecting a wide range of commercial and general aviation segments. The current version, FAA Aerospace Forecast - Fiscal Years (2020-2040), provides projections of key activity segments in 5-year increments beginning with the 2020 forecast.

A Modified FAA Aerospace GA Fleet Model was developed to use growth rates for each aircraft classification established in the forecast to project counts for each type of aircraft for the 20-year current planning period. The model assumes that the FAA-predicted national decline in the U.S. single-engine piston fleet will be largely offset by growth in light sport aircraft (LSA) and/or experimental aircraft at Madras Municipal Airport. These aircraft are cheaper to buy, own and operate, and are rapidly growing in popularity nationwide. This assumption is supported by the anticipated 1.0 percent annual decline in single-engine pistons and the projected 3.3 percent annual increase in LSAs nationwide through 2040.

Reflecting the mix of aircraft types based at Madras Municipal Airport, an average annual growth rate of 0.29 percent is projected in this model. Although this growth is low, it is important to note that the underlying FAA forecast growth rate for the national GA aircraft fleet between 2020 and 2040 0.0 percent, with the piston fleet declining at an annual rate of 0.6 percent.

The Modified FAA Aerospace GA Fleet Model, when applied to the updated base year count of 97, projects 103 based aircraft at the Airport in 2040. The increase of 6 aircraft (6%) over the planning period, reflects an average annual growth rate of 0f 0.29 percent.

FAA Northwest Mountain Region Trend

The FAA Terminal Area Forecast (2019-2045) for the Northwest-Mountain Region projects that the based aircraft fleet will grow at an average annual rate of 0.91 percent between 2019 and 2045. This rate represents the third highest rate among the nine FAA regions. It is also greater than the annual projected growth rate for the nation (0.80 percent) for the same period. This indicates that although the forecast rate of growth is modest, the region is expected to be among the strongest in the nation for general aviation based aircraft fleet growth over the next twenty years.

The FAA TAF Northwest Region Model, when applied to the updated base year count of 97, projects 116 based aircraft at the Airport in 2040. The increase of 19 aircraft (20%) over the planning period, reflects an average annual growth rate of 0f 0.91 percent.

Oregon Aviation Plan (OAP v6.0) Top-Down Forecast

OAP v6.0 presents a preferred 2015-2035 statewide based aircraft forecast that utilizes a modified top-down methodology. This model projects that Oregon's based aircraft fleet will grow at an average of 1.1 percent annually through 2035. This forecast growth rate was applied to Madras Municipal Airport to create an updated forecast based on current growth expectations for the Oregon airport system.

The Oregon Aviation Plan Forecast Model, when applied to the updated base year count of 97, projects 121 based aircraft at the Airport in 2040. The increase of 24 aircraft (25%) over the planning period, reflects an average annual growth rate of 0f 1.1 percent.

Jefferson County Per Capita Income/Long Term Employment Forecast

Current Woods & Poole Economics, Inc. (W&P) forecasts[2] of per capita income for Jefferson County and the state of Oregon were reviewed to gauge long term income expectations as a potential indicator of airport activity trends. The 2019 W&P forecast indicates per capita income (using "constant" dollars) in Jefferson County is expected to increase at average annual rate of 1.21 percent between 2020 and 2050, which outplaces the annual rate (1.02%) forecast for Oregon during the period. A review of the W&P long term employment forecasts for Jefferson County and Oregon was also conducted. Employment in Jefferson County is forecast to increase at an annual rate of 0.67 percent between 2020 and 2050, which trails the annual rate (0.97%) forecast for Oregon through 2050.

The W&P forecasts suggest Jefferson County will experience modest growth in net employment (lower than statewide growth rates), but faster income growth than Oregon through 2050. Increases in per capita income and employment indicate underlying economic durability, which suggests, although not empirically, that the conditions are favorable to sustained growth in airport activity. Since both economic indicators provide important foundations for economic growth, their 2020-2050 growth rates were combined (0.91 percent), with a slight weighting favoring income for use is projecting future based aircraft.

The Jefferson County Income/Employment Forecast Model, when applied to the updated base year count of 97, projects 117 based aircraft at the Airport in 2040. The increase of 20 aircraft (21%) over the planning period, reflects an average annual growth rate of 0f 0.94 percent.

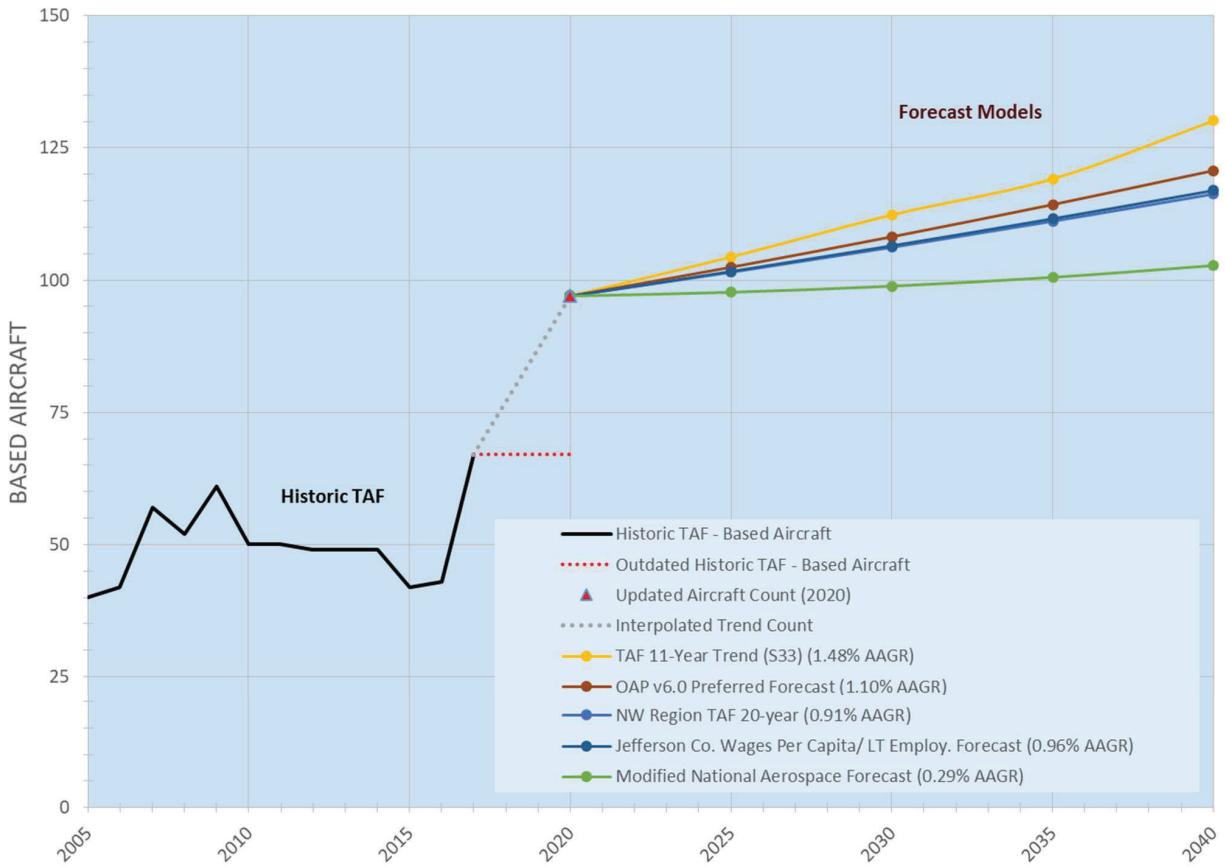
2 2019 State Profile - Idaho, Oregon and Washington, Woods & Poole Economics, Inc. © 2019 ISSN 1044-4947

TABLE 3-5: BASED AIRCRAFT FORECAST MODELS (S33)

Forecast Model	Growth Rate	2020	2025	2030	2035	2040
Jefferson County Wages Per Capita/ LT Employment Forecast	0.94%	97	102	107	112	117
OAP v6.0 Top-Down Forecast	1.10%	97	102	108	114	121
NW Region TAF 20-year (Recommended Forecast)	0.91%	97	101	106	111	116
Modified National Aerospace Forecast	**0.3%**	**97**	**98**	**99**	**101**	**103**
TAF 11-Year Trend (S33)	1.48%	97	104	112	119	130

Source: Century West Engineering

FIGURE 3-6: BASED AIRCRAFT FORECAST MODELS (S33)



Source: Century West Engineering

RECOMMENDED BASED AIRCRAFT SUMMARY

The **FAA TAF Northwest Region Model** forecast is recommended as the preferred based aircraft forecast for use in the Madras Municipal Airport Master Plan. The recommended forecast results in a net increase of 19 based aircraft over the twenty-year planning period, which reflects an average annual growth rate of about 1 percent (0.91%). The forecast reflects an expectation that future growth in based aircraft at Madras Municipal Airport will be consistent with the FAA's NPIAS forecast growth for the Northwest/Mountain region of the country.

It is important to emphasize that the modest forecast expectations for the Airport are built on a recent period of dramatic growth in based aircraft at the Airport. The boost experienced since the 2010 airport master plan reflects a major, positive shift largely driven by a specific tenant, rather than an indication of events that would be expected to be duplicated over the long term. The 2020 based aircraft count described earlier in the chapter, represents a 56 percent increase since 2010. The largest portion of this period's growth is attributed to newly-established Erickson Aero Tanker and Erickson Aircraft Collection operations at the Airport. Now firmly established, the future growth of these tenants is expected to be consistent with overall airport activity, and the forecast growth rates are applied to their current fleets.

The recommended based aircraft forecast projects 116 based aircraft at the Airport in 2040. The increase of 19 aircraft (20%) over the planning period, reflects an average annual growth rate of 0f 0.91 percent

Based aircraft forecasts are primarily intended to identify future facility needs in forthcoming sections of the master plan, particularly aircraft storage – apron parking and hangar space. Identifying development reserves is recommended for defining activity-dependent facility needs that may exceed forecast growth. The proposed development reserve should have the capacity to accommodate 100 percent of the projected net increase of based aircraft (+19) over the planning period. Accordingly, the long term planning of landside facilities at Madras Municipal Airport should be capable of accommodating 38 additional based aircraft (forecast + reserve) over the next twenty years. Based on the Airport's tenant development history, it would be appropriate to assume the need for future development reserve space would apply generally, and specifically to Erickson facilities.

BASED AIRCRAFT FLEET MIX

The current based aircraft fleet at Madras Municipal Airport is very diverse, ranging from small single-engine piston aircraft to transport category fire bombers (including converted MD-87 139-seat airliners). **Table 3-6** summarizes the current and forecast fleet mix for the planning period.

The based aircraft fleet mix at the Airport is expected to become more diverse due to a range of factors. The ongoing system-wide retirement of legacy general aviation piston aircraft, and the addition of new light sport aircraft and experimental aircraft as replacements and alternatives to traditional aircraft models, are expected to become increasingly significant in the local based aircraft fleet. Continued growth in specialized flight operations at the Airport is also expected to contribute to shifting fleet mix, with the addition of more turbine-engine aircraft (turboprop, jet, helicopter, etc.).

TABLE 3-6: BASED AIRCRAFT FLEET MIX SUMMARY (S33)

Aircraft Type	Updated Aircraft Count (2020)	2025	2030	2035	2040
Single Engine Piston/ LSA	70	73	74	77	81
Multi Engine Piston	17	18	18	19	20
Turboprop	1	2	3	3	3
Jet	8	8	9	9	10
Helicopter	1	1	2	2	2
TOTAL	**97**	**102**	**106**	**111**	**116**

Source: Century West Engineering

A unique aspect of the based aircraft fleet at the Airport is the Erickson Collection of antique aircraft. These aircraft are expertly maintained in flying condition, allowing them to continue their active service well beyond common useful life, which counters the established system-wide fleet attrition trend defined by FAA. For non-museum general aviation aircraft, new aircraft manufacturing levels have been unable to fully offset piston fleet attrition. Based on these factors, the ability to increase general aviation based aircraft at the Airport will be largely driven by growth in the local and regional economy and the ability to attract existing aircraft from other airports. In this scenario, the market-driven increases in LSA, experimental, and personal/business turbine aircraft is expected to be reflected in the future based aircraft fleet mix and the Airport.

AIRCRAFT OPERATIONS

Four operations forecasts were prepared for comparison to the TAF. The current TAF operations projection (APO TAF Detail Report 2019-2045, Issued January 2020) for Madras Municipal Airport is provided for comparison only, as the TAF is not considered an acceptable forecast by FAA for master planning purposes. As noted earlier, the recommended forecast will be compared to the TAF for formal FAA review and approval.

The first two forecasts apply growth rates established by previous regional and national planning efforts (2020 FAA Aerospace Forecasts and 2019 Oregon Aviation Plan) to the updated (2019) estimate of aircraft operations presented earlier in the chapter. The third model projects a trend based on historic fuel sales at the Airport. The final model applies a modified operations per based aircraft (OPBA) formula recognized by FAA for estimating activity at non-towered GA airports.

All of the projections assume that recently-developed activity segments including large volume transient flight training and seasonal fire operations are now established at a level that can be sustained, or grow incrementally during the planning period at rates comparable to other general aviation airports. The updated aircraft operations forecasts and the FAA TAF are presented in **Table 3-7** at the end of this section.

FAA National Aerospace GA Operations Growth Rate

The current FAA Aerospace Forecast - Fiscal Years (2020-2040) projects a 0.4 percent average annual increase in general aviation operations within the FAA system through 2040. This growth rate was applied to the 2019 base year operations estimate for Madras Municipal Airport to develop projections for the twenty-year master planning period. The model projects 66,838 operations in 2040, an increase of 9,846 (17.3 percent; AAGR 0.80 percent) over the 20-year planning period.

Oregon Aviation Plan (V. 6.0) Top Down Growth Rate

The most recent Oregon Aviation Plan (OAP v6.0), published in 2019, provides forecasts of aviation activity over its 2015- 2035 planning period. Annual general aviation operations forecasts were prepared for individual airports, as well as for the state system as a whole. The OAP identified a Top-Down model based on FAA national average growth forecast for general aviation hours flown as the preferred forecast. The average annual growth rate for this model is 0.9 percent. Applying the OAP model to the 2019 base year operations estimate for Madras Municipal Airport results in a projection of 68,177 operations in 2040, an increase of 11,185 (19.6 percent; AAGR 0.9 percent) over the 20-year planning period.

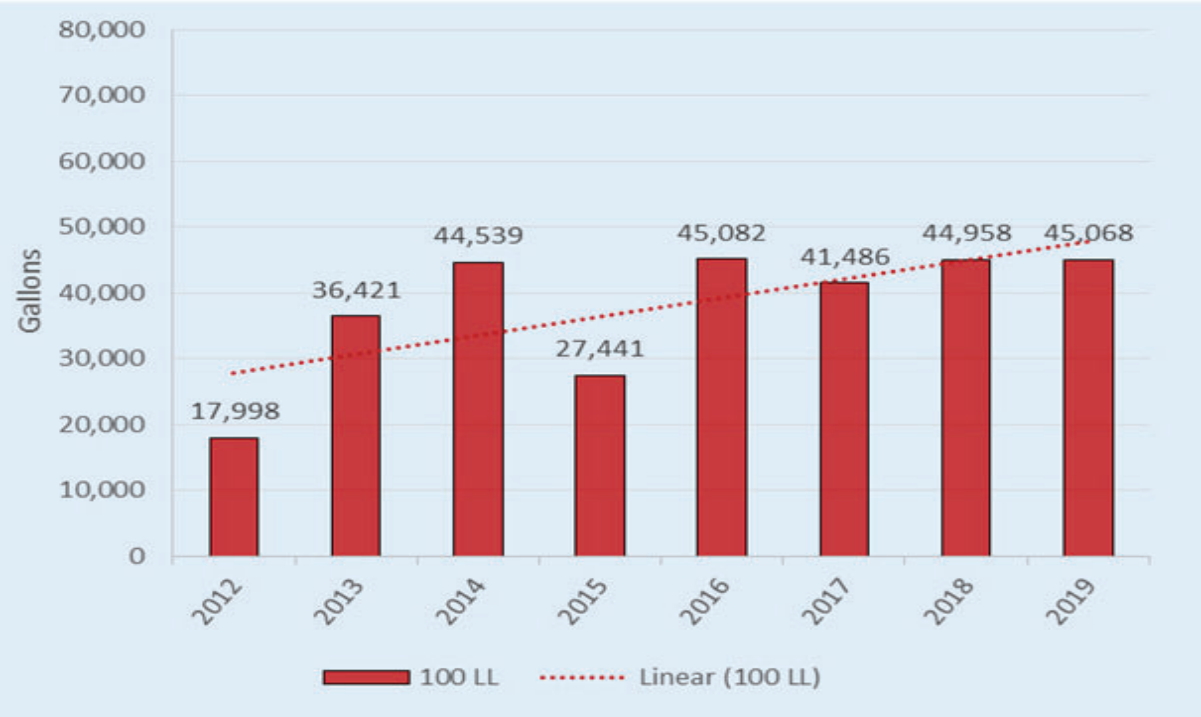
Madras Municipal Airport 7-Year 100LL Fuel Sales

Historic aircraft fueling data can provide a broad indication of an airport's activity trends over time. A variety of factors may affect fueling activity. These may include price and competition from other nearby airports and temporary surges in activity related to special events, such as fly-ins. A model was created to capture piston engine aircraft activity trends at the Airport based on aviation gasoline (AVGAS) delivery volumes. As noted earlier, jet fuel deliveries at the Airport are known to fluctuate heavily based on seasonal fire activity, which involves primarily turbine aircraft (see Figure 3-4). In contrast, the 100LL AVGAS delivery trend at the Airport reflects stable, sustained growth associated with locally-generated general aviation activity, and the majority of non-training transient activity. The large volume of transient flight training at the Airport described earlier generates limited fuel sales volume due to the close proximity of the home base airports. The flight school operators report that the majority of the Redmond- or Bend-generated transient aircraft fueling at Madras is associated with cross country flights.

A review of the last seven full years of 100LL fuel delivery data identified an upward trend, as depicted in **Figure 3-7.** The linear trend line projection for 2012-2019 fuel sales reflects an average annual growth rate of approximately 0.80 percent within a data set with moderate year-to-year fluctuations. On balance, the positive upward trend in 100LL fuel sales experienced at the Airport over the seven-year period is consistent with the increase in the number of based piston-engine aircraft, increased local and transient flight training, and overall strengthening in the general aviation industry.

Applying the 7-year 100LL trend line model to the base year operations estimate for Madras Municipal Airport results in a projection of 66,838 operations in 2040, an increase of 9,846 (17.3 percent; AAGR 0.80 percent) over the 20-year planning period.

FIGURE 3-7: S33 ANNUAL FUEL DELIVERIES (100LL)



Source: City of Madras Airport Fuel Delivery Records

FAA NPIAS Operations Per Based Aircraft (OPBA) Formula

This model uses a modified OPBA formula to project forecast airport operations. FAA Order 5090.5 Formulation of the NPIAS and ACIP, suggests a forecast methodology for non-towered airports that relies on a general formula for estimating operations by utilizing an activity ratio that is applied to current and forecast based aircraft. The Order identifies a typical range of 250 to 450 OPBA for different types of general aviation airports depending on the airport's role in the NPIAS. The current estimate of aircraft operations presented previously in **Figure 3-6** combines a fixed 350 OPBA (the NPIAS recommended multiplier for a Local General Aviation airport) with the activity estimates for the unique activity/user groups described in this chapter. This forecasting methodology was determined to be appropriate based on the significant variance between the unadjusted 350 OPBA-derived operations level and the updated operations estimate developed through verification of data for each discreet group.

The recommended based aircraft forecast growth rate (AAGR 1.05 percent) was then applied to the current operations estimate to project future activity through the 20-year planning period. This approach assumes that aircraft operations at Madras Municipal Airport will increase at a rate comparable to forecast based aircraft.

Applying the model to the base year operations estimate results in 70,233 total operations in 2040, an increase of 13,241 operations (23.2 percent; **AAGR 1.05 percent**) over the 20-year planning period.

TAF 2020-2040

The TAF is provided for comparison to the updated operations forecast models. The current TAF (APO TAF Detail Report 2019-2045, Issued January 2020) projects Madras Municipal Airport annual operations to increase from 11,249 to 18,036 operations in 2040, an increase of 6,787 operations (60.3 percent; **AAGR 2.29 percent**).

RECOMMENDED AIRCRAFT OPERATIONS SUMMARY

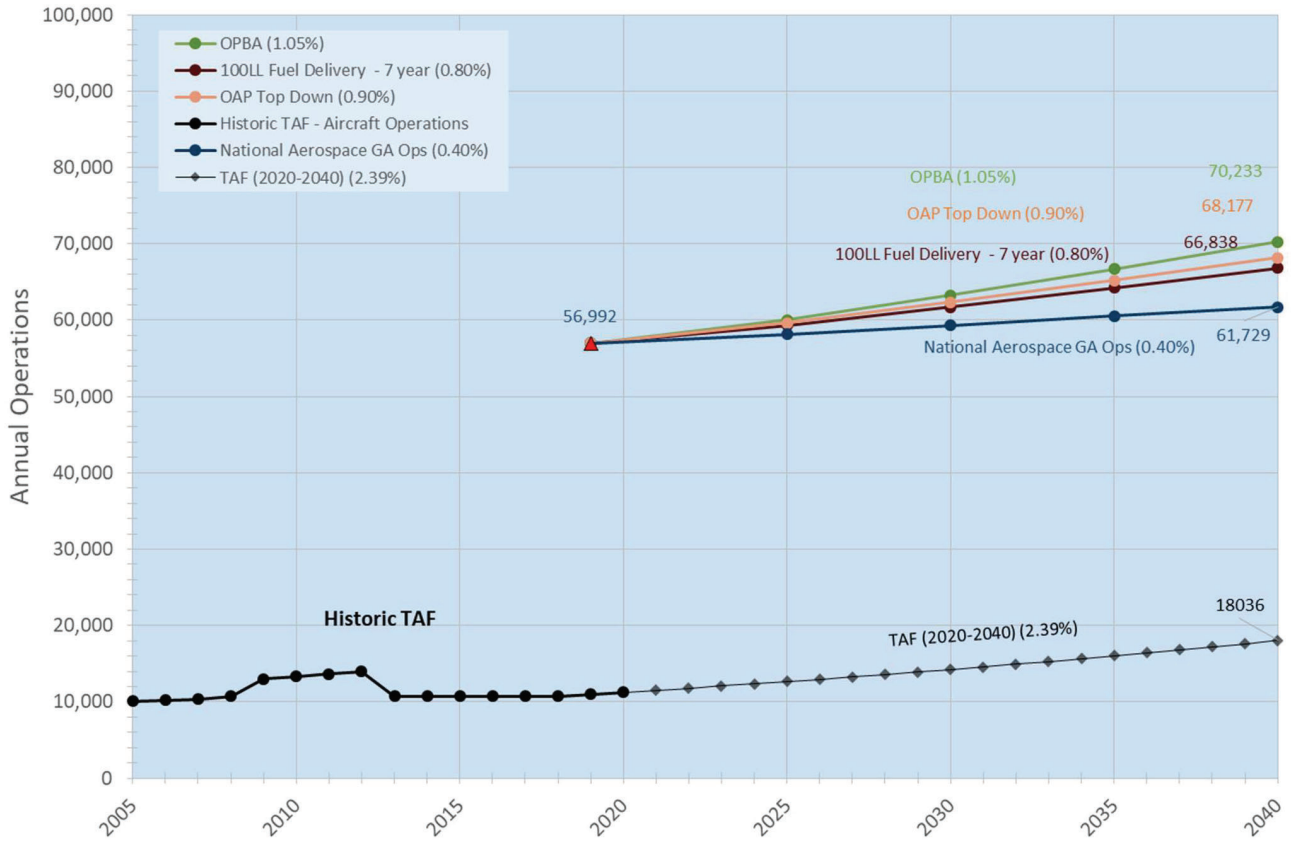
The recommended forecast of aircraft operations at Madras Municipal Airport is the **FAA NPIAS Operations per Based Aircraft (OPBA) Formula.** This model projects an average annual growth rate in operations of 1.05 percent over the planning period, resulting in 70,232 aircraft operations in 2040. The use of the NPIAS OPBA model is consistent with FAA guidance for estimating operations at non-towered airports and the projected estimates derived from the model are in line with operational estimates of other area airports of similar size. The aircraft operations forecast models that were evaluated, including the recommended model, are summarized in **Table 3-7** and depicted on **Figure 3-8.**

TABLE 3-7: FORECAST ANNUAL OPERATIONS RATES (S33)

Forecast Model	AAGR	2020	2025	2030	2035	2040
OPBA (Recommended)	**1.05%**	**56,992**	**60,048**	**63,267**	**66,659**	**70,233**
OAP Top Down	0.90%	56,992	59,603	62,334	65,190	68,177
Fuel Sales - 7 year	0.80%	56,992	59,308	61,719	64,228	66,838
TAF (2020-2040)	2.39%	11,249	12,656	14,245	16,027	18,036
National Aerospace GA Ops	0.40%	56,992	58,141	59,313	60,509	61,729

Source: Century West Engineering

FIGURE 3-8: AIRCRAFT OPERATIONS FORECAST MODELS (S33)



Source: Century West Engineering

LOCAL AND ITINERANT OPERATIONS

Aircraft operations consist of aircraft takeoffs and landings that are classified as local or itinerant. Local operations are conducted in the vicinity of an airport and include flights that begin and end at the airport. These include aerial applicators, flight training, touch and go operations, and other flights that do not involve a landing at another airport. Itinerant operations include flights between airports, including cross-country flights. Itinerant operations reflect specific travel between multiple points, often associated with business and personal travel.

A review of flight activity used to develop the updated estimate of airport operations (see **Figure 3-5**) indicates that local traffic accounted from approximately 55 percent of operations at the Airport. The high volume of local operations at Madras Municipal Airport is attributed to flight training activity (primarily traffic pattern work), helicopter wildfire response flights, aerial applicator activity, and other general aviation activity. It is recommended that a 55 percent/45 percent local/itinerant air traffic distribution be applied to the forecast operations for the planning period. The FAA TAF operations split for 2019 is consistent with the updated master plan assessment, with a 56%/44% split between local and itinerant operations. The local and itinerant distribution for each forecast year is summarized in **Table 3-8.**

TABLE 3-8: ITINERANT/LOCAL OPERATIONS MIX (S33)

Activity	2020	2025	2030	2035	2040
Total Itinerant Operations	25,646	27,022	28,470	29,997	31,605
Local Operations	31,346	33,026	34,797	36,662	38,628
Total Local & Itinerant Operations	**56,992**	**60,048**	**63,247**	**66,659**	**70,233**

Source: Century West Engineering

AIRCRAFT OPERATIONS FLEET MIX

Single engine piston aircraft currently account for just over 75 percent of airport operations, followed by helicopters, multi- engine piston, single-engine and multi-engine turboprops, and business jets. It is expected that the mix of air traffic at Madras Municipal Airport will shift slightly during the twenty-year planning period to include more turboprops, helicopters, and a small number of jets based on current trends in aircraft manufacturing and the composition of airport users. The growing popularity of single-engine turboprops for personal and business use is expected to have the greatest impact on the operational fleet mix at Madras Municipal Airport. Piston helicopter activity is also expected to increase for general aviation transportation and flight training purposes. The aircraft operations fleet mix forecast is summarized in **Table 3-9.**

TABLE 3-9: OPERATIONS FLEET MIX (S33)

Aircraft Type	2020	2025	2030	2035	2040
Single Engine Piston[1]	45,080	47,558	50,107	52,794	55,625
Multi Engine Piston	5,938	6,245	6,453	6,799	7,164
Turbo Prop	1,789	1,922	2,088	2,200	2,318
Jet	172	180	253	267	281
Helicopters	3,773	3,903	4,112	4,333	4,565
Military	240	240	253	267	281
Total Operations	**56,992**	**60,048**	**63,267**	**66,659**	**70,233**

Source: Century West Engineering
1. Includes LSA and Experimental AC

CRITICAL AIRCRAFT AND AIRPORT REFERENCE CODE (ARC)

The critical aircraft (or design aircraft) represents the most demanding aircraft using the airport on a regular basis and determines the appropriate airport reference code (ARC) and airport design standards for airport development. **Table 3-10** details the aircraft-defined ARC parameters and sample aircraft by ARC category.

TABLE 3-10: AIRPORT REFERENCE CODE (ARC)

Aircraft Approach Category	Aircraft Approach Speed knots	Airplane Design Group	Aircraft Wingspan
A	less than or equal to 91	I - Existing	less than or equal to 49’
B	92 to 121	II - Future	50’ to 79’
C	122 to 141	III	80’ to 118’
D	142 to 166	IV	119’ to 171’

A-I (small) 12,500 lbs. or less

Beech Baron 55
Beech Bonanza
Cessna 182
Piper Archer

B-I (small) 12,500 lbs. or less

Beech Baron 58
Beech King Air C90
Cessna 402
Cessna 421

A-II, B-II (small) 12,500 lbs. or less

Super King Air 200
Pilatus PC-12
DCH Twin Otter
Cessna Caravan

ARC - B-II Greater than 12,500 lbs.

Super King Air 300, 350
Beech 1900
Cessna Citation
Falcon 20, 50

A-III, B-III Greater than 12,500 lbs.

DHC Dash 7, Dash 8
Q-200, Q-300
DC-3
Convair 580

C-I, D-I

Lear 25, 35, 55, 60
Israeli Westwind
HS 125-700

C-II, D-II

Gulfstream II, III, IV
Canadair 600
Canadair Regional Jet
Lockheed JetStar

C-III, D-III

Boeing Business Jet
Gulfstream 650
B 737-300 Series
MD-80, DC-9

C-IV, D-IV

B - 757
B - 767
DC - 8-70
DC - 10

Source: Century West Engineering

Critical Aircraft

The selection of design standards for airfield facilities is based upon the characteristics of the most demanding aircraft that are expected to use the airport. This group of aircraft or aircraft type is designated as the "critical aircraft." The FAA provides the following definitions:

> *"The critical aircraft is the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, including both itinerant and local operations, but excluding touch- and-go operations. An operation is either a takeoff or landing." (FAA AC 150/5000-17)*

The FAA group aircraft into five categories (A-E) based upon their approach speeds. Aircraft Approach Categories A and B include small propeller aircraft, many small or medium business jet aircraft, and some larger aircraft with approach speeds of less than 121 knots (nautical miles per hour). Categories C, D, and E consist of the remaining business jets, and larger jet and propeller aircraft generally associated with commercial and military use with approach speeds of 121 knots or more. The FAA also establishes six airplane design groups (I-VI), based on the wingspan and tail height of the aircraft. The categories range from Airplane Design Group (ADG) I, for aircraft with wingspans of less than 49 feet, to ADG VI for the largest commercial and military aircraft. The combination of airplane design group and aircraft approach speed for the critical aircraft creates the Airport Reference Code (ARC), which is used to define applicable airfield design standards.

CURRENT CRITICAL AIRCRAFT

The identification of the current critical aircraft for an airport is required to define the appropriate design standard for airport facilities currently and in the near term. **Table 3-11** summarizes the current estimate of aircraft operations at Madras Municipal Airport by aircraft type and ARC. Evaluations of applicable design standards will be conducted for both runways in the facility requirements chapter.

RUNWAY 16/34

The 2010 Airport Layout Plan (ALP) lists Runway 16/34 with an ARC B-II, with a Beechcraft King Air 350 listed as the current critical aircraft, and a Cessna Citation Bravo (CE550) at the future critical aircraft. These aircraft were representative of the mix of business aviation aircraft commonly operating at the airport. As noted in the earlier review of instrument flight plan data, the current level of business aircraft activity (B-II or larger) appears to be below the FAA's 500 annual operations threshold used to define critical aircraft.

However, based on the evaluation of 2019 air traffic at Madras Municipal Airport, it appears that both the Aircraft Approach Category B and Airplane Design Group II designation can be maintained for Runway 16/34 through a composite of different aircraft activity segments.

A significant portion of the Approach Category B activity on Runway 16/34 is generated by ADG I aircraft. When combined with ADG II or larger aircraft, the Approach Category B activity reaches the FAA regular use threshold of 500 annual operations. Similarly, a combination of Approach Category A, B, and C aircraft activity is used to reach the 500 annual operations threshold for ADG II aircraft. In addition, 155 annual operations generated by more demanding ADG III and IV transport category aircraft in 2019 is assumed to be maintained or increase during the planning period.

As a result, the ARC B-II designation for Runway 16/34 is best represented by the combination of aircraft types depicted at the end of this section.

Based on the critical aircraft designation, the recommended current and future ARC for Runway 16/34 is B-II.

RUNWAY 4/22

The 2010 Airport Layout Plan (ALP) lists Runway 4/22 with an ARC A-I (Small), with a Beechcraft Baron listed as the current and future critical aircraft. The runway currently accommodates a variety of aircraft types, including tailwheel-equipped aircraft that rely on the runway's alignment in crosswind conditions. It is estimated that the runway accounts for 1 to 2 percent of total airport operations, or approximately 500 to 1,000 annual operations.

The majority of activity on Runway 4/22 is generated by Approach Category A and Airplane Design Group I (ADG I) aircraft, which maintains the A-I (small) ARC. A representative ARC A-I (Small) aircraft is a single-engine piston Cessna 182, which is recommended as the critical aircraft for Runway 4/22.

Based on the critical aircraft designation, the recommended current and future ARC for Runway 4/22 is A-I (small).

TABLE 3-11: OPERATIONS BY AIRCRAFT TYPE AND ARC

Operator	A/C Type	ARC	Annual Operations
Local Aerial Applicator	Thrush (SETP)	A-II	1,500
Skydive Awesome!	C-182 (SEP)	A-I	2,520
Transient Helicopter Fire & Training Operations [3]	K-Max, S-64 (HELI)	Heli	2,480
Local Flight Training[1]	C-172, C-182 (SEP)	A-I	4,960
Transient Flight Training[2]			
Fixed Wing	C-152, C-172 (SEP)	A-I	18,846
Fixed Wing	PA-44 (Seminole) (MEP)	A-I	5,450
Helicopter	R22, R44 (HELI)	Heli	1,100
Other Local & Transient Activity[4]	SE Piston (SEP)	A-I	18,268
	ME Piston (MEP)	A-I	154
	ME Piston (MEP)	B-I	231
	Turboprop (SETP)	A-I	58
	Turboprop (METP)	B-I	19
	Turboprop (SETP)	A-II	135
	Turboprop (METP)	B-II	77
	Jet (JET)	B-II	100
	Jet (JET)	C-I	2
	Jet (JET)	C-II	6
	Jet (JET)	C-III	8
	Helicopter (HELI)	Heli	193
Military[5]	Helicopter (HELI)	Heli	200
	Lockheed C130 (METP)	C-IV	40
Erickson Aero Tanker	DC-7 (MEP)	B-IV	25
	MD-87 (Jet)	C-III	47
Erickson Collection	Antique (SEP)	A-I	487
	Antique (MEP)	B-II	43
	Antique (MEP)	A/B-III	35
	Antique (JET)	C-II	9
TOTAL OPS - ALL			56,992
TOTAL OPS - A-I			50,743
TOTAL OPS - B-I			250
TOTAL OPS - A-II			1,635
TOTAL OPS - B-II			219
TOTAL OPS - C-I			2
TOTAL OPS - C-II			15
TOTAL OPS - A/B - III			35
TOTAL OPS - C - III			55
TOTAL OPS - B/C - IV			65
TOTAL OPS - HELI			3,973
TOTAL OPS - ALL A/C			**56,992**
TOTAL OPS – ADG II and Greater			**2,024**
TOTAL OPS – AAC B and Greater			**607**

1. Estimated activity reported by Berg Air
2. Estimated activity reported by Hillsboro Aviation Academy, Leading Edge Aviation
3. Includes private contract and agency aircraft seasonal training and active fire response; military aircraft listed separately
4. Operations are estimates using 350 OPBA applied to based aircraft counts (non duplicated aircraft)
5. Includes Oregon Army National Guard (HELI) and Oregon Air National Guard (C130)

FUTURE CRITICAL AIRCRAFT

Based on the updated aviation activity forecasts, no change in critical aircraft is anticipated for either runway during the current twenty year planning period. Activity by Approach Category B and ADG II, and larger aircraft on Runway 16/34 is expected to increase over the course of the planning period, as the commercial and industrial industries in Madras continue to grow. **Table 3-12** summarizes forecast fleet mix by ADG.

TABLE 3-12: OPERATIONS FLEET MIX BY ADG

	%	2020	2025	2030	2035	2040
TOTAL OPS - A-I	89%	50,743	53,464	56,330	59,350	62,532
TOTAL OPS - B-I	<0.5%	252	266	280	295	311
TOTAL OPS - A-II/B-II	3%	1,854	1,953	2,058	2,168	2,285
TOTAL OPS - C-II/D-II	<0.5%	15	16	17	18	19
TOTAL OPS – ADG III (A-C)	<0.5%	90	95	100	105	111
TOTAL OPS – ADG IV (B-C)	<0.5%	65	68	72	76	80
TOTAL OPS - HELI	7%	3,973	4,186	4,410	4,647	4,896
TOTAL OPS - ALL A/C	**100.00%**	**56,992**	**60,048**	**63,267**	**66,659**	**70,233**

Source: Century West Engineering

RUNWAY 16/34 REPRESENTATIVE CRITICAL AIRCRAFT (ARC A-II & B-II) (NOT TO SCALE)

RUNWAY 4/22 REPRESENTATIVE CRITICAL AIRCRAFT (ARC A-I – SMALL) (NOT TO SCALE)

Image Source: Thrush Aircraft; Textron Aviation

Operational Peaks

Activity peaking is evaluated to identify potential capacity related issues that may need to be addressed through facility improvements or operational changes. The Peak Month represents the month of the year with the greatest number of aircraft operations (takeoffs and landings). The peak month for most general aviation airports occurs during the summer when weather conditions and daylight are optimal. The 2010 Airport Master Plan estimated the peak month for aircraft operations at the Airport to be a typical summer month (July or August), generating approximately 18 percent of annual traffic.

The updated review of 2019 air traffic presented earlier in the chapter identified significant amounts of concentrated activity in the summer months, including helicopter and fixed wing wildfire response in addition to normal summer increases in general aviation traffic.

A review of 2020 year-to-date (YTD) airport fuel delivery records confirmed a major peak in jet fuel volumes, which translates directly into increased aircraft activity. 62 percent of YTD jet fuel delivery through 9/10/20 occurred over a 5-week period in August, coinciding with a busy period of helicopter wildfire response at the Airport. A review of full year (2018 and 2019) 100 LL fuel deliveries also shows a peak in summer delivery activity, with three or four deliveries clustered from late spring to late summer accounting for about 60 percent of annual fuel deliveries, which is consistent with other assessments of seasonality.

Based on the combination of factors affecting air traffic at Madras Municipal Airport, a **peak month operations percentage of 21 percent** is recommended for the current planning period.

Peak Day operations are defined by the average day in the peak month (Design Day) and the busy day in the typical week during peak month (Busy Day). The Design Day is calculated by dividing peak month operations by 30. For planning purposes, the Busy Day is estimated to be 25 percent higher than the average day in the peak month (Design Day x 1.25), based on common activities generating significant surges in flight activity.

The peak activity period in the Design Day is the Design Hour. For planning purposes, the Design Hour operations are estimated to account for 20 percent of Design Day operations (Design Day x 0.20).

The operational peaks for each forecast year are summarized in **Table 3-13.** This level of peaking is consistent with the mix of airport traffic and is expected to remain relatively unchanged during the planning period. These measures of activity are considered when calculating runway/taxiway capacity and transient aircraft parking requirements. No significant runway or taxiway capacity issues have been identified based on current or forecast peak activity levels. However, the heavy concentration of large helicopter activity during peak fire season contributes to congestion in the terminal area and creates some operational challenges for users.

TABLE 3-13: PEAK OPERATIONS (S33)

Aircraft Type	2020	2025	2030	2035	2040
Annual Operations	56,992	60,048	63,267	66,659	70,233
Peak Month Operations (24%)	11,968	12,610	13,286	13,998	14,749
Design Day Operations (average day in peak month)	399	420	443	467	492
Busy Day Operations (assumed 150% of design day)	499	525	554	583	615
Design Hour Operations (assumed 20% of design day)	80	84	89	93	98

Source: Century West Engineering

Military Activity

The FAA Terminal Area Forecast (TAF) lists 100 annual itinerant military operations at Madras Municipal Airport for 2019, and maintains this level of activity through 2045. The estimate of 2019 aircraft operations previously presented in **Figure 3-5** includes 240 military operations (helicopter and fixed wing), which are considered to represent a typical level of military activity at the Airport that would be maintained during the current planning period.

Military activity at the Airport includes helicopters and large fixed-wing aircraft in support of wildfire response, emergency response, search and rescue, and training activities. In addition to live event responses, National Guard parachute rescue jump training operations at the Airport occur throughout the year with C130 aircraft and ground support crews. Current military activity at the Airport is primarily generated by the Oregon Army National Guard (Chinook and Blackhawk helicopters) and the Oregon Air National Guard (C130 Hercules).

Air Taxi Activity

Air taxi activity includes for-hire charter flights, medevac flights, and some scheduled commercial air carriers operating under FAR Part 135. The current FAA TAF lists 609 annual air taxi operations at Madras Municipal Airport in 2019, with gradual increase to 945 operations projected in 2045.

The USDA-FS makes extensive use of contractors, which suggests that a portion of aerial fire operations would be categorized as air taxi. It is unknown whether the USDA-FS operator contracts are performed under FAR Part 135 or 91, but the nature of the activity suggests that it is appropriate to differentiate the activity from other general aviation flight activity regulated under FAR Part 91.

Based on the updated (2019) estimate of air traffic for the Airport, current air taxi activity is estimated at 2,552 operations, projected to increase to 3,145 operations in 2040. Air Taxi operations are projected to increase at the same rate as overall airport activity over the planning period.

Forecast Summary

A summary of the based aircraft and annual aircraft operations is presented in **Table 3-14.** These forecasts project moderate growth over the twenty-year planning period that is consistent with FAA's long-term expectations for general aviation in the region.

TABLE 3-14: FORECAST SUMMARY

Activity	2020	2025	2030	2035	2040
Itinerant Operations					
General Aviation	22,854	24,080	25,371	26,731	28,164
Air Taxi (Fire & Medevac)	2,552	2,689	2,833	2,985	3,145
Military	240	253	266	281	296
Total Itinerant Operations	**25,646**	**27,022**	**28,470**	**29,997**	**31,605**
Local Operations	31,346	33,026	34,797	36,662	38,628
Total Local & Itinerant Operations	**56,992**	**60,048**	**63,267**	**66,659**	**70,233**
Based Aircraft	97	102	106	111	116
Operations per Based Aircraft	588	589	597	601	605

Source: Century West Engineering

TERMINAL AREA FORECAST (TAF) COMPARISON

Per FAA forecasting guidelines, FAA review will be required for the recommended based aircraft and the aircraft operations models for comparison to the current TAF. A comparison of the forecast based aircraft and aircraft operations and the current TAF is summarized in **Table 3-15.**

The current TAF based aircraft and annual aircraft operations data at Madras Municipal Airport do not correlate with updated airport management based aircraft counts or the updated estimate of current aircraft operations prepared for the master plan. As a result, a comparison of the recommended master plan forecasts with the current TAF will not provide a valid basis for gauging the reasonableness of the forecasts.

Updated based aircraft data has been submitted by the Airport to FAA for review, separate from this forecast exercise. When an updated based aircraft total is accepted by FAA, the data will eventually populate the Airport Master Record Form (5010-1) and the TAF. Any update to the aircraft operations data in the 5010 and TAF would follow FAA approval of the master plan forecast.

TABLE 3-15: TAF COMPARISON

Based Aircraft	2020	2025	2030	2035	2040
Preferred Forecast	97	102	106	111	116
TAF	67	67	67	67	67
Percent Difference	**44.8%**	**52.2%**	**58.2%**	**65.7%**	**73.1%**

Aircraft Operations	2020	2025	2030	2035	2040
Preferred Forecast	56,992	60,048	63,267	66,659	70,233
TAF	11,249	12,656	14,245	16,027	18,036
Percent Difference	**406.6%**	**374.5%**	**344.1%**	**315.9%**	**280.3%**

Source: Century West Engineering

FIFTY-YEAR FORECAST

Fifty-year demand forecasts were prepared as required in the FAA-approved master plan scope of work by extrapolating the average annual growth rates (AAGR) for the recommended twenty-year based aircraft and aircraft operations forecasts. The purpose of the 50-year projection is to provide an estimate of demand that can be used to approximate long-term aviation use land requirements for the airport. **Table 3-16** summarizes the 50-year forecast including the intermediate 30- and 40-year based aircraft and aircraft operations.

TABLE 3-16: 50-YEAR FORECAST (S33)

	2020	2040	2050	2060	2070
Annual Operations	56,992	70,233	77,966	86,550	96,079
Based Aircraft	97	116	127	139	153

Source: Century West Engineering

Next Steps

The draft aviation activity forecasts will be submitted to the FAA Seattle Airports District Office (ADO) for review after City of Madras review is completed. Upon completion of their review, the FAA will provide comments, including requests for clarification, additional information, or revisions, if needed. Once the FAA accepts the forecasts, a letter of approval will be provided to the Airport. As noted in the chapter, a critical item related to the forecast approval is the selection of the current and future critical aircraft. These designations will confirm the appropriate design criteria, including Airport Reference Code (ARC), and Taxiway Design Group (TDG) to be used for each runway in the Madras Municipal Airport - 2020-2040 Airport Master Plan.

The draft aviation activity forecasts are used to evaluate the aeronautical facility requirements for the Airport in the following chapter (Chapter 4 – Facility Requirements). If any substantive changes to the forecasts result from FAA review and approval, adjustments will be made to specific demand-based facility requirements, as appropriate. The facility requirements evaluation will quantify current and future facility needs in general terms and volume.