

**CRATER LAKE**  
**KLAMATH**  
REGIONAL AIRPORT

# Master Plan

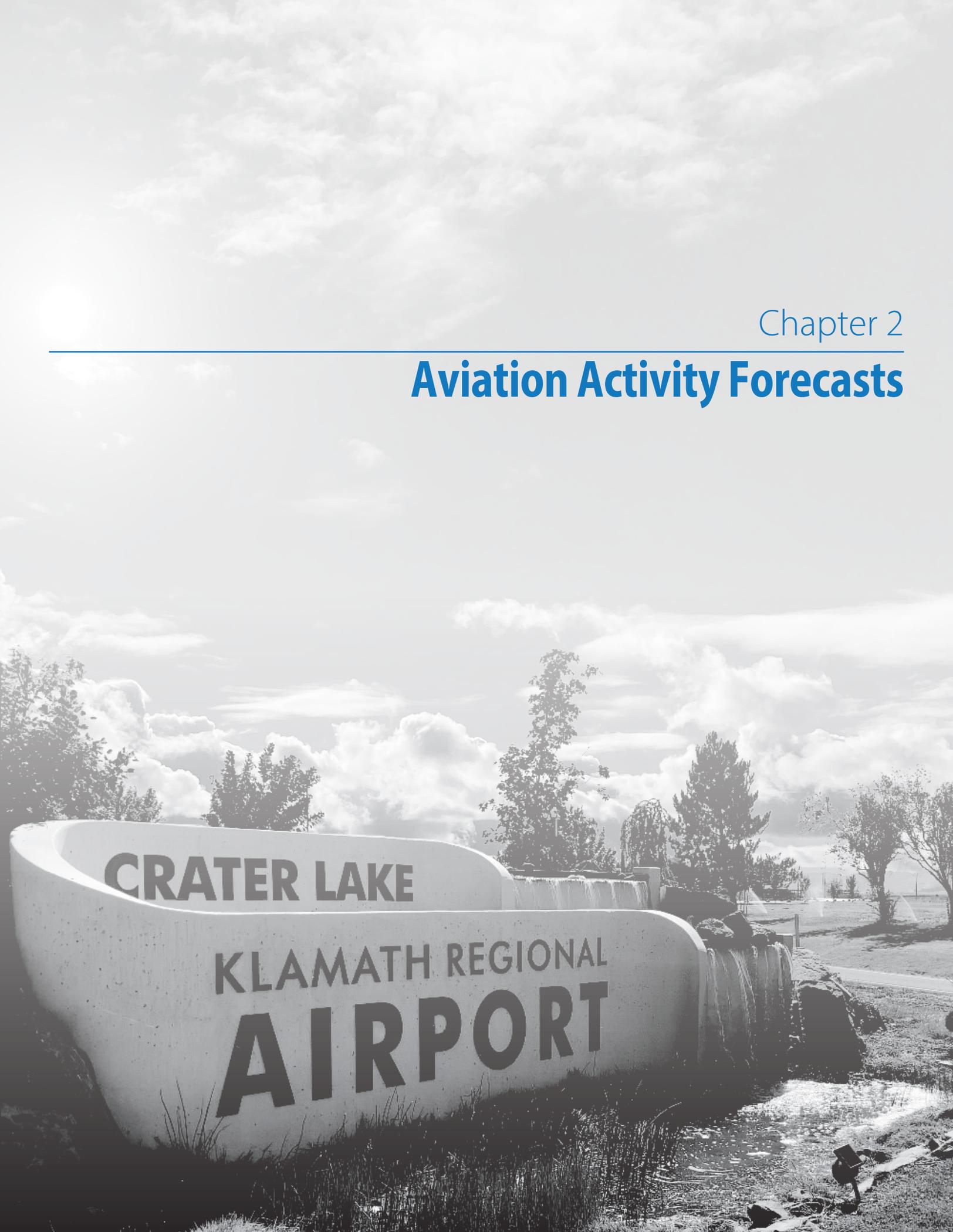
February 2021



Chapter 2

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# Aviation Activity Forecasts



CRATER LAKE

KLAMATH REGIONAL  
**AIRPORT**

# Forecasts

## INTRODUCTION

This chapter presents the aviation activity forecasts for the Crater Lake – Klamath Regional Airport (LMT). The aviation forecasts identify the 20-year aeronautical user demands. The forecasts are used to assess the type, timing, and allocation of future Airport infrastructure, equipment, and service needs in support of the Master Plan facility recommendations, alternatives, and project funding strategies.

## FORECAST OVERVIEW

**Table 2-1** summarizes the low and high forecast scenarios for the major aviation demand elements. Aviation activity is projected to steadily increase throughout the 20-year forecast period (2018-2038), in-step with Klamath Regional commerce. Although LMT activity is susceptible to economic downturns, the principal factors shaping the aviation demand forecasts are positive:

- ▶ The Klamath Region is steadily growing and emerging as a year-around recreational destination; LMT is expected to support expanding tourism.
- ▶ LMT traffic was negatively impacted by past economic downturns; however, LMT activity levels and forecast factors are trending upward.
- ▶ LMT airline service may resume, with most promising routes to Portland (PDX) or San Francisco (SFO).
- ▶ LMT scheduled air cargo service is stable and projected to increase in proportion with the Klamath Region commerce expansion.
- ▶ LMT general aviation growth is expected, largely through expanded Fixed Base Operator (FBO) and Special Aviation Service Organization (SASO) services including continued transition towards higher-performance turbine aircraft. Flight training and education programs at LMT are expected to grow in response to industry pilot-shortages.

**Table 2-1 : LMT Forecast Activity**

Demand Forecast Component (Annual Activity Totals)		Baseline Year Condition	20-Year Forecast	20-Year Forecast	Preferred Forecast Scenario	Preferred Forecast Scenario Direction
		2017/2018	2038-Low Scenario	2038-High Scenario		
<b>CIVILIAN ACTIVITY (PREFERRED FORECAST SHOWN BY BLUE SHADING)</b>						
Airline Passengers (Enplaned-Boarded)		18,000 (Historical Average)	15,500	30,600	Low	
Air Cargo (Total Pounds)		1,500,000	1,709,800	1,963,600	Low	
Based Aircraft (Civilian)		85	79	102	High	
Total Annual Aircraft Operations (Civilian + Military)		48,500	49,700	55,000	High	
Annual Aircraft Operations (Civilian Only)		31,600	32,700	38,000	High	
Flight Training (Annual Aircraft Operations)		9,700	9,700	11,100	High	
US Forest Service (Annual Aircraft Operations)		250	300	800	High	
<b>MILITARY (OREGON AIR NATIONAL GUARD)</b>						
Aircraft Operations (Military)		16,900	16,900	16,900	--	
Based Aircraft (Military)		32	32	32	--	

Note: Totals subject to rounding.

Note: LMT Master Plan does not forecast military operations for the Oregon Air National Guard (Oregon ANG).

Source: Mead & Hunt, Inc. 2018.

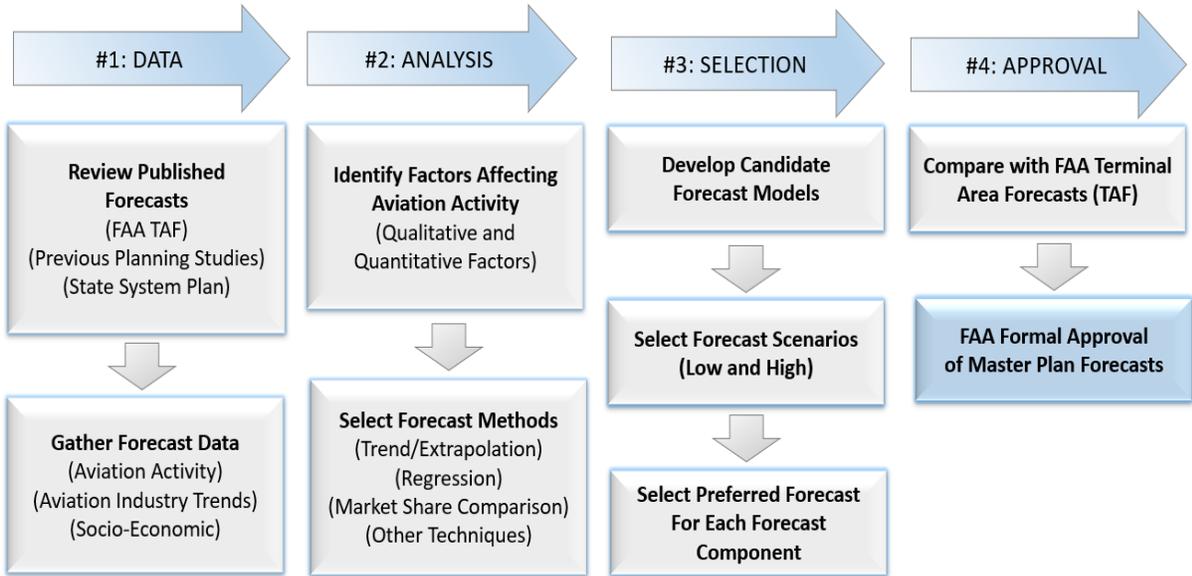
## FORECAST APPROACH

The aviation demand forecast quantifies a realistic expectation of future aeronautical demand at LMT over the next 20 years, as substantiated from LMT factors and aviation industry trends. The LMT forecasts are prepared for the following civilian aviation demand components:

- #1 Airline (annual enplaned passengers and aircraft operations)
- #2 Air Cargo (annual freight tonnage and aircraft operations)
- #3 Aircraft Operations (aircraft type/mix, FAA design category, and operational peaking)
- #4 Based Aircraft (aircraft type and FAA design category)
- #5 Critical Aircraft (aircraft type, characteristics, and FAA design category).

As illustrated in **Figure 2-1**, the forecasts are prepared consistent with technical and procedural guidance from Federal Aviation Administration (FAA) Advisory Circular 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. The FAA-approved forecasts are carried forward throughout the Master Plan.

**Figure 2-1 : Airport Master Plan Forecast Process**



Source: Mead & Hunt, Inc. 2018

### Forecast Timeline

The LMT Master Plan forecasts cover a 20-year planning period (2018 to 2038) with 2018 as the existing baseline year. Forecasts are identified for three planning phases: the short-term (2019-2023); the mid-term (2024-2028); and the long-term (2029-2038). Forecasts reflect the FAA fiscal year from October to September unless otherwise noted.

## Forecast Statistical Analysis

The LMT Master Plan forecasts follow FAA-acceptable statistical methods, including times-series trend, regression, comparative analysis, and market share techniques. Forecast projections are developed for a range of low (constrained) to high (unconstrained) demand scenarios. The forecast scenarios are supported by qualitative and quantitative factors to establish direct forecast causation, attain high statistical confidence, and sustainability. Factors are reported for each aviation demand element to reflect possible upward (+) and downward (-) influences on the 20-year demand and activity levels. The identification of these factors also helps determine the appropriate forecast methodology. The reported forecast values are rounded, with year-to-year total and net annual changes expressed in compounded annual growth rates (CAGR).

**Unconstrained Forecast (High):**

Leaning towards an unfettered demand, not overly influenced by constraining factors.

**Constrained Forecast (Low):**

Leaning towards factors restricting the projected demand and facility implementation.

## Guard (Military) Operations

In accordance with FAA guidance, military activity is not projected as part of the Master Plan. The FAA Terminal Area Forecasts (TAF) recognizes military aircraft operations; however, the FAA does not provide a forecast projection of military activity. Military traffic accounts for 17,000 to 20,000 annual aircraft operations (35 percent of total operations) and 32 military based aircraft (27 percent of total based aircraft). Below are the civilian and military airport users:

### *Civilian Users/Tenants*

- ▶ Commercial Operators (LMT air cargo and potential passenger air carrier)
- ▶ General Aviation and Fixed Base Operator – FBO (LMT Tenant)
- ▶ US Forest Service (LMT Tenant)
- ▶ Medical Flights (LMT Tenant)
- ▶ Agricultural Spray Service (LMT Tenant)
- ▶ Adversary Air (Oregon ANG private contract tactical training).

### *Military Users/Tenants*

- ▶ Oregon ANG 173<sup>rd</sup> Fighter Wing (LMT Tenant)
- ▶ Other military armed services branch training and exercises conducted at LMT.

## AVIATION FORECAST RESOURCES

Forecast data was collected from Airport records, user interviews/questionnaires, FAA data, Oregon DOT website data, Woods and Poole data for Klamath County, and aviation industry trade publications. Community and socioeconomic data were collected from Klamath County sources (see Appendix D *Forecast Supporting Data*). The following aviation resources were reviewed for historical and projected aeronautical activity and application to the Master Plan forecasts.

### FAA Aerospace Forecasts (Fiscal Years 2018 to 2038)

The *FAA Aerospace Forecasts* provides aviation industry projections by aeronautical sector. The FAA prepares this document annually to identify the 20-year demands on the nationwide airport and airspace system. This FAA aerospace data is referenced throughout this chapter and used to identify general aviation industry activity patterns including industry trends, the direction of future demand, and challenges to growth.

### FAA Terminal Area Forecasts (TAF)

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 developed in an unconstrained top-down manner, including activity for general aviation aircraft operations (itinerant and local activity) and total based aircraft. The TAF forecast methodology for individual airports is not published. Additionally, the TAF forecast may not reflect current airport activity as the TAF tends to lag by one year and does not consider local forecast drivers.

#### **FAA Terminal Area Forecasts (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 following summarizes the FAA TAF trends for LMT:

#### *Airline Enplaned Passengers (TAF 2018 to 2038)*

Total 20-year annual passenger projection remains the same as the 2018 level of 8,323 enplaned (boarding) passengers.

#### *Annual Aircraft Operations – Civilian (TAF 2018 to 2038)*

Total 20-year increase in civilian operations is 2,167 (108 annual average), from 30,941 in 2018 to 33,108 in 2038, a 7 percent overall growth and a 0.3 percent annual growth rate.

### *Based Aircraft – Civilian (TAF 2018 to 2038)*

Total 20-year increase of 39 based aircraft (2.0 annual average), from 85 in 2018 to 124 in 2038, a 46 percent overall growth and a 1.9 percent annual growth rate.

### *Military Activity (TAF 2018 to 2038)*

The TAF 20-year military projections provide no change to the total of 16,955 military aircraft operations (9,307 itinerant and 7,648 local) and 32 military based aircraft recorded since 2017. The Oregon ANG planning studies—Installation Development Plan (IDP); Joint Land Use Study (JLUS); and Installation Complex Encroachment Management Action Plan (ICEMAP)—do not provide military aviation activity projections for LMT. Therefore, the Master Plan recognizes the FAA TAF as the official record of projected military activity at LMT.

## FAA TAF REVIEW AND CONSISTENCY

The FAA reviews and approves Master Plan forecasts. The Master Plan forecasts are compared to the FAA TAF and are considered consistent 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 evaluates forecast consistency on reasonable planning assumptions, current activity data, and appropriate forecast methods. A comparison between the Master Plan forecast and the TAF forecast is provided in the Forecast Summary Section below.

## FORECAST COMPONENTS

### COMPONENT #1: AIRLINE FORECAST

The airline forecast is quantified by annual passenger enplanements and annual aircraft operations. The airline passenger forecast directly influences terminal building space allocation, aircraft apron parking, and auto parking/access. The airline outlook forecast is premised on airline service being re-established in the next 1 to 3 years. The forecast provides an anticipated air service scenario based on market conditions, industry factors, and discussions with regional airlines.

**Airline Outlook Forecast:** A scenario-based forecast that is only realized if airline service is reestablished at LMT.

The airline outlook forecast recognizes that the return of scheduled airline service is not guaranteed; and, the longer the absence of airline service during times of economic prosperity, the more difficult it will be to regain scheduled airline service.

## LMT Airline Historical Trends

Since 2000, three different carriers have served LMT and passenger enplanements have averaged 18,500 annually showing the ability to attract traveler demand under various airline operating models. The following describes airline market-based information used in developing the passenger enplanement forecasts. This background information provides a historical context of factors that could reasonably influence future passenger demand levels and the airline supply of services. Overall, this information helps substantiate the forecast methods and the range of forecast scenarios to provide an outlook if airline service returns to LMT.

### Trends

- ▶ Since 1990, LMT passenger enplanements historically averaged 18,500 per year; typically ranging between 8,500 and 32,000, and very consistent from month-to-month.
- ▶ LMT airline service had been provided mainly to Portland (PDX) and San Francisco (SFO) with 2 to 4 daily flights. Previous airlines included Alaska Airlines/Horizon (through 2008), United Express (1986-1987; 1993-1997; 2008-2014); American Eagle (1987-1993); Reno Air (1994-1995); Pen Air (2016-2017) which declared bankruptcy. Passenger enplanements were highest from 1999 to 2008, during Alaska/Horizon service.
- ▶ The LMT airline catchment area generates 153,000 total inbound and outbound passengers per year. The LMT passenger retention is approximately 8 percent, equivalent to 12,240 passengers ( $153,000 * 8 \text{ percent} = 12,240 \text{ passengers}$ ), with 92 percent leakage to other commercial airports (Medford-MFR captures about 65 percent and Portland-PDX about 15 percent).
- ▶ LMT passenger and aircraft seat capacity has declined since the 2008 recession.

## LMT Airline Catchment Area and Passenger Retention

The LMT true passenger market area, which includes Klamath County and Lake County, Oregon, and the northern portions of Siskiyou County and Modoc County, California, totals 153,000 per year or the equivalent of 210 origin and destination passengers daily each way (PDEW). Approximately 7 to 8 percent of the total passengers are captured by LMT, equivalent to 14.4 PDEW.

### Industry Trends – Regional Airlines

The *FAA Aerospace Forecasts* show the regional airline sector has experienced nationwide market share contraction and shrinking aircraft capacity, resulting in declining passengers, seat capacity, 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

**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.

**Commuter Operator:** A company which operates airplanes designed to have no more than 60 passenger seats that provides scheduled passenger service of five or more round trip flights per week on at least one route according to published flight schedules.

continued growth of the national economy. 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.

## **LMT Forecast Factors – Airline Service**

Development of the forecast scenarios considered and incorporated the following factors and trends, which could influence the unconstrained aircraft operation forecasts.

### **Upward Factors (+)**

- ▶ City of Klamath continues to aggressively pursue airline service.
- ▶ Klamath Basin commerce is growing about two percent per year.
- ▶ Klamath tourism is increasing attracting 900,000 annual visitors.
- ▶ Regional airlines are showing interest in the Klamath recreational/tourist passenger market.
- ▶ Potential passengers are coming from the northern California catchment area.
- ▶ Passengers may choose to use LMT because of extended drive and travel times to alternative airports during winter months. Approximate drive times are shown below:
  - Medford-MFR is the nearest small-hub commercial airport (80 miles; ±1.4-hour drive)
  - Portland-PDX is the nearest large-hub commercial airport (290 miles; ±5.2-hour drive)
  - San Francisco-SFO is the nearest international hub airport (365 miles; ±5.8-hour drive).

### **Downward Factors (-)**

- ▶ Regional airline prorated service agreements with mainline carriers limit rural service.
- ▶ Regional airline industry is suffering from pilot shortages and flight cancellations.
- ▶ Regional airline industry is phasing-out aircraft fleets with less than 50-passenger seats.
- ▶ Mobilizing Transportation Security Administration (TSA) personnel is time-consuming.
- ▶ LMT is not a US DOT designated Essential Air Service (EAS) location or route.

## **LMT Airline Service Factors**

- ▶ Possible LMT city-pair (hub airport) destinations are typically within 1,000 statutory miles.
- ▶ Connecting service was not considered due market demand and proximity to MFR.
- ▶ There is a challenge pairing LMT airline service (aircraft seat size, flight distance, and yields) with LMT passenger demand (load factors) in consideration of airline hub practices and pro-rated agreements between the mainline air carriers and the regional affiliates (Horizon and SkyWest).

## LMT Forecast Scenarios - Airline Passenger

**Figure 2-2** provides a graph and table of the historical and 20-year forecast of airline passenger enplanements at LMT. The airline passenger forecast is based on the analysis of potential reinstatement of airline service at LMT. The airline passenger forecast provides an outlook into how many potential enplanements will use LMT between 2018 to 2038 if airline service is reinstated. The first three years of service, forecasts beginning in 2019/2020, were graduated to reflect service introduction and/or a partial year of service.

The airline passenger forecast provides a low range and high range of potential future enplanements. These ranges are boundaries for the minimum and maximum potential enplanements at LMT if airline service is reinstated. Development of the forecast scenarios considered and incorporated the following factors, which could influence the airline passenger forecasts:

**Low Scenario (Preferred):** True Passenger Market Retention Growth Rate  
15,500 by 2038

**High Scenario:** Enplanements per Population Growth Rate  
30,600 by 2038

**FAA TAF:** Enplanement Projection – No Change  
8,323 through 2038

**Low Scenario (Preferred Forecast):** This method forecasts passenger enplanements using the 7.0 to 8.0 percent LMT passenger retention applied to the 153,000 LMT airline passenger catchment area. The true passenger market share was increased to reflect population growth in Klamath County and applies the 0.5 percent annualized population growth rate throughout the 20-year planning period. This forecast methodology results in 15,500 enplaned passengers by 2038. The low scenario reflects a historically supported catchment of true passengers and is consistent with past LMT air service factors. This scenario represents the lower range of passenger enplanements representative of airline service and passenger demand during slower economic periods. The low scenario range reflects the return of scheduled airline service (airline operators, aircraft type, flight frequency, route-destination, and passenger demand levels) commensurate with historical activity levels within the past 10 years.

**High Scenario:** This forecast projects passenger enplanements based on the historic ratio of enplanements to Klamath County population, an historically reliable trend of population. This forecast results in 30,600 enplaned passengers by 2038. The high scenario range reflects passenger levels during economic prosperity, such as the current period for Klamath Region. This projects airline service (airline operators, aircraft type, flight frequency, route-destination, and passenger demand levels) equivalent to a longer historical period during the past 20 years.

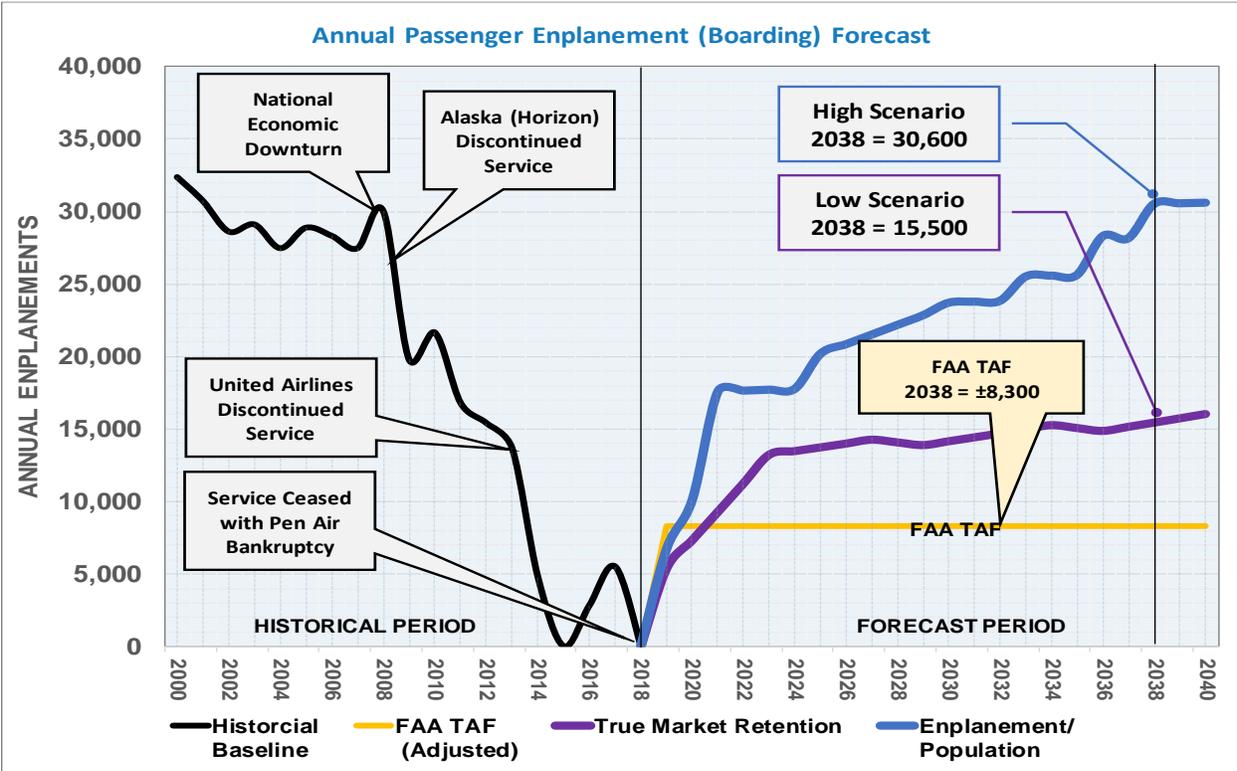
**Preferred Forecast Summary and Reasonableness (Low Scenario):** The 2038 forecast includes a range between 15,500 and 30,600 enplanements with the low forecast scenario preferred. Under the low scenario, airline service is reestablished with enplanement volumes anticipated to reflect historic levels and increase commensurate with regional commerce expansion and regional population growth. Additionally, the low scenario is reasonable with the LMT Airline Catchment Area retention. The ability of LMT to attract

a larger or broader segment of the passengers within the catchment area market would be the largest influence on attracting an air carrier provider, upward load factors, and future Airport passenger levels. The low forecast scenario exceeds the FAA TAF.

Also, a legislative rulemaking change providing LMT entry into the Essential Air Service (EAS) subsidy program could have a profound affect in regaining air service, even though EAS airports served by a single carrier can be susceptible to changing airline practices. Common with national trends, future air service challenges might involve the transition to larger aircraft (more passenger seats) and the balancing of competitive airfares to support airline operating yields under a climate of increasing airline costs, as well as incentivizing air travelers not to use alternate commercial airports.

**Essential Air Service (EAS):** A USDOT subsidized program to maintain a minimal level of scheduled air service for eligible small communities; generally accomplished with two daily round trips with 30 to 50-seat aircraft or additional frequencies with aircraft with 9-seat or fewer - usually to a large or medium-hub airport.

Figure 2-2 : Airline Enplanement Forecast



Airline Enplanements - Forecast Scenarios				
Year	Historical Baseline	FAA TAF (Adjusted)	Low Scenario	High Scenario
			True Market Retention	Enplanement/Population
2018	0	0	0	0
2019	-	8,323	5,400	6,800
2023	-	8,323	13,300	17,800
2028	-	8,323	14,100	22,200
2033	-	8,323	15,100	25,600
2038	-	8,323	15,500	30,600
2040	-	8,323	16,100	30,700
20-Year Change	-	0	15,500	30,600
20-Year Average	-	0.0	775	1,530
20-Year % Change	-	0.0%	117%	172%
% CAGR	-	0.0%	1.0%	3.7%

Source: Mead & Hunt, Inc. 2018

**Table 2-2** summarizes airline service activity projections commensurate with the preferred passenger enplanement forecast. The activity reflects scheduled airline service and does not include non-scheduled operators offering on-demand or air taxi service.

**Table 2-2 : Forecast Airline Service Outlook Summary**

AIRLINE SERVICE SUMMARY - SCHEDULED SERVICE						
Year (Fiscal)	Annual Airline Passengers			Annual Airline Aircraft Operations		
	Enplaned	Deplaned	Total	Air Carrier	Commuter	Total
2000	32,407	32,407	64,814	--	--	--
2005	28,912	28,912	57,824	--	--	--
2010	21,670	21,670	43,340	--	--	2,730
2015	0	0	0	--	--	0
2016	2,818	2,818	5,636	--	--	306
2017	5,505	5,505	11,010	--	--	898
2018	0	0	0	--	--	0
2019	5,400	5,400	10,800	--	1,040	1,040
2023	13,300	13,300	26,600	--	1,248	1,248
2028	14,100	14,100	28,200	--	2,184	2,184
2033	15,100	15,100	30,200	--	2,184	2,184
2038	15,500	15,500	31,000	--	2,496	2,496
2040	16,100	16,100	32,200	--	2,496	2,184
CAGR (00-17)	-16.2%	-16.2%	-16.2%	--	--	
CAGR (17-37)	5.3%	5.3%	5.5%	--	--	
Year	Airline	Aircraft Type	Aircraft Model	Aircraft Seats	Average Daily Departures	Average Load Factor
2000	Horizon	Turboprop	Q-200	37	2 to 4	50% to 75%
2005	Horizon	Turboprop	Q-200	37	2 to 4	50% to 75%
2010	Horizon	Turboprop	Q-200	37	2 to 4	50% to 75%
2015	--	--	--	--	--	--
2016	--	--	--	--	--	--
2017	PenAir	Turboprop	Saab 340	32	2 to 3	30% to 40%
2019	--	--	--	--	--	--
2023	Regional	Turboprop/Jet	--	32 to 76	2 to 4	50% to 75%
2028	Regional	Turboprop/Jet	--	32 to 76	2 to 4	50% to 75%
2033	Regional	Turboprop/Jet	--	32 to 76	2 to 4	50% to 75%
2038	Regional	Jet	--	32 to 76	2 to 4	50% to 75%
2040	Regional	Jet	--	32 to 76	2 to 4	50% to 75%

Note: Passengers = Enplanements and Deplanements, Operations = Takeoffs and Landings

Note: Load Factor = Seats / Passengers. Load Factor includes Enplaning and Deplaning Passengers

Source: Mead & Hunt, Inc. 2018.

## COMPONENT #2: AIR CARGO

The air cargo forecast is quantified by annual freight tonnage and aircraft operations. The air cargo forecast directly influences the planning of landside building area, aircraft parking allocation, delivery vehicle access, and auto parking.

### LMT Historical Trends

The two air cargo operators, FedEx (operated by Empire) and UPS (operated by Ameriflight), are integrated cargo operators using aircraft for air cargo shipments. Combined, the two cargo operators transport 1.5 million pounds annually by air, with 63 percent shipped inbound and 37 percent shipped outbound. On average, FedEx accounts for 75 percent and UPS accounts for 25 percent of the total air cargo pounds. Since 2010, the air cargo total pounds and market share have exhibited stability.

### Industry Trends - Air Cargo

The *FAA Aerospace Forecasts* reports a maturation of the domestic air cargo market, having increased 0.2 percent annually over the last 10 years. The most notable air cargo industry changes have been caused by global economic contraction, a shift from air-to-truck modes, higher fuel costs, more stringent Transportation Security Administration (TSA) air cargo security regulations, and the decline in mail caused by electronic substitutes. Per FAA forecasts, all-cargo revenue ton mile growth is expected through increased rates paid for shipment of air cargo and not through expanded tonnage. The FAA forecasts a 1.2 to 2.0 percent annual revenue ton mile increase over the next 20 years.

### LMT Forecast Factors – Air Cargo Service

The following are upward and downward forecast factors considered as part of formulating the forecast methodology and projections in developing the low and high forecast scenarios:

#### Upward Factors (+)

- ▶ LMT air cargo market and service are exhibiting consistency.
- ▶ Klamath commerce is growing about two percent annually.
- ▶ FedEx and UPS are expected to continue serving the LMT air cargo market.
- ▶ LMT inbound cargo is expected to grow in proportion to outbound cargo.
- ▶ Larger turboprop air cargo transport aircraft (Beechcraft 1900, Embraer 120, ATR 42/72) are anticipated to supplement LMT peak-season air cargo volumes.

#### Downward Factors (-)

- ▶ Trucks are expected to compensate for fluctuations in annualized air cargo volumes and shipments.
- ▶ A return of airline service and air carrier belly cargo could lower FedEx and UPS air volumes.

## LMT Forecast Scenarios – Air Cargo

Future cargo volumes are expected to coincide with local commerce growth. Klamath County's commerce is growing between 1 and 2 percent annually and is moving from producer-based market to a consumer-based market. Air cargo is traditionally correlated with gross domestic product patterns. The air cargo operators responded to a survey and their responses indicate they do not anticipate significant changes to future activity or route logistics.

Frequency of air cargo flights and delivery schedules are expected to remain similar to current levels. In addition, neither cargo operator anticipates aircraft cargo volumes would regularly exceed the usable payload of the dedicated turboprop aircraft currently being operated. As an industry standard practice, when total cargo sort volumes increase, trucks rather than aircraft are commonly used to accommodate fluctuating volumes. Inbound air cargo will likely be attributed to retail, while outbound air cargo would be associated more with industries with low-inventory and high-value components.

The air cargo forecast is based on the analysis of nine years of air cargo data, from 2010 to 2018. This period reflects the extent of available air cargo data records. Both UPS and FedEx have reported seeing longer peak season air cargo volumes. As reported by UPS and FedEx, inbound cargo and outbound cargo will both grow; this is attributed to the growth of commerce and a stronger consumer market than producer market in Klamath County.

**Figure 2-3** provides a graph and table of the historical and 20-year forecast of air cargo pounds at LMT. The following describes the forecast scenarios under consideration:

**Low Scenario (Preferred):** Total Retail Sales (in 2018 dollars) Growth Rate  
1.7 Million Pounds by 2038

**High Scenario:** Gross Regional Product (GRP) Growth Rate  
1.9 Million Pounds by 2038

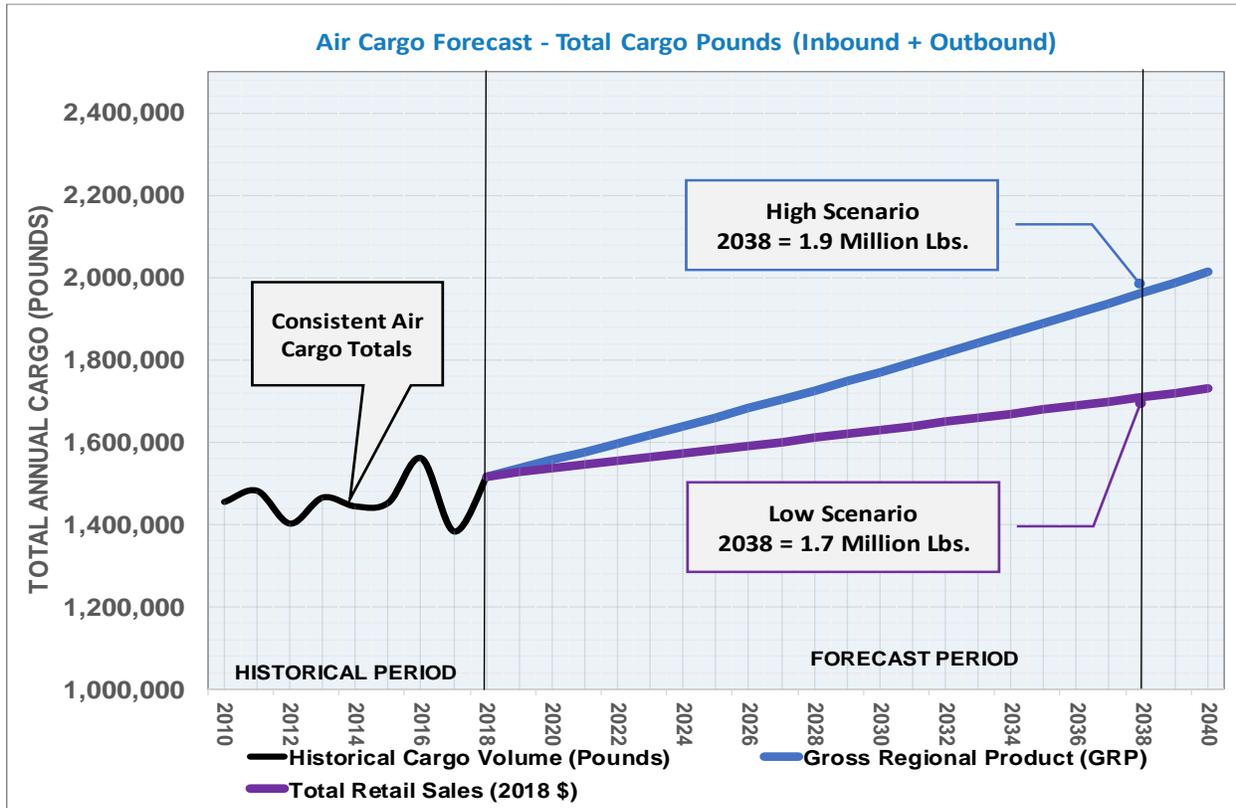
**FAA TAF:** TAF Does Not Provide Air Cargo Forecasts

**Low Scenario (Preferred):** This forecast is based on the total retail sales (TRS) in Klamath County between 2018 to 2038 using an annualized 0.6 percent Woods & Poole projection. This results in 1.7 million pounds of total air cargo by 2038. For forecast purposes, this 12.6 percent total increase in cargo volume is split proportionately between inbound and outbound cargo. The low forecast scenario is consistent with the low growth rate of historical air cargo trends.

**High Scenario:** This forecast is based on gross regional product (GRP) in Klamath County between 2018 to 2038; using an annualized 1.3 annual percent Woods & Poole projection. This local growth towards medical and technology industries is expected to result in increased air cargo volumes. The high forecast scenario is consistent with a growth rate exceeding historical air cargo trends, but still consistent with nationwide air cargo industry trends.

**Preferred Forecast Summary and Reasonableness (Low Scenario):** Air cargo volumes are anticipated to increase commensurate with Klamath regional commerce expansion, especially in support of the emerging medical and technical business base. From the FedEx and UPS survey responses, air cargo logistics (routes, aircraft equipment type, yearly flight frequency) are not expected to change significantly during the 20-year forecast period to accommodate the expected growth of Klamath Region cargo/freight volumes. Therefore, the preferred low forecast scenario is reasonable in terms of air cargo service logistics. As typical in the air cargo industry, integrated shipping companies (FedEx and UPS) would commonly add daily flights for supplementing high-peak priority package volumes and use delivery trucks to supplement fluctuations in bulk cargo volumes during high volume seasonal periods. This is also true when aircraft cannot be dispatched due to weather or other operating conditions. While air cargo volumes are expected to grow beyond levels experienced in the past, the forecast growth is not expected to result in a significant change to air cargo service, flight logistics, air cargo infrastructure, or future facility improvements.

Figure 2-3 : (Exhibit & Table): Air Cargo Volume Forecast



Air Cargo - Forecast Scenarios			
Year	FAA TAF	Low Scenario	High Scenario
		Total Retail Sales (2018 \$)	Gross Regional Product (GRP)
2018	N/A	1,517,821	1,517,821
2019	N/A	1,526,800	1,537,400
2023	N/A	1,563,600	1,618,700
2028	N/A	1,610,900	1,726,300
2033	N/A	1,659,600	1,841,100
2038	N/A	1,709,800	1,963,600
2040	N/A	1,730,300	2,014,800
20-Year Change	N/A	191,979	445,779
20-Year Average	N/A	9,599.0	22,289.0
20-Year % Change	N/A	12.6%	29.4%
% CAGR	N/A	0.6%	1.3%

Source: Mead & Hunt, Inc. 2018

## COMPONENT #3: CIVILIAN AIRCRAFT OPERATIONS AND PEAKING

The aircraft operations forecast is quantified by total annual civilian aircraft operations (takeoffs and landings). The forecast includes activity by both commercial operators and general aviation. The forecasts directly influence the planning of airfield infrastructure and facilities as well as to landside space allocation and access.

### LMT Historical Trends

Aircraft operations involve only civilian aircraft operations, no military operations. LMT reported 31,600 civilian aircraft operations in 2018. Historically, operations have increased since 2012. Civilian itinerant and local operations are increasing, with local operations increasing the most.

**Aircraft Operation:** Aircraft operations, defined as either a takeoff or a landing, determine the year-by-year total number of annual operations.

### Industry Trends – Commercial Operators

The commercial operations include activity by scheduled and non-scheduled aircraft operators for the transport of passengers and freight. The commercial users are tending to transition to larger and more complex aircraft, as evidenced by the industry trends identified for the airline and air cargo forecast components.

**Commercial Operator:** The carriage by aircraft in air commerce of persons or property by aircraft for compensation or hire.

### Industry Trends - General Aviation

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, it provides a transportation benefit for commerce within the Klamath Falls region, and throughout a vast portion of the country, including international. As described below, the Master Plan considers trends and forecast factors, by general aviation industry sector, as documented in various aeronautical reports and publications. A review of industry trends provides insight into drivers of past change and emerging forecast directions.

**General Aviation:** Activity by aircraft flown for private and business purposes, comprising recreational, sport, flight instruction, on-demand charter, tourism, and governmental.

Nationwide, the overall general aviation industry is experiencing prolonged slow growth, and an aircraft fleet continuing to undergo transition. In terms of aircraft production and flight hour utilization, the combined piston fleet is declining by 0.5 percent annually, while the combined turbine (turboprop and business jet) fleet is growing at 2.5 percent annually.

The single and multi-engine piston aircraft fleet is experiencing continued reduction/retirement, coupled with declining production of single and twin piston aircraft. Turboprop aircraft utilization is increasing, but with moderate single-turboprop production and stagnant twin-turboprop production. The business jet, helicopter, and experimental/light sport piston aircraft segments are seeing continued increases in aircraft utilization and production rates.

According to the FAA 2015 *General Aviation and Air Taxi Survey*, the general aviation industry is experiencing growth resulting from corporate aircraft utilization, fractional ownership programs, student and commercial pilot training, and growth of the experimental/sport aircraft segment. Factors impeding industry growth involve escalating aircraft operating costs (e.g. purchase price, rental, maintenance, fuel, insurance and taxes), an overall national decline in private pilot populations, more demanding pilot and aircraft regulatory requirements (pilot qualifications, Automatic Dependent Surveillance Broadcast (ADS-B)-equipped aircraft timeline), and competing interests for personal income and leisure time.

## Forecast Factors

The following are upward and downward forecast factors considered as part of formulating the forecast methodology and projections in developing the low and high forecast scenarios:

### Upward Factors (+)

- ▶ The Klamath regional economy is growing, and dependent on LMT aeronautical services.
- ▶ LMT offers facilities and services (ATCT, ARFF) for commercial and general aviation users.
- ▶ Air cargo (FedEx and UPS) is expected to continue similar express and freight services.
- ▶ US Forest Service activity is expected to increase, and transition to transport jet aircraft.
- ▶ Adversary Air is increasing Oregon ANG tactical training activity.
- ▶ Pelican Aviation anticipates increases in flight training and student pilots.
- ▶ Precision Aviation anticipates increases in flight training and student pilots.
- ▶ Agricultural aircraft operator activity is expected to remain and continue to grow.
- ▶ Nationwide turbine and helicopter fleet production and utilization are increasing.
- ▶ Nationwide light/experimental piston fleet production and utilization are increasing.

### Downward Factors (-)

- ▶ General aviation industry piston fleet production and flight-hour utilizations are declining.
- ▶ Availability of hangar space is limited; aircraft owners are requesting larger hangar space.
- ▶ General aviation pilot population is in decline and the pilot population is aging.
- ▶ Aircraft attrition is caused by aging aircraft.
- ▶ General aviation operating costs and regulatory requirements are increasing.

## Forecast Scenarios – Civilian Aircraft Operations

**Figure 2-4** depicts the forecast of total annual operations over the 20-year forecast period. Aircraft activity was assessed by aircraft-type category, as each activity segment is characterized by unique industry influences and user factors. This operational segmentation allows a more comprehensive analysis for future commercial and general aviation activity levels. The following describes the forecast scenarios:

**Low Scenario:** LMT Historical Trend – Percent  
32,700 annual operations by 2038

**High Scenario (Preferred):** LMT Historical Trend - Additives  
38,000 annual operations by 2038

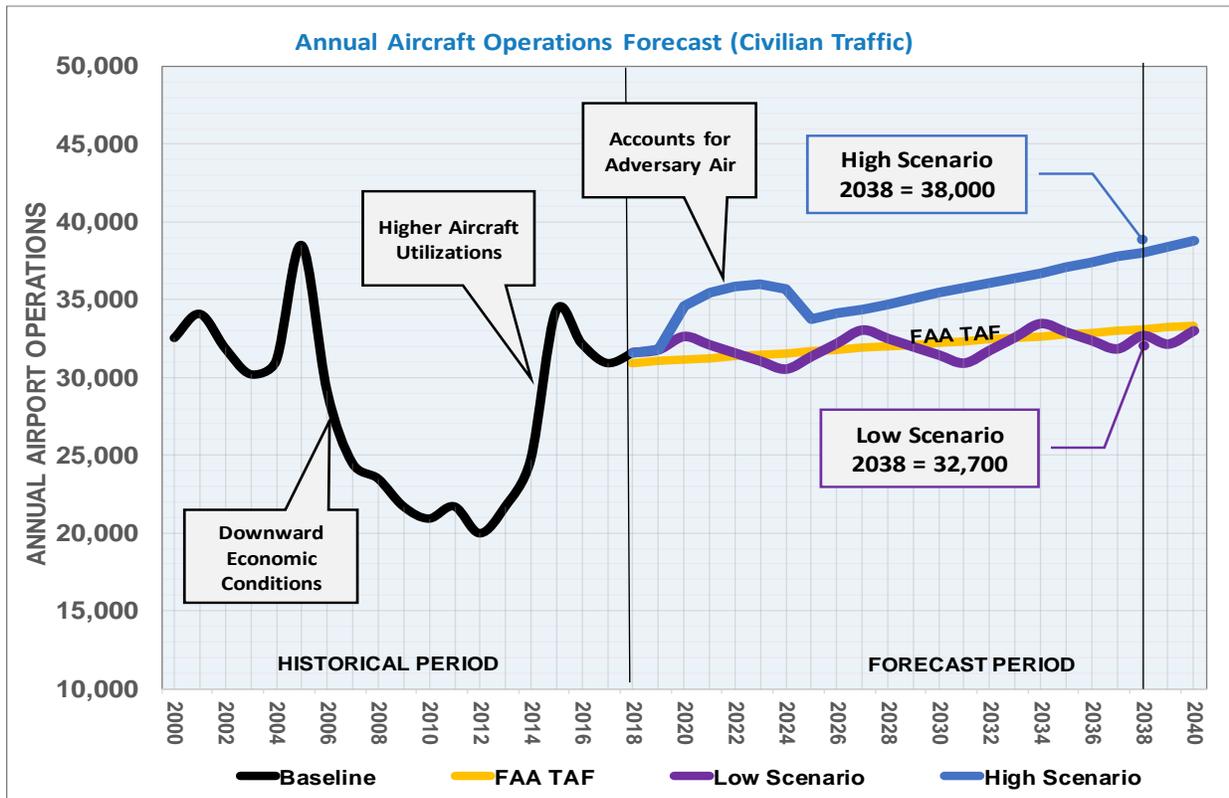
**FAA TAF:** Operations Projection  
33,108 annual operations by 2038

**Low Scenario:** This forecast approach uses a 15-year historical traffic trend to project future aircraft operations. This results in 32,700 operations by 2038, an annualized 0.3 percent growth rate. This forecast approach was dismissed from further consideration because it does not reflect the key upward operational factors (flight training, Adversary Air, FBO service improvements) expected beyond 2019.

**High Scenario (Preferred):** This forecast approach uses a 5-year historical civilian traffic trend adjusted to reflect the upward trendline of civilian operations experienced from 2012 to 2018. This forecast results in 38,000 operations by 2038, an annualized 0.9 percent annual growth. In addition, this forecast has been adjusted to reflect Adversary Air activity (Adversary Air provides military training support starting in 2019 and forecast through 2023 and is expected to generate an additional 2,500 to 5,000 LMT annual civilian operations).

**Preferred Forecast Summary and Reasonableness (High Scenario):** The high forecast scenario closely aligns with the LMT forecast factors and continued Klamath region economic expansion. LMT aircraft operations show stability, and sustainable growth. In addition, the high forecast scenario is consistent with recent historical trends and FAA industry utilization forecasts; projecting civilian operations will return to historical LMT levels, including a transition towards turbine aircraft which have a higher operational utilization than piston aircraft. The high forecast scenario exceeds the 2018 FAA TAF.

Figure 2-4 : Total Annual Aircraft Operations (Civilian)



Aircraft Operations - Forecast Scenarios				
Year	Baseline	FAA TAF	Low Scenario	High Scenario
			Trend - Percents	Trend - Additives
2018	31,600	30,941	31,600	31,600
2019	-	31,356	31,800	31,700
2023	-	31,462	31,100	36,000
2028	-	31,999	32,600	34,600
2033	-	32,546	32,700	36,300
2038	-	33,108	32,700	38,000
2040	-	33,338	33,100	38,800
20-Year Change	-	2,167	1,100	6,400
20-Year Average	-	108.4	55.0	320.0
20-Year % Change	-	7.0%	3.5%	20.3%
% CAGR	-	0.3%	0.2%	0.9%

Source: Mead & Hunt, Inc. 2018  
 Aircraft Operational Peaking – Preferred Forecast Scenario

**Table 2-3** summarizes the peaking activity forecast for the preferred 20-year operational forecast scenario, including a breakdown of traffic by peak periods. 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.

**Table 2-3 : Aircraft Operational Peaking (Civilian)**

AIRCRAFT OPERATIONAL PEAKING (CIVILIAN)					
Operational Peaking Components	Calculation Factor	2018	Forecast Demand Activity		
			2019	2038	20-Yr. Change
<b>Annual Operational Activity (Civilian)</b>					
<b>Total Annual Operations</b>	--	<b>31,600</b>	<b>31,800</b>	<b>38,000</b>	<b>6,200</b>
Itinerant	60%	18,960	19,080	22,800	3,720
Local	40%	12,640	12,720	15,200	2,480
Visual (VFR)	90%	28,282	28,461	34,010	5,549
Instrument (IFR)	10%	3,160	3,180	3,800	620
Daytime	96%	30,336	30,528	36,480	5,952
Nighttime	4%	1,264	1,272	1,520	248
Touch & Go	15%	4,740	4,770	5,700	930
Flight Training	15%	4,740	4,770	5,700	930
<b>Runway Operational Activity</b>					
Runway 14/32	88%	27,808	27,984	33,440	5,456
Runway 7/25	12%	3,792	3,816	4,560	744
<b>Monthly Operational Activity</b>					
Peak Month	15.0%	4,740	4,770	5,700	930
Average Week	Avg. Day/7	677	681	814	133
Average Day - Operations	365 Days	87	87	104	17
Average Day - Flights	Ops/2	43	44	52	8
Average Day Peak Month	30.5 Days	156	157	188	31
<b>Hourly Operational Activity</b>					
Peak Hour	12%	10.4	10.5	12.5	2.0
Peak Hour - Itinerant	60%	6.2	6.3	7.5	1.2
Peak Hour - Local	40%	4.2	4.2	5.0	0.8
Peak Hour - Instrument (IFR)	20%	2.1	2.1	2.5	0.4
Peak Hour - Visual (VFR)	80%	8.3	8.4	10.0	1.6

Source: Mead & Hunt, Inc. 2018

Peak activity levels are derived from annual aircraft operations, broken-down by month, day, and hour periods. According to FAA Advisory Circular 150/5060-5 *Airport Capacity and Delay* guidance, the average-day-peak-month (ADPM) is used to define an airport's busy period to avoid constructing facilities that will rarely be used. The ADPM peaking percentages, or calculation factors are substantiated from Airport traffic records which show the percent ratios are planned to remain consistent throughout the 20-year forecast period.

## COMPONENT #4: BASED AIRCRAFT

The based aircraft forecast is quantified by total civilian aircraft stored at LMT 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 landside facilities, space allocation, property assets, and access.

### Trends

Since 2008, there have been two reasons for based aircraft declines: the national recession and aircraft reporting inconsistency. In terms of based aircraft demand, all hangars are currently occupied. The hangar waitlist is eight aircraft, with two owners ready to base their aircraft at LMT when hangar space becomes available.

### Existing Based Aircraft

LMT reports 117 total aircraft, of which 85 are civilian based fixed-wing and helicopter aircraft and 32 are military based aircraft. The 85 civilian based aircraft are comprised of:

- ▶ Piston - 69
  - Single Engine Piston - 67
  - Twin-Engine Piston - 2
- ▶ Turbine Turboprop - 8
  - Single Engine Turboprop - 6
  - Twin-Engine Turboprop - 2
- ▶ Helicopter - 1
  - Helicopter (Piston) - 1
  - Helicopter (Turbine) - 0
- ▶ Turbine Jet - 9
  - Small-Cabin Business Jet - 4
  - Large-Cabin Business Jet - 5  
(2 Falcon 50 jets based in December 2018)

Century Aviation (FBO) owns and operates the following turbine aircraft (turboprop/business jet):

- ▶ 5 - Falcon 50 (ARC B/C-II)
- ▶ 1 - Falcon 900 (ARC B/C-II)
- ▶ 1 - Hawker 800XP (ARC B-II)
- ▶ 1 - Lear 55 (ARC C-I)
- ▶ 1 - Lear 35 (ARC D-I)
- ▶ 1 - Turbo Commander (ARC B-II).

## FAA TAF Indexed Based Aircraft

The FAA TAF indicates 140 total based aircraft, this includes 32 military aircraft listed as *other*. Historically, the FAA TAF appears to have included military aircraft as part of the total based aircraft and this has tended to overstate the number of actual civilian based aircraft. For this reason, the FAA TAF has been indexed to the current 85 civilian based aircraft, while applying the same FAA TAF forecast growth rate of 2.0 aircraft per year.

## Forecast Factors

Assessment of the based aircraft activity is by aircraft-type category, unique operator, and industry factors that influence each segment. The following are upward and downward forecast factors considered as part of formulating the forecast methodology and projections in developing the low and high forecast scenarios:

### Upward Factors (+)

- ▶ LMT hangar waiting list is averaging two to eight new based aircraft owners.
- ▶ Flight training and college flight training programs are showing potential expansion.
- ▶ Flight training operators are anticipating based aircraft increases.
- ▶ High California taxation and airport rental rates make LMT attractive.
- ▶ Klamath region has a heightened aviation presence resulting from the Oregon ANG.
- ▶ Klamath Region has favorable flying and weather conditions.

### Downward Factors (-)

- ▶ Aircraft attrition due to aging aircraft owners, pilot populations, and sales of aging aircraft affect the number of based aircraft.
- ▶ Self-service fuel dispensing is not available.
- ▶ Rising aircraft ownership and operating cost are occurring.
- ▶ Expanding FAA regulations are affecting pilot and aircraft certification.

## Forecast Scenarios – Based Aircraft

**Figure 2-5** summarizes the 20-year total based aircraft forecast.

**Low Scenario:** FAA Aerospace Forecast Industry Growth Rates  
79 Based Aircraft by 2038

**High Scenario (Preferred):** LMT Hangar Waiting List/Construction Schedule  
102 Based Aircraft by 2038

**FAA TAF:** Based Aircraft Projection (179 Based Aircraft by 2038)

**FAA TAF (Indexed):** Based Aircraft Projection (124 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) 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, and 1.5 percent for helicopters. 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 LMT forecast factors:

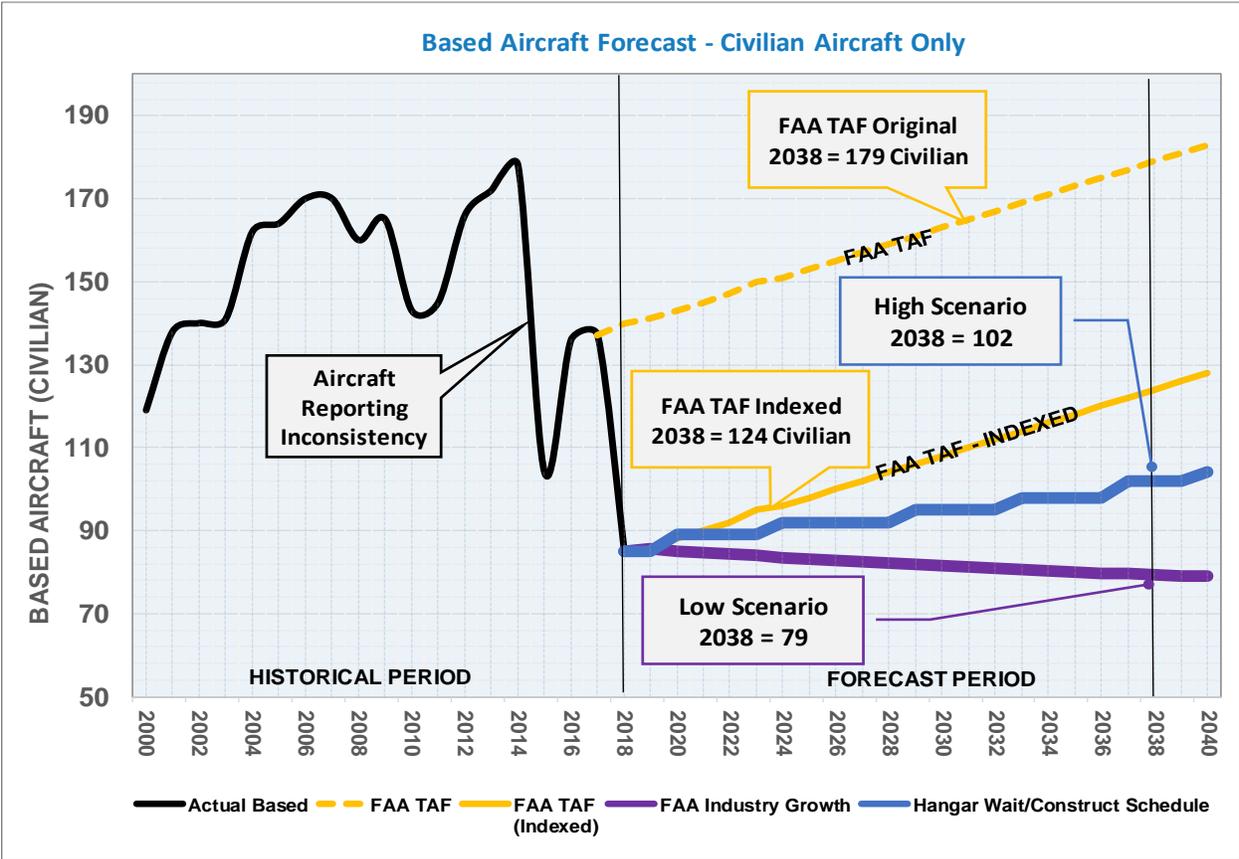
- ▶ Aircraft and pilot attrition will outpace new based aircraft.
- ▶ There is a decline of general aviation piston aircraft and utilization.
- ▶ Less than eight of the hangar waiting list would be realized.
- ▶ Flight training would expand significantly for college flight programs.

**High Scenario (Preferred):** This forecast approach applies the historic trend of two to eight pilots on the LMT hangar wait list and projects the trend to 2038. This forecast assumes LMT will have between two to eight pilots on the hangar wait-list, be able to accommodate pilots who want hangars, and that pilots will base their aircraft at LMT. The 20-year growth rate is 1.3 percent. This forecast approach assumes that influences on LMT will have minimal negative impact and assumes that influences change to be positive as previously stated in the medium forecast section. This forecast also assumes the following:

- ▶ Hangar ownership and construction arrangements will be resolved; new hangar development will proceed, eventually accommodate the waiting-list demand, and incentivize others.
- ▶ Based aircraft sales, due to attrition, will be retained at LMT.
- ▶ FBO plans to base two large-cabin business jets at LMT.
- ▶ Flight training and college aviation program expansion will result in additional based aircraft.
- ▶ Higher performance aircraft may be based at LMT due to higher California taxation and rental rates.

**Preferred Forecast Summary and Reasonableness (High Scenario):** The high forecast scenario more closely aligns with the LMT forecast factors and hangar waiting list/construction demand. In addition, the high forecast scenario is consistent with a growing Klamath region and economy. Therefore, the civilian based aircraft will likely fluctuate over the 20-year planning period, but not substantially. Similar to aircraft operations, the high forecast scenario resembles the transition towards turbine aircraft, which now exceed piston aircraft production. The high forecast scenario exceeds the FAA TAF.

Figure 2-5 : (Exhibit & Table): Based Aircraft Forecast



Based Aircraft - Forecast Scenarios					
Year	Actual Based	FAA TAF	FAA TAF (Indexed)	Low Scenario	High Scenario
				FAA Industry Growth	Hangar Wait/Construct Schedule
2018	85	140	85	85	85
2019	-	141	86	86	85
2023	-	150	95	84	94
2028	-	159	104	82	94
2033	-	169	114	81	100
2038	-	179	124	79	102
2040	-	183	128	79	104
20-Year Change	-	39	39	-6	17
20-Year Average	-	2.0	2.0	-0.3	0.9
20-Year % Change	-	27.9%	45.9%	-6.7%	20.0%
% CAGR	-	1.2%	1.9%	-0.3%	0.9%

Source: Mead & Hunt, Inc. 2018

## Based Aircraft Forecast Mix

**Table 2-4** summarizes the 20-year mix of based aircraft forecast by aircraft type for the preferred forecast scenario. The mix forecast was prepared using input from LMT user and tenant survey responses and is representative of FAA Aerospace Forecasts on the general aviation industry and fleet production. The forecast reflects the transition towards higher performance aircraft, including helicopters.

Based Aircraft Mix Forecast Factors:

- ▶ LMT revolving hangar waiting list remains between two and eight aircraft.
- ▶ FBO plans to base two additional large-cabin business jets at LMT.
- ▶ General aviation aircraft are transitioning from piston to turbine aircraft.
- ▶ Hangar construction schedule is based on reasonable cost/financing schedules.

**Table 2-4 : Based Aircraft – By Aircraft Type**

Based Aircraft By Type - Preferred Forecast (High Scenario)					
Year	Piston	Turboprop	Jet	Helicopter	TOTAL
2018	69	8	7	1	85
2019	69	8	7	1	85
2023	75	9	9	1	94
2028	75	9	9	1	94
2033	79	10	9	2	100
2038	79	12	9	2	102
2040	81	12	9	2	104
20-Year Change	10	4	2	1	17
20-Year Average	0.5	0.2	0.1	0.05	0.85
20-Year % Change	14.5%	50.0%	28.6%	100.0%	20.0%
% CAGR	0.7%	2.0%	1.3%	3.5%	0.9%

Note: Two Dassault Falcon 50 jets were based at LMT in December 2018 but were not recognized as 2018 table activity.

Source: Mead & Hunt, Inc. 2018.

## COMPONENT #5: CRITICAL AIRCRAFT

This section describes the LMT critical aircraft forecast as derived from the operational fleet mix forecast. The critical aircraft classification is assigned to each runway based on aircraft dimensional and performance characteristics to determine the applicable FAA standards to plan safe and efficient airport facilities.

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.

## Unique LMT Critical Aircraft Factors

The critical aircraft designation for LMT considers unique tenant/user factors which have operational implications extending from local to national significance. Over the years, LMT infrastructure and services have been strategically developed to support LMT users and tenants with unique operational needs. Two of LMT's primary users are the US Forest Service (USFS) and the Oregon Air National Guard (Oregon ANG); their needs include the operation of large transport aircraft (up to the DC-10-30 jet transport).

**Critical Aircraft:** As defined by FAA Advisory Circular 150/5000-17, *Critical Aircraft and Regular Use Determination*, the Airport's most demanding aircraft, or grouping of aircraft category, as determined from aircraft approach speed, wingspan, and weight, regularly using the airport for 500 annual operations; excluding touch and go operations.

The LMT unique critical aircraft factors include the following:

- ▶ USFS Klamath Air Tanker Base (contract aircraft operations)
- ▶ Oregon ANG and Military Training Missions/Exercises (fighter and transport aircraft). LMT serves as the only F-15 fighter training facility in the United States.
- ▶ Large-cabin business jets operated for on-demand medical and charter flights (FAR Part 135)
- ▶ Private fighter aircraft operating under military contract (tactical jet fighter training aircraft)
- ▶ State of Oregon's Resilience Plan (LMT is a Tier 1 facility for first responders)

## Critical Aircraft Planning Determinations

The following section describes the critical aircraft forecast for LMT, primary Runway 14/32, and crosswind Runway 7/25. The critical aircraft is the most demanding combination of similar aircraft currently using, or forecast to use, LMT with reference to FAA aircraft classifications for the Airport Reference Code (ARC) and Runway Design Code (RDC). The critical aircraft for primary Runway 14/32 also serves as LMT's critical aircraft.

**Figure 2-6** depicts LMT's most demanding group of similar critical aircraft by user and FAA ARC aircraft classification (AAC and ADG). These turbine aircraft highlight the unique critical aircraft demands at LMT as supported by the airfield infrastructure, including a 10,300-foot runway.

**Airport Reference Code (ARC):** An airport designation defined by FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*, used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport. The AC defines the **Runway Design Code (RDC)** as the code signifying the design standards to which the runway is to be built.

**Figure 2-6 : LMT Similar/Critical Aircraft Users and Types – Turbine Aircraft**

US Forest Service	Military	General Aviation
Transport Aerial Tankers	Cargo/Fuel Transports	Large Cabin Jets
DC-10-30 ARC D-IV 	KC-10 ARC D-IV 	Falcon 900/50 Series ARC B/C-II 
MD-87 ARC C-III 	C-17 ARC D-IV 	Gulfstream 500 Series ARC D-III 
Avro 85 ARC C-III 	KC-135 ARC D-IV 	
C-130 ARC C-IV 	KC-130 ARC C-IV 	

Source Categories: FAA TFMSC, LMT ATC Tower Input, LMT Master Plan User Surveys, Airport Staff Report

### Primary Runway 14/32 Critical Aircraft (Existing/Future)

The DC-10-30, which supports LMT civilian and military aviation missions, is the most demanding aircraft at LMT and has been the critical aircraft used for airfield design since the 1993 LMT Master Plan. The most demanding jet transport aircraft operating at LMT (AAC C/D and ADG III/IV) with similar/critical characteristics to the DC-10-30 include:

- ▶ DC-10-30 (Contract US Forest Service Very Large Air Tanker)
- ▶ KC-10 Extender (Military Heavy Transport/Aerial Refueling)
- ▶ C-17 Globemaster (Heavy Military Transport)
- ▶ KC-135 Stratotanker (Heavy Military Transport)
- ▶ C-130/J/Q Hercules (Large USFS Air Tanker)
- ▶ C-130 Hercules (Military Transport).
- ▶ Heavy transport aircraft are over 300,000 pounds maximum takeoff weight
- ▶ Large transport aircraft are over 150,000 pounds maximum takeoff weight.

**Table 2-5** lists the existing (2017/2018) and forecast (2038) activity for the most demanding turbine aircraft at LMT by standard FAA aircraft classification. Activity has been categorized by civilian and military operations; LMT military operations are not forecast as part of the LMT Master Plan or by the Oregon ANG. Runway 14/32 currently has 42,800 annual operations (24,500 civilian and 18,300 military) and handles 90 percent of 48,500 total airport operations. As indicated in **Table 2-5**, existing activity by the most demanding turbine aircraft totals over 19,000 annual operations or 40 percent of the LMT traffic operating on Runway 14/32.

FAA guidance requires 500 operations by the most demanding aircraft type or grouping of aircraft with similar characteristics. The following is the AAC and ADG determination for LMT and Runway 14/32 based on existing and future activity levels, and LMT unique factors:

**Table 2-5 : LMT Aircraft Traffic Mix (Total and Most Demanding Turbine Aircraft)**

TRAFFIC MIX - TOTAL AIRPORT OPERATIONS										
Annual Operations	Aircraft Approach Speed (AAS)				AAS	Airplane Design Group (ADG)				ADG
	A	B	C	D	Total	I	II	III	IV	Total
<b>Total - Existing (2018)</b>	<b>22,280</b>	<b>7,760</b>	<b>922</b>	<b>17,538</b>	<b>48,500</b>	<b>44,973</b>	<b>9,982</b>	<b>364</b>	<b>136</b>	<b>55,455</b>
Civilian Operations	22,280	7,760	866	886	31,792	44,973	9,982	352	46	55,353
Military Operations	0	0	56	16,652	16,708	0	0	12	90	102
<b>Total - Future (2038)</b>	<b>22,138</b>	<b>7,760</b>	<b>1,265</b>	<b>17,337</b>	<b>48,500</b>	<b>45,584</b>	<b>8,873</b>	<b>689</b>	<b>184</b>	<b>55,455</b>
Civilian Operations	22,138	7,760	1,209	691	31,798	45,584	8,873	677	94	55,228
Military Operations	0	0	56	16,646	16,702	0	0	12	90	102

TRAFFIC MIX - MOST DEMANDING TURBINE AIRCRAFT OPERATIONS										
Annual Operations	Aircraft Approach Speed (AAS)				AAS	Airplane Design Group (ADG)				ADG
	A	B	C	D	Total	I	II	III	IV	Total
<b>Total - Existing (2018)</b>	<b>0</b>	<b>574</b>	<b>922</b>	<b>17,538</b>	<b>19,034</b>	<b>17,446</b>	<b>1,088</b>	<b>364</b>	<b>136</b>	<b>19,034</b>
Civilian Operations	0	574	866	886	2,326	840	1,088	352	46	2,326
Military Operations	0	0	56	16,652	16,708	16,606	0	12	90	16,708
<b>Total - Future (2038)</b>	<b>0</b>	<b>850</b>	<b>1,265</b>	<b>17,337</b>	<b>19,452</b>	<b>16,840</b>	<b>1,739</b>	<b>689</b>	<b>184</b>	<b>19,452</b>
Civilian Operations	0	850	1,209	691	2,750	240	1,739	677	94	2,750
Military Operations	0	0	56	16,646	16,702	16,600	0	12	90	16,702

Note: Turbine Aircraft (defined): jet and turboprop engine aircraft using kerosene-based fuels.

Note: Military aircraft activity was not forecasted as part of the LMT Master Plan; however, military traffic is expected to increase throughout the 20-year LMT forecast period.

Note: The 2017/2018 activity includes 600 annual operations by Adversary Air aircraft (D-I). The contract is not anticipated to extend beyond 2023 at LMT. The 2019 Adversary Air activity is expected to total 4,500 annual operations.

Source: FAA TFMSC, LMT ATC Tower Input, LMT Master Plan User Surveys, Airport Staff Report.

**Existing Critical Aircraft Designation: D-III**

AAC D Representative Aircraft: F-15 C/D / L-159 Civilian Fighter

ADG III Representative Aircraft: Avro RJ-85 / MD-80 Series / B-737 Series

**AAC Determination (Existing):** There were 17,538 total operations (886 civilian) by AAC D aircraft in 2017/2018. This exceeds the FAA regular use threshold; therefore, the AAC D is justified.

**ADG Determination (Existing):** There were a combined 500 total operations (398 civilian) by ADG III and IV aircraft in 2017/2018. This exceeds the FAA regular use threshold; therefore, the ADG III is justified.

**Future Critical Aircraft Designation: D-IV**

AAC D Representative Aircraft: DC-10-30 Military Transport / Civilian US Forest Service Tanker

ADG IV Representative Aircraft: DC-10-30 Military Transport / Civilian US Forest Service Tanker

**AAC Determination (Future):** There are forecast to be 17,337 total operations (691 civilian) by AAC D aircraft in 2038. This exceeds the FAA regular use threshold; therefore, the AAC D is justified.

**ADG Determination (Future):** There are forecast to be 184 total operations (94 civilian) by ADG IV aircraft in 2038. While this does not meet the FAA regular use threshold, it is recommended that ADG IV design standards be maintained for planning purposes for the following reasons:

**US Forest Service (USFS):** LMT plays a critical role in fire support services for the USFS as wildfires are a growing problem in the mountain west. The USFS manages nearly 60 percent of all Oregon fires, which is significantly higher than Washington at 18 percent and California at 19 percent. The U.S. Department of the Interior reports that for the period from 1985 to 2018, the total acres burned has increased at four percent annually and the suppression costs have increased at eight percent annually. This trend is not expected to reverse in the immediate future; therefore, it is vital that the capabilities at existing support facilities like LMT are maintained. The USFS is retiring older turboprop and jet tanker aircraft (DC-7, MD-87, and Avro RJ85) from their contract fleet and is replacing them with the C-130 (C-IV), DC-10-30 (D-IV), and eventually the Boeing 737 (C-III). The USFS has inquired about operating the Boeing 747 supertanker (D-V) at LMT. Discussions with the USFS indicate that the facilities recently made available at LMT, including improved Taxiway B access to the USFS ramp and large east-side apron, make it highly likely that LMT will see increasing activity by these large jet tanker aircraft. In summary, based on USFS fleet logistics, the ADG IV transport aircraft (DC-10-30, C-130) is the most demanding aircraft group at LMT.

**Guard/Military:** LMT plays a critical role in military support services for the Oregon ANG. Oregon does not have any military bases, so federal facilities like the Guard base at LMT are vital for State military and emergency response. LMT is a Guard base for fighter training and military readiness exercises, which involves operations by large/heavy transport aircraft including the KC-10 Extender Air Tanker (D-IV), C-17 Globemaster (D-IV), and KC-135 Stratotanker (D-IV). Similarly, the military KC-46A Pegasus (D-IV Boeing 767 model) is programmed to replace the KC-135 Stratotanker (D-IV). LMT activity by large/heavy transports averages 100 to 200 annual operations, depending on training exercise events hosted at LMT. Oregon ANG forecasts are not available to project military traffic levels at LMT; however, Airport Staff expects military traffic to moderately increase throughout the 20-year LMT planning period. In addition, LMT has been notified that the C-17 Globemaster (D-IV) would be the expected military aircraft to support Tier

1 Resilience Plan logistics for Klamath Falls. In summary, based on military and state emergency response needs, the ADG IV transport aircraft (KC-10, C-17, KC-135) is the most demanding aircraft group at LMT.

**Other:** LMT is used by other large aircraft, including AAC C/D large-cabin business jets (Gulfstream 300/400/500 Series, Bombardier Global Express), and as a Boeing test site for the Boeing 737 (C-III). The FBO (Century Aviation) recently purchased a large hangar at LMT with the intentions of basing a Gulfstream 400 Series (D-II) and Gulfstream 500 Series (D-III) business jet to support domestic and international medical and charter flights.

**Figure 2-7** depicts the performance and dimensional characteristics of the critical aircraft (DC-10) for the Airport and primary Runway 14/32. The DC-10-30 is a tri-jet transport aircraft operated at LMT under contract for the USFS and is also used for military aerial refueling and troop transports.

**Figure 2-7 : Primary Runway / Airport Critical Aircraft**



Note: Aircraft dimensions and performances vary per model configuration.  
 Source: Aircraft Manufacturer Website, FAA Aircraft Database Spreadsheet (Obtained August 2018).  
 While there are not 500 ADG IV operations, LMT tenants (USFS and the Oregon ANG) have indicated that ADG IV facilities are vital to their mission at LMT. Therefore, for future airport planning purposes, the primary Runway 14/32 and associated taxiway system should continue to comply with FAA D-IV and TDG-5 standards to accommodate large/heavy transport aircraft (representative of the DC-10-30 critical aircraft) with an AAC approach speed less than 166 knots, an ADG aircraft wingspan up to 171 feet, and a tail height less than 60 feet.

## Crosswind Runway 7/25 Critical Aircraft (Existing/Future)

The critical aircraft for crosswind Runway 7/25 is the Beechcraft King Air, which has an ARC B-II and TDG 2 classification. The King Air Series, as represented by the King Air 350/1900 models, is a popular twin-turboprop plane in production, and commonly used for business, corporate, and commercial transport purposes.

Runway 7/25 handles 5,500 annual operations, which is approximately 10 percent of total airport operations. FAA Advisory Circular 150/5000-17 guidance requires 500 operations by the most demanding aircraft type or grouping of aircraft with similar characteristics. The turbine aircraft, similar to the King Air Series, conduct 1,500 annual operations on the crosswind runway, including 1,360 operations by Part 135 operators and 980 operations by 'large' aircraft with a maximum takeoff weight greater than 12,500 pounds. These turbine aircraft operate on the crosswind runway for commercial and business/corporate transport purposes, including charter passengers, scheduled air cargo freight, on-demand medical air lift, USFS, and agricultural users. Therefore, the King Air Series is the representative aircraft group for the activity taking place on the crosswind runway. Below are turbine (turboprop and jets) aircraft with similar characteristics to the King Air critical aircraft and operating on Runway 7/25; documented by aircraft type/model, ARC, user and crosswind runway activity [annual operations]:

- ▶ King Air Series (B-II) Large Twin Turboprop: General Aviation Transient [80 Operations]
- ▶ Pilatus PC-12 (A-II) Single Turboprop: Medical Air Lift [60 Operations \*]
- ▶ Air Tractor AT-402B (A-II) Large Single Turboprop: Based Agriculture [700 Operations \*]
- ▶ Cessna Caravan 208 (A-II) Single Turboprop: Air Cargo [225 Operations \*]
- ▶ Beechcraft 99 (B-I) Twin Turboprop: Air Cargo [150 Operations \*]
- ▶ ST-2 Grumman (B-II) Large Twin Turboprop: USFS [50 Operations \*]
- ▶ Air Tractor AT-802F Fire Boss (B-II) Large Single Turboprop: USFS [60 Operations \*]
- ▶ Aero Commander 500 Turbo Series (B-II) Twin Piston: USFS [40 Operations \*]
- ▶ Business Jets - Based and Transient General Aviation Users [50 Operations \*]
- ▶ Falcon 50 (ARC B/C-II) Twin-Engine Jet: FBO Charter/Medical Flights
- ▶ Falcon 900 (ARC B/C-II) Tri-Engine Jet: FBO Charter/Medical Flights
- ▶ Hawker 800XP (ARC B-II) Twin-Engine Jet: FBO Charter/Medical Flights
- ▶ Turbo Commander (ARC B-II) Twin-Turboprop: FBO Charter/Medical Flights
- ▶ Other Transient General Aviation Users [100± Operations \*].

Note: Large turboprop aircraft are over 12,500 pounds maximum takeoff weight

Note: \* Denotes Part 135 Certificated Operator

Combined, the above turbine aircraft with similar characteristics to the King Air account for 1,500 annual regular use operations on Runway 7/25 (activity information obtained from 2018 LMT Tenant/User Surveys and 2019 Crosswind Testimonial Letters). Business jets are the largest aircraft operating on the crosswind runway, but they do not conduct 500 annual regular use operations.

The military does not conduct normal landing or takeoff operations on the Crosswind Runway 7/25, unless required for emergency purposes. Also, as a future forecast scenario, the crosswind runway could once again accommodate regional airline passenger aircraft, including the twin-turboprops comparable to the King Air Series.

The following is the AAC and ADG determination for the Runway 7/25 based on existing and future activity levels and LMT unique factors:

**AAC Determination (Existing/Future):** There were 1,206 total civilian operations by AAC B aircraft in 2017/2018; that number is projected to reach 1,600 total civilian operations in 2038. This exceeds the FAA regular use threshold; therefore, the AAC B is justified.

**ADG Determination (Existing/Future):** There were 1,236 total civilian operations by ADG II aircraft in 2017/2018; that number is projected to reach 1,450 total civilian operations by 2038. This exceeds the FAA regular use threshold; therefore, the ADG Category II is justified.

For future planning purposes, the crosswind runway should comply with FAA B-II (large aircraft) and TDG-2 standards to accommodate large turboprop aircraft (representative of the King Air 350/1900 Series) with an AAC approach speed less than 121 knots, an ADG aircraft wingspan less than 79 feet, and a tail height up to 29 feet. The crosswind Runway 7/25, which is aligned with the strong, gusty-wind conditions from the west, is required to meet a minimum FAA 10.5-knot crosswind coverage. It should be noted the previous LMT 2005 Master Plan identified the crosswind Runway 7/25 as an ARC B-III classification based on the Alaska/Horizon Airlines 37-seat Bombardier Q-200 twin-turboprop aircraft used for scheduled airline service. **Figure 2-8** depicts the performance and dimensional characteristics of the representative critical aircraft (Beechcraft King Air 350/1900) for the crosswind Runway 7/25.

**Figure 2-8 : Crosswind Runway Critical Aircraft**



<b>Aircraft Design Characteristics:</b>	
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: Aircraft Manufacturer Website, FAA Aircraft Database Spreadsheet (Obtained August 2018)

## Critical Aircraft Forecast Recommendation

The critical aircraft is important to airport planning. The critical aircraft is a basis for determining airfield and landside geometric dimensions, setbacks, separations, airspace clearances, safety areas, and other structural considerations. Regarding critical aircraft determinations, 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.

Airport planning considers a variety of critical aircraft to define separate elements of airport design (runway length, taxiway design, apron strength, etc.). This critical aircraft determination is made for airport planning purposes only; federal law does not allow the FAA to fund projects that solely benefit another federal agency. The critical aircraft is used to determine project eligibility or justification; therefore, in some cases, the FAA will need to designate a critical aircraft for Airport Improvement Plan (AIP) or Passenger Facility Charge (PFC) eligibility that is separate and distinct from the critical aircraft used for planning and designing the airfield. It is acknowledged that FAA ability to participate, in full or in part, in LMT capital improvement projects will be determined on a case by case basis closer to the time of project design and implementation.

The following is a summary of LMT existing and future critical aircraft and FAA aircraft classifications as defined by FAA Advisory Circular 150/5300-13, *Airport Design*:

**Airport and Runway 14/32 Critical Aircraft (Existing)**

- ▶ FAA AAC Category D
- ▶ FAA ADG Category III
- ▶ FAA Runway Visibility Minimums: Not Lower than ½-Mile (2400 RVR).

**Airport and Runway 14/32 Critical Aircraft (Future)**

- ▶ FAA AAC Category D
- ▶ FAA ADG Category IV
- ▶ FAA Runway Visibility Minimums: Not Lower than ½-Mile (2400 RVR).

Note: Not all airfield facilities and construction projects (such as holding/by-pass areas and certain taxiway segments) would require adherence to ARC D-IV and TDG 5.

**Crosswind Runway 7/25 Critical Aircraft (Existing/Future)**

- ▶ FAA AAC Category B
- ▶ FAA ADG Category II
- ▶ FAA Runway Visibility Minimums: Visual.

## SPECIALIZED CIVILIAN FORECAST ACTIVITIES

The following are unique forecast activities considered for facility planning purposes:

### US FOREST SERVICE ACTIVITY

During the fire season, which typically extends from June to October, the US Forest Service Klamath Air Tanker Base (KATB) supports up to 37 different air tanker aircraft flying about 220 flights, or nearly 500 annual operations at LMT. The US Forest Service is in the process of retiring the older multi-engine propeller aircraft (DC-7, Convair 580) and transitioning toward jet transports (RJ-85, MD-80), including interest in accommodating the DC-10-30 transport (3-engine heavy jet) at LMT. KATB flights during the 20-year forecast period are projected to range between 300 and 500 annual aircraft operations, depending on fire season severity.

### MEDICAL FLIGHTS

Medical flights include the transport of people and organs/tissues using turbine fixed-wing and helicopter aircraft. Medical-related flight activity during the 20-year forecast period is projected to range between 1,500 and 2,500 annual aircraft operations at LMT, depending on the medical flight contracts.

## CIVILIAN FLIGHT TRAINING ACTIVITY

Combined, there are 7 based flight training aircraft (6 fixed-wing and 1 helicopter) conducting about 16,000 operations per year (Civilian flight school training is provided by Pelican Aviation and Precision Aviation. Pelican Aviation provides fixed-wing pilot instruction and training. Precision Aviation offers helicopter and fixed-wing pilot instruction and an accredited flight training program affiliated with the Klamath Community College). As an industry standard, each flight training aircraft typically operates between 200 and 500 hours annually and conducts 2,200 to 2,600 operations per year.

Flight training activity is expected to increase, principally in response to the airline industry demand for supplying professional pilots. However, flight training activities are potentially limited by LMT military activity and surrounding military operating airspace constraints, in addition to other impeding industry factors associated with flight training costs, regulatory costs, and the supply of flight instructors. Flight training activity during the 20-year forecast period is projected to range between 15,000 and 20,000 annual aircraft operations at LMT, depending on the pilot shortage condition.

## ADVERSARY AIR (CIVILIAN CONTRACT)

Adversary Air is a private company providing tactical aircraft training under contract with the Oregon ANG starting in a year or two. Adversary Air will base between 4 and 10 L-159 Alca fighter jets, and perhaps other fighter aircraft at LMT. This LMT forecast assumes that Adversary Air will receive a contract extension for four additional years, similar to other military base contract terms. Adversary Air flight training activity during the 20-year forecast period is projected to range between 2,500 and 5,000 annual aircraft operations at LMT, depending on daily flight schedules during the week and weekend periods.

## POTENTIAL SCENIC/TOURISM FLIGHTS

Located 55 flight miles from the Crater Lake National Park, there is a potential for scenic air passenger flight tours operating out of LMT. These flights would likely be offered on a seasonal basis, operated as scheduled or non-scheduled service, using fixed-wing aircraft and/or helicopters. The air tour operator may provide scenic flight tours from other surrounding airports and might provide other on-demand passenger service at LMT. During the peak tourism season, flights would likely not be conducted daily and would not exceed one to two flights per day; equivalent to about 1,000 to 2,000 enplaned passengers per year.

## POTENTIAL UNMANNED AIRCRAFT SYSTEMS (UAS-DRONES)

Unmanned Aircraft System (UAS) aircraft are rapidly becoming a more mainstream aircraft platform supporting various civilian and military flight applications. Large retail companies are pursuing UAS for product deliveries. While future UAS aircraft may not require airfield facilities for delivery networks, there may be UAS applications which could involve other on-airport land use, such as a domicile for maintenance and training. As the UAS industry and regulations evolve, including advocating airspace compatibility, some aspects of UAS activity could be realized at LMT. However, due to the potential conflicts with military training exercises and uncertainty of the UAS industry for commercial applications, no UAS-specific activities have been projected or forecast for LMT.

## CHAPTER SUMMARY

### AVIATION FORECAST

This section summarizes the preferred aviation demand forecasts and will be used in subsequent Airport Master Plan tasks. **Table 2-6** summarizes the preferred Master Plan forecasts.

**Table 2-6 : Master Plan Forecast Summary**

MASTER PLAN FORECAST SUMMARY						
Forecast Component (Annual Totals)	Existing Base Year 2018	Base Year + 1 Year 2019	Base Year + 5 Years 2023	Base Year + 10 Years 2028	Base Year + 15 Years 2033	Base Year + 20 Years 2038
<b>Airline Passengers - Total</b>	<b>0</b>	<b>10,800</b>	<b>26,600</b>	<b>28,200</b>	<b>30,200</b>	<b>31,000</b>
Enplaned	0	5,400	13,300	14,100	15,100	15,500
Deplaned	0	5,400	13,300	14,100	15,100	15,500
<b>Total Operations (Civilian+Military)</b>	<b>48,500</b>	<b>48,755</b>	<b>52,955</b>	<b>51,655</b>	<b>53,355</b>	<b>54,955</b>
<b>Total Operations (Civilian)</b>	<b>31,600</b>	<b>31,800</b>	<b>36,000</b>	<b>34,700</b>	<b>36,400</b>	<b>38,000</b>
<b>Itinerant (Base)</b>	<b>27,500</b>	<b>27,757</b>	<b>28,737</b>	<b>29,977</b>	<b>31,257</b>	<b>32,547</b>
<b>Itinerant (Base + Outlook)</b>	<b>27,500</b>	<b>28,797</b>	<b>29,987</b>	<b>32,157</b>	<b>33,437</b>	<b>35,047</b>
Air Carrier (Outlook)	0	1,040	1,250	2,180	2,180	2,500
Air Cargo	1,000	1,020	1,090	1,180	1,270	1,360
Air Taxi	2,600	2,650	2,840	3,090	3,380	3,680
General Aviation	14,600	14,780	15,500	16,400	17,300	18,200
Military	9,300	9,307	9,307	9,307	9,307	9,307
<b>Local</b>	<b>21,000</b>	<b>21,125</b>	<b>21,435</b>	<b>21,822</b>	<b>22,209</b>	<b>22,596</b>
General Aviation	13,400	13,477	13,787	14,174	14,561	14,948
Military	7,600	7,648	7,648	7,648	7,648	7,648
<b>Instrument Operations</b>	<b>2,460</b>	<b>2,490</b>	<b>2,605</b>	<b>2,751</b>	<b>2,902</b>	<b>3,053</b>
<b>Peak Hour Operations</b>	<b>10.4</b>	<b>10.5</b>	<b>11.8</b>	<b>11.4</b>	<b>12.0</b>	<b>12.5</b>
<b>Air Cargo (Freight+Mail - Lbs)</b>	<b>1,517,821</b>	<b>1,526,800</b>	<b>1,563,600</b>	<b>1,610,900</b>	<b>1,659,600</b>	<b>1,709,800</b>
<b>Based Aircraft</b>	<b>85</b>	<b>85</b>	<b>94</b>	<b>94</b>	<b>100</b>	<b>102</b>
Single Engine Piston	67	67	72	72	76	76
Multi Engine Piston	2	2	3	3	3	3
Turboprop	8	8	9	9	10	12
Jet Engine	7	7	9	9	9	9
Helicopter	1	1	1	1	2	2
Other	0	0	0	0	0	0
<b>GA Operations/Based Aircraft</b>	<b>329</b>	<b>332</b>	<b>312</b>	<b>325</b>	<b>319</b>	<b>325</b>

Note: Forecast values rounded, may not total.

Source: Mead & Hunt, Inc. 2018

## FORECAST PLANNING ACTIVITY LEVELS

The preferred aviation forecasts are projected demand levels. The forecasts are used to evaluate the type, size, and location of capital improvements. These serve as the basis for Plan decision-making and recommendations; they are used to analyze facility requirements, to assess alternatives, and to prioritize project improvements.

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 LMT should monitor the relationship between forecast demand and actual activity levels. As recommended by FAA Advisory Circular 150/5070-6B, LMT 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.”

## CRITICAL AIRCRAFT FORECAST

The critical aircraft designation has implications for civilian and military tenants/users at LMT, with consequences affecting regional, state, and national safety and security interests. As previously indicated, LMT serves as the only F-15 C/D fighter training facility in the United States and, therefore, is an essential facility for LMT’s key tenant, the Oregon ANG.

In addition, the unique operational factors at LMT are taken into consideration as part of the critical aircraft determination to maintain a safe and efficient airport facility. Therefore, the future critical aircraft for planning LMT and primary Runway 14/32 is the DC-10-30(ARC D-IV), an aircraft directly supporting the US Forest Service, Guard/Military, and the Oregon Resilience Plan at LMT. The DC-10-30 is representative of the most demanding jet transport aircraft of similar characteristics operating at LMT. Other D-IV aircraft also operate at LMT, including the C-130, KC-135, C-17, and likely the KC-46 Air Refueler.

The critical aircraft is relevant to other LMT facilities as it influences runway length, runway width, taxiway systems, and pavement strength. The LMT critical aircraft is used to identify existing and future LMT facilities required to satisfy FAA critical aircraft planning and design standards. These facility requirements are documented in the Facility Requirement Chapter (Chapter 3).

## FAA TERMINAL AREA FORECASTS COMPARISON AND APPROVAL

**Table 2-7** summarizes and compares the preferred 20-year Master Plan forecasts with the FAA TAF (dated January 2018), in terms of consistency with FAA tolerances. 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 2-7 : Master Plan Forecast and FAA TAF Comparison**

COMPARISON OF MASTER PLAN ANF FAA TAF FORECASTS					
Forecast Component	Year (Fiscal)	Master Plan (Preferred Forecast)	FAA TAF Unadjusted (Jan-2018)	FAA TAF Adjusted (Jan-2018)	Airport/TAF (% Difference)
<b>Airline Passenger Enplanements</b>					
Base Year (2018)	2018	0	8,323	Same	-
Base Year + 1	2019	5,400	8,323	Same	<b>-35.1%</b>
Base Year + 5	2023	13,300	8,323	Same	<b>59.8%</b>
Base Year + 10	2028	14,100	8,323	Same	<b>69.4%</b>
Base Year + 15	2033	15,100	8,323	Same	<b>81.4%</b>
Base Year + 20	2038	15,500	8,323	Same	<b>86.2%</b>
<b>Commercial Aircraft Operations (Civilian)</b>					
Base Year (2018)	2018	3,600	4,886	Same	-26.3%
Base Year + 1	2019	3,670	4,921	Same	<b>-25.4%</b>
Base Year + 5	2023	3,930	5,063	Same	<b>-22.4%</b>
Base Year + 10	2028	4,270	5,248	Same	<b>-18.6%</b>
Base Year + 15	2033	4,650	5,435	Same	<b>-14.4%</b>
Base Year + 20	2038	5,040	5,629	Same	<b>-10.5%</b>
<b>Total Airport Aircraft Operations (Civilian)</b>					
Base Year (2018)	2018	31,600	30,941	Same	2.1%
Base Year + 1	2019	31,800	31,044	Same	2.4%
Base Year + 5	2023	36,000	31,462	Same	<b>14.4%</b>
Base Year + 10	2028	34,700	31,999	Same	8.4%
Base Year + 15	2033	36,400	32,546	Same	11.8%
Base Year + 20	2038	38,000	33,108	Same	<b>14.8%</b>
<b>Total Based Aircraft (Civilian)</b>					
Base Year (2018)	2018	85	140	85	0.0%
Base Year + 1	2019	85	141	86	-1.2%
Base Year + 5	2023	94	150	95	-1.1%
Base Year + 10	2028	94	159	104	-9.6%
Base Year + 15	2033	100	169	114	-12.3%
Base Year + 20	2038	102	179	124	<b>-17.7%</b>

Note: Bold text indicates Master Plan Forecast exceeds FAA Forecast Threshold

Source: FAA TAF published January 2018; adjusted to reflect LMT current activity for civilian based aircraft

Note: Forecast values rounded, may not total.

Note: Commercial Aircraft Operation include scheduled air cargo and potential airline outlook.

Source: Mead & Hunt, Inc. 2018

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Mead&Hunt

