U.S. Department
of Transportation
**Federal Aviation
Administration**

Western-Pacific Region
Airports Division

San Francisco Airports District Office
1000 Marina Boulevard, Suite 220
Brisbane, CA 94005-1835

April 13, 2017

Mr. Brian Picken
Airport Manager
Town of Mammoth Lakes
1300 Airport Road
Mammoth Lakes, CA 93546

Dear Mr. Picken,

RE: FAA Approval of Activity Forecast; Mammoth Yosemite Airport,
Airport Improvement Program (AIP) Project No. 3-06-0146-023-2010

The Federal Aviation Administration (FAA) has completed its evaluation and approves the updated *Aviation Activity Forecast* document for the Mammoth Yosemite Airport (MMH), dated March 31, 2017. The San Francisco Airports District Office (SFO ADO) has the following comments about the forecast and the Terminal Area Development Plan (TADP):

- There are variations in operations projections when comparing your forecast to the FAA Terminal Area Forecast (TAF). We have determined the variance is because the TAF projection for 2016 air carrier operations was too high when compared to the number of air carrier operations actually performed.

- The aviation activity forecast provides adequate justification for near-term and mid-term airport planned development at MMH.

- The TADP should be updated as required based on the approved forecast prior to moving forward to the environmental phase of the proposed project.

To finalize AIP Project No. 23, please submit two (2) copies of the updated Draft Final TADP including approved forecast.

If you have any questions, please contact Katherine Kennedy at 650-827-7611.

Kind Regards,

James W. Lomen
Manager, San Francisco Airports District Office

Mammoth Yosemite Airport
Aviation Activity Forecasts

Prepared for the Town of Mammoth Lakes

Prepared by

March 31, 2017

1. INTRODUCTION

Forecasts of aviation demand are used to identify future facility needs. In planning for the future growth of any airport, it is important to understand the context within which potential increases in aviation activity are likely to occur. Aviation forecasting is not an "exact science," so professional judgment and practical considerations will influence the level of detail and effort required to establish reasonable forecasts and subsequent airport development decisions.

This chapter includes forecasts of the following aviation activities: scheduled passenger enplanements, peak passenger activity, aircraft operations and fleet mix, based aircraft, and air cargo volumes. Because this forecast will be principally used in the assessment of facility requirements for a proposed replacement passenger terminal, it focuses on the next 10 years (i.e., through 2026). The aviation forecasts must be approved by the Federal Aviation Administration (FAA) in order to provide justification for FAA funding participation in eligible airport improvement projects.

Several indicators of aviation activity including regional and local trends for both commercial and general aviation were used to develop an aviation activity forecast for Mammoth Yosemite Airport (MMH or "the Airport"). These trends provide one element that shapes the projections of aviation activity developed for the Airport. However, the unique characteristics of an airport serving a resort destination that is remote from metropolitan areas have a profound effect on forecasting. Particularly important are the revenue guarantees provided to the scheduled passenger airlines.

This chapter is organized into the following sections:

- 1. Introduction
- 2. Airport Role
- 3. Historical Activity at MMH
- 4. National Aviation Industry Trends
- 5. Forecasting Methodologies
- 6. Forecasts
- 7. Design Aircraft
- 8. Summary

2. AIRPORT ROLE

An airport's role is defined by the mix of aviation uses that exist, or are anticipated to exist, at the facility. Each use is defined by the type of aircraft involved and its mission. Aircraft can be used for multiple missions. A medium-sized turboprop may be used by an airline for scheduled passenger service, an air charter operator for on-demand air taxi service, an air cargo airline for transporting express packages, and the military for transport. It is critical to know both the aircraft type and mission in order to identify the necessary airport support facilities. A key part of the forecasting effort is to identify how the current mix of aircraft types and missions will evolve over the 10-year forecast period. This information will be used to identify needed modifications to the airfield and airport facilities.

2.1 CURRENT ROLES

Mammoth Yosemite Airport is classified by the FAA as a primary, non-hub commercial airport which provides scheduled passenger service to the Mammoth Lakes area and surrounding areas. As of January 2016, the Airport is served by two airlines with non-stop service to three destinations. As of 2016, the aviation activities at the Airport are:

- Passenger Service.
- Recreational Aviation.
- Business Aviation.
- Medical Transport.
- Military Aviation.

The Airport also has limited flight training activity and air cargo has been delivered via scheduled airline aircraft in past years. Information about these uses is presented in the paragraphs that follow.

The Airport is home to one fixed-base operator (FBO) that serves general aviation aircraft. The FBO operates from the general aviation terminal located west of the commercial passenger terminal. The FBO provides:

- Aviation fuels: Jet A and 100LL.
- Aircraft parking and hangar storage.
- Oxygen service and pilot supplies.
- A crew car available for pilots.

The Airport's role can also be defined in operational terms. The mission-related roles defined above can also be grouped into three operational groups:

- Commercial service – scheduled and charter passenger service.
- General aviation – aviation activities other than scheduled service and military.
- Military – transient military aircraft.

2.2 FUTURE ROLES

The Airport is anticipated to maintain existing roles throughout the 10-year planning period. No significant changes to the mix of aircraft types or uses is anticipated.

3. HISTORICAL ACTIVITY AT MMH

This section provides background on historical aviation activity at MMH. The many uncommon aspects of aviation uses at the Airport make familiarity with this background information necessary to understand the approaches used in forecasting. **Table 1** presents historical activity data for the years 2009-2016. Data was taken from several sources to provide the most accurate data for forecasting. Enplanement data was obtained from the Airport from records provided by United and Alaska Airlines. Operations counts were obtained from Hot Creek Aviation, the fixed base operator at the Airport. Based aircraft counts were taken from the FAA's 2016 Terminal Area Forecast, except that the 2016 is an estimate provided by Airport staff.

It should be noted that the FAA defines *air carrier* differently for passenger enplanements and aircraft operations. For enplanements, the FAA divides the passenger airline industry into two categories of airlines: *air carrier* and *commuter* (also called *regional airlines*). The primary difference between the two is the role that the airline plays relative to the other. Regional airlines carry passengers to the hub cities of the air carrier airlines, and may feed passengers onto air carrier service at the hub cities. Regional airlines may operate aircraft painted like air carrier airlines, and may have their tickets sold by the air carrier operator. Air carrier airlines typically fly aircraft with more passenger seats than regional airlines and serve larger markets. However, the difference between air carrier and regional airlines is generally indistinguishable to a passenger with the exception of aircraft size. All of the enplanements at MMH are counted in the *commuter* category.

Airline operations are categorized based on aircraft seating capacity. Aircraft with 60 or more seats are *air carrier*, and aircraft with fewer than 60 seats that are operated by airlines are included in *air taxi/commuter*. All of the airline operations at MMH are counted as *air carrier* operations. The only *air taxi/commuter* operations at the Airport are charter operations that are classified as air taxi. One example of charter activity at MMH is the service recently started by JetSuiteX under contract with the Air Partners group (see page 5 for a discussion of the Air Partners group). JetSuiteX started providing service between Burbank and Mammoth in mid-December 2016. Service was offered four times weekly through the end of 2016 and is scheduled to continue until early April 2017. However, charter activity has always been a significant component of general aviation operations. The Airport's FBO, Hot Creek Aviation, estimates that charter operations account for more than half of all general aviation operations by turbine aircraft.

Table 1. Historical Aviation Activity

Passenger Enplanements				Itinerant Operations					Local Operations			Total Operations	Based Aircraft
Fiscal Year	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	General Aviation	Military	Total	Civil	Military	Total		
2009	0	5,021	5,021	314	1,570	4,568	106	6,558	214	0	214	**6,772**	**4**
2010	0	19,798	19,798	1,228	1,840	4,296	62	7,426	200	0	200	**7,626**	**4**
2011	0	26,196	26,196	1,394	1,824	4,133	38	7,389	202	0	202	**7,591**	**3**
2012	0	27,246	27,246	1,564	1,688	3,568	40	6,860	173	0	173	**7,033**	**3**
2013	0	30,858	30,858	1,530	1,784	4,108	56	7,478	199	0	199	**7,677**	**7**
2014	0	25,892	25,892	1,404	1,514	3,200	24	6,142	148	0	148	**6,290**	**7**
2015	0	23,504	23,504	1,234	1,472	3,325	22	6,053	144	0	144	**6,197**	**7**
2016	0	22,253	22,253	990	1,634	4,017	32	6,673	143	0	143	**6,816**	**7**

Source: Passenger enplanements and air carrier operations: Airport records; all other operations: Hot Creek Aviation; based aircraft FAA 2016 Terminal Area Forecast.

Notes:
1. 2009 air carrier operations data not available. Operations estimated by assuming same number of passengers per aircraft as 2010.
2. Airline passenger service started in 2009 and was only for part of the year.

3.1 PASSENGER ENPLANEMENTS

After an 11 year hiatus, scheduled passenger service resumed at MMH in December 2008 with the introduction of service by Alaska Airlines. Service by United Airlines was added in December 2010. Initially service was only provided during winter months. In 2010, year-round service began and continues as of 2017.

Passengers at MMH are predominantly associated with leisure travel which is concentrated during the ski season. Skiing typically starts by mid-November and some years skiing will continue until July. However, the prime ski season lasts from mid-December through mid-April (usually Easter) and accounts for over 70% of annual passengers. For this reason there are distinct winter-spring (i.e. ski season) and summer-fall airline schedules. Winter-spring schedules commonly include service from Los Angeles (LAX), San Diego (SAN), and San Francisco International Airports (SFO). The summer-fall schedule typically includes only flights from LAX. **Figure 1** shows the average monthly distribution of enplanements from 2010 to 2016.

The passenger service offered at MMH is arranged through Minimum Revenue Guarantee Contracts (MRGCs) with airlines. A local partnership (the Air Partners) was established to implement the MRGC program for service to MMH. The Air Partners consist of the Town of Mammoth Lakes, Mammoth Lakes Tourism, and Mammoth Mountain Ski Area (MMSA). An important change occurred in 2014 with the creation of a new revenue guarantee funding mechanism, the Mammoth Lakes Tourism Business Improvement District (MLTBID). MLTBID was formed by public referendum in which local businesses agreed to a special tax on themselves for the purpose of marketing the town as a resort destination with a unique brand. The MLTBID tax raises between $4.7 and $5 million annually. Up to about $2.3 million is available annually, if needed, to support commercial air service by funding MRGCs. About $2.4 million from the MLTBID fund is available for marketing programs to support tourism.

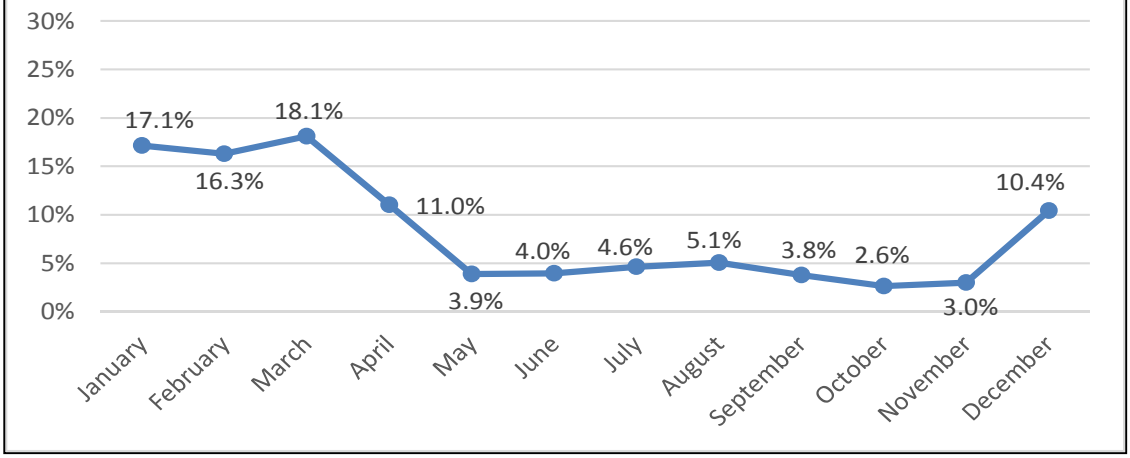
The Air Partners' air service strategy is designed to attract visitors from four markets: southern California, western states, east coast and international. Since the beginning of the program the Air Partners have tried and discontinued flights from five markets. The rationale for initiating and ultimately cancelling service from each destination is summarized below:

- **Reno** – Intent was to pull skiers from the Tahoe-area market. Load factors remained low because the driving distance was too short to make a flight to MMH attractive to many visitors.
- **Denver** – Purpose was to gain access to east coast market by using United Airlines flights from its hub in Denver. The ski clubs on the east coast were specifically targeted. Four drought winters and ski seasons with poor snow resulted in low load factors.
- **San Jose** – Purpose was to attract skiers from the San Francisco Bay Area, particularly the eastern portion. The only available departure time slot was mid-morning with an early afternoon return flight. This proved unattractive to skiers because the mid-morning departure did not allow skiers to begin skiing on the first day and the early afternoon return flight did not permit time for skiing on the last day, while also not allowing for a full work day on either end.

- **Orange County** – This departure location was intended to serve this geographic region within the southern California market. As with the San Jose flights, this service was unsuccessful because of a mid-morning departure and early afternoon return flight.
- **Las Vegas** – Service was started from this location to gain access to the southern Nevada market. Flights were scheduled for a Thursday departure from Las Vegas with a Monday return flight. After the first season it appeared that the choice of days of the week were not appropriate for this market. When it appeared that the aircraft used for this flight was going to be reallocated by the airline, the flight was cancelled by Alaska Airlines.

Over the last three seasons, including the partially completed 2016-2017 ski season, the Air Partners have fine-tuned the schedules for service from Los Angeles, San Diego and San Francisco to increase load factors. This involved reduction or cancellation of service during the shoulder season and reduction in the frequency of service on some routes during the prime winter season. The purpose was to increase load factors to the point where little or no subsidies were required for service from these locations. The load factor is the percentage of filled passenger seats. These schedule modifications were intended to eliminate flights where load factors were in the 20% and 30% ranges. During the 2015-2016 ski season this new strategy reduced flights by 19% while only reducing enplanements by about 6%. This strategy frees-up funds for use in marketing and testing service from new cities.

Figure 1.
Average Monthly Percentage of Annual Enplanements



Source: Airport

Annual enplanements grew from 19,798 in 2010 to 30,858 in 2013 and decreased to 22,253 in 2016 (see **Table 1**). Enplanements declined in between 2013 and 2016. Initially the decline was due to the "right sizing" strategy noted above which eliminated flights with low load factors. Based upon ticket sales, calendar year 2016 would have had higher enplanements than 2015 except for the severe weather in December 2016. The blizzard conditions resulted in flight cancellations that exceeded 50% in some weeks of this peak holiday season.

As a resort destination, visitors come to Mammoth Lakes and the surrounding area for recreation. According to Mammoth Lakes Tourism staff, most travelers are coming in for three- to five-day stays. Flights into Mammoth Lakes during later afternoon hours allow visitors to work half a day, arrive around dinner time and plan on beginning skiing, hiking, biking, fishing and sightseeing the following morning. This also allows them to ski for half a day before their departure (ski lifts close at 4:00 p.m.). The Air Partners have found through experience that flights at other times during the day have not been successful. A late-morning or mid-afternoon flight is often considered a "wasted" day travelling. This flight schedule also allows visitors time during the day to make flight connections from East Coast cities and other locations more conveniently. Early morning flights are not as desirable as late afternoon and early evening flights. An early morning flight would also poorly serve visitors connecting from other cities. The year-round mid-morning flight from LAX exists only because it was the only year-round time slot that Alaska was willing to make available.

The preference for later afternoon or early evening flights is the key factor driving demand for terminal gates at MMH. Currently the terminal has only one gate. During the ski season weather delays occur regularly. This can result in three commercial aircraft being parked at the Airport concurrently approximately 20 times per ski season (about 18%), with rarer occurrences when four aircraft are parked at the Airport concurrently. In 2013, when the Airport had seven flights on five days each week during the ski season, airline scheduling pushed peak hour passengers well past the terminal's capacity. This resulted in three or more planes on the ground more frequently. Some flights had to be scheduled earlier in the day, which reduced their load factor as people chose not to fly due to the inconvenient timing of the flights. By requiring some origination markets to fly during the middle of the day their viability was reduced as enplanements fell and subsidy money was increased. This ultimately led to the cancellation of some of these routes, due to low load factors.

3.2 BASED AIRCRAFT

Based aircraft are defined as those stored at an airport on a long term basis. These aircraft owners buy or lease hangar and parking space from the Airport or a third-party developer. The forecast of based aircraft will be used to determine whether additional hangar spaces are needed. MMH is unusual in that most hangars are used by transient aircraft, that is, aircraft based at another airport. The dominance of hangars used for transient aircraft is due to two factors: aircraft owners who have second homes in the Mammoth Lakes area, and the desire to shield aircraft from the weather (particularly snow) when parked at the Airport. This information will also be used to assess the need for new or expanded supporting facilities or services. The counts of based aircraft from 2009-2016 are shown in **Table 1**.

3.3 AIRCRAFT OPERATIONS

An aircraft operation is either a landing or a take-off. A touch-and-go is a common training activity where the pilot lands and then takes off without leaving the runway. A touch-and-go is counted as two operations.

3.3.1 General Aviation Operations

The Airport does not have an airport traffic control tower, so there is no official count of aircraft operations. However, the Airport's sole FBO is required by contract to keep a record of all landings. The FBO's staff monitors the Airport's Unicom radio frequency and records the aircraft numbers of arriving aircraft. FBO

counts include landings that occur during business hours: Saturday-Thursday 8:00 a.m. to 6:00 p.m. and Friday 8:00 a.m. to 8:00 p.m. The counts also include aircraft that arrive at night and are still parked on the transient apron in the morning. Local operations, such as touch and goes, are not included in the count. FBO staff estimate that local operations are about 5% of total piston operations. Based upon a two-month sample of their aircraft logs, the FBO estimates that about 54% of turbine operations are charters (i.e., air taxi). The counts of operations by general aviation aircraft from 2009-2016 are shown in **Table 1.** Aircraft operations include both landings and take-offs. Therefore, the FBO's counts of landings have been doubled.

3.3.2 Military Operations

The FBO's operation counts include military operations. **Table 1** presents the annual counts of operations from 2009-2016. All military operations are transient operations. Most are by helicopters.

3.3.3 Airline Operations

Alaska and United Airlines provide Airport staff with documentation of both their scheduled and actual operations. Records available from the Airport extend back to 2010. The operations estimate for 2009 was calculated from available records of passenger enplanements. It was assumed that the ratio of enplanements to operations was the same as in 2010.

3.4 AIR CARGO

Air cargo activity at MMH does not include any type of scheduled cargo service. According to DOT T100 data, in the first few years following reintroduction of scheduled passenger service small quantities of cargo were carried by the scheduled airlines as belly-haul (i.e., included with passenger baggage). However, in recent years no significant amounts of cargo have been shipped through MMH.

4. NATIONAL AVIATION INDUSTRY TRENDS

Aviation industry trends are based upon data available through April 2016. Separate sections will discuss: passenger enplanements, the general aviation fleet, aircraft operations, and air cargo. Most forecast material is extracted from the FAA's *Aerospace Forecast Fiscal Years 2016-2036* (hereafter *Aerospace Forecast*). The *Aerospace Forecast* presents FAA expectation for the aviation industry at a national level for the next 20 years and is updated annually. This information will provide a context for review of historical activity levels at MMH and development of forecasts. However, as is explained in the individual sections that follow, broad national trends have limited applicability to forecasting for the Airport.

4.1 PASSENGER ENPLANEMENTS

The foremost challenges facing the airline industry are the volatility of fuel prices and global economic uncertainty. Nationally, passenger enplanements have returned to levels achieved prior to the recession that began in 2008. Economic recovery, airline consolidation, and capacity constraints have restored airline profitability. Airlines have increased load factors, the percentage of seats occupied, by reducing flight frequencies. This practice has reduced consumer choice, effectively consolidating a growing number of

passengers on to fewer flights. Airlines are also adding aircraft with more seats, which has further necessitated the need to cut frequencies in order to operate the flights profitably.

The *Aerospace Forecast* projects that national passenger enplanements (domestic plus international) will increase an average of 1.9% per year through 2035. Air carrier airlines, called "mainline carriers" in the *Aerospace Forecast*, are expected to grow at 2% a year. This is higher than regional airlines, which are projected to grow at 1.6% a year. This section of the *Aerospace Forecast* is summarized in **Table 2**.

Because commercial carrier capacity is expected to grow at a slightly slower rate than enplanements, most airliners will remain crowded. Domestic commercial carrier capacity (i.e., total number of passenger seats) is expected to grow slowly at an average of 1.8% per year, with mainline carriers growing slower than regional carriers, 1.8% versus 2.0%. Because of subsidies and revenue guarantees, load factors (i.e., percent of seats occupied) for airlines serving ski resorts are commonly lower than for other destinations. Nationally, load factors for domestic mainline airlines are currently around 85% and 80% for domestic regional airlines. It is common to have average load factors on airlines serving ski resorts in the 60% to 70% range and lower on specific routes. It is these low load factors that necessitate having subsidies to make the flights economically viable.

Table 2.
Comparison of Forecast Passenger Enplanement Growth Rates

	Domestic + International Flights 2016-2035	Domestic Flights		
		2016-2025	2026-2035	2016-2035
Mainline Carriers	2.0%	1.5%	1.8%	1.7%
Regional Carriers	1.6%	1.5%	1.8%	1.7%
All Carriers	1.9%	1.5%	1.8%	1.7%

Source: FAA Aerospace Forecast Fiscal Years 2015-2035

Forecasts of national trends in enplanements have limited applicability to the Airport. The airline revenue guarantee program (discussed in Section 1.4) allows scheduled passenger service to be offered that is largely independent of national trends. As long as forecast national economic trends are broadly positive (which they are), it can be assumed that the disposable income necessary for the recreational pursuits (mainly skiing) that are the principal purpose of the Airport's passengers will be available.

4.2 GENERAL AVIATION AIRCRAFT FLEET

The total number of aircraft in a given area or organization is referred to as a *fleet*. The *Aerospace Forecast* indicates that the national general aviation fleet decreased by 3.2% annually from 2010 to 2013. This decline is partially due to aging aircraft requiring expensive repairs to remain airworthy, the aging pilot community struggling to meet medical requirements, the rising cost associated with aircraft ownership, and fewer new pilots overall. Fewer pilots results in reduced demand for new aircraft, particularly those purchased by individuals who would fly for recreation. The *Aerospace Forecast* expects the number of private pilots in the US to decrease at 0.35% per year through 2035.

The *Aerospace Forecast* projects that the number of piston fixed wing aircraft will continue to decline through 2035. Multi-engine piston aircraft are projected to decline by 0.4% per year and single-engine

aircraft are forecast to decline at a rate of 0.6% per year. However, within the single-engine group, the light sport aircraft segment is forecast to experience 4.3% annual growth, although this user class makes up less than 2% of the national fleet.

Although the general trend has been one of decline, there are areas of growth for certain segments of the national fleet. Continued concerns about safety, security, and flight delays keep business aviation attractive relative to commercial air travel. For these reasons, the turbine aircraft fleet (jets, turboprops and turbine-powered helicopters) is forecast to grow from 14.3% of the general aviation fleet to 21.5% by 2035. **Table 3** shows that it is the growth of turbine aircraft that supports the projection that the total general aviation fleet will grow at an average annual rate of 0.4% through 2035.

Table 3.
Comparison of Forecast Growth Rates by Aircraft Type

	Total Fleet	Rotorcraft	Fixed Wing					
			Turbine	Multi-Engine Piston	Single-Engine Piston	Light Sport	Experimental	Other
2015*	198,780	10,440	21,305	13,175	122,435	2,355	24,880	4,190
2035	214,260	17,110	33,785	12,135	108,810	5,360	33.040	4,020
CAGR	0.4%	2.5%	2.2%	-0.4%	-0.6%	4.3%	1.4%	-0.2%

Source: FAA Aerospace Forecast Fiscal Years 2015-2035 *Estimate from *Aerospace Forecast*
CAGR = Compound Annual Growth Rate

National trends have limited applicability in forecasting based aircraft at the Airport. With only seven based aircraft, the unique factors shaping decisions by individual aircraft owners will more profoundly affect changes in based aircraft than broad national trends.

4.3 AIRCRAFT OPERATIONS

The number of annual aircraft operations at towered airports in the United States has declined steadily from 2001-2015 (from 66.2 million to 49.6 million). The sharpest drop in all segments of the aviation industry occurred in 2009, the year following the beginning of the recession. From 2013 to 2014, the number of operations by commercial aircraft (air carrier and regional) grew, reflecting improvement in the national economy. Unlike passenger enplanements, which are categorized as air carrier or regional based on the airlines role, operations are categorized based on aircraft seating capacity. Aircraft with more than 60 seats are *air carrier*, and aircraft with 60 seats or fewer are operated by airlines are *air taxi/commuter*. Charter operations, such as the scheduled charter by JetSuiteX introduced in the December 2016, are included in the air taxi category.

General aviation operations grew from 2011 to 2012, before declining again in subsequent years. Segments of the general aviation market, namely aircraft used for business purposes, are operating more frequently while flight training and leisure and hobby flying are contracting. Business general aviation is growing in response to airline consolidation – it is simply less convenient to fly commercially than it used to be. Flight training is growing among students interested in the airline career track, but fewer are learning to fly as a hobby. This has led to the decline in leisure pilots. Reasons for this decline include the increased cost of

aircraft ownership, the expense associated with learning to fly, and competing financial needs. Younger generations are saving for a home and repaying student loans, which limits discretionary income.

The *Aerospace Forecast* projects total operations by all segments of the aviation industry to increase at an average rate of 0.9% per year through 2035 at towered airports. Most of the growth is expected to be from increased commercial aircraft activity (up 1.5% annually). The air carrier component is projected to increase an average of 2.7% per year. The increase in air carrier activity is expected to occur due to a combination of air carrier airlines increasing frequencies on select routes, and a switch by regional airlines from 50 seat aircraft to 70-90 seat aircraft, which are counted in the air carrier category by the Terminal Area Forecast (TAF). Air taxi/commuter operations were forecast to fall 4.9% in 2015 and decrease 1% a year through 2035. This reduction in the air taxi/commuter component will be driven by the retirement of passenger jets with fewer than 60 seats. Nationally, at small and non-hub airports such as MMH, total operations are projected to increase at an average annual rate of 0.5% a year. The *Aerospace Forecast* projects that general aviation activity at towered airports will increase an average of 0.4% annually through 2035.

The national trends forecast for aircraft operations have broad applicability to forecasts for the Airport. Although the forecast percentage changes in operations at the national level are not directly used in the Airport's forecasts, several trends support assumptions used in the Airport's forecasts:

- Increase in operations by air carrier aircraft.
- Growth in use of general aviation aircraft for transportation in lieu of using scheduled commercial flights.
- Decline in flight training for individuals interested in flying as a hobby.

4.4 AIR CARGO VOLUMES

The *Aerospace Forecast* concludes that the national volume of air cargo follows trends in the gross domestic product, with secondary influencers of airline fuel costs and the need for just-in-time logistics chains. Air cargo volumes have grown since the post-recession low point in 2009, although there has been some year-to-year variability. Significant structural changes in the air cargo industry have occurred over the last decade and have affected air cargo volumes, including: FAA and TSA air cargo screening requirements, maturation of the domestic express package market, a shift from air to other transportation modes (especially truck), use of all-cargo carriers by the US Postal Service, and the increased use of internet-based mail substitutes. Another key change is the continuing reduction in the amount of air cargo carried on passenger airliners.

The *Aerospace Forecast* projects that air cargo volumes will increase at an average annual rate of 0.5%. The all-cargo carriers' share of the air cargo market are forecast to grow to 90.2% by 2035 as airlines take less and less cargo.

The national trends forecast for air cargo have limited applicability to forecasts for the Airport. Although the forecast percentage changes in air cargo at the national level are not used in the Airport's forecast, the forecasts do reflect the national trend in reduction in cargo carried by airlines.

5. FORECASTING METHODOLOGIES

A variety of forecasting techniques may be used to project aviation activity range from subjective judgment to sophisticated mathematical modeling. These techniques may utilize local or national industry trends in assessing current and future demand. Socioeconomic factors such as local population, retail sales, employment, and per capita income can be analyzed for the relationship they have had, and may have, with activity levels. This section presents a range of methodologies that were considered for use in forecasting aviation activity at MMH. The applicability of these methodologies to each activity forecast (e.g., enplanements, operations) is addressed in the forecast section (Section 6).

5.1 MARKET SHARE METHODOLOGIES

The market share methodology compares local levels of activity with those of a larger market (e.g. state, nation, or world). This methodology implies that the proportion of activity that can be assigned to the local level is a fixed percentage of the larger entity. Most commonly this involves assuming a ratio between activities at an airport with FAA national forecasts.

5.2 TIME-SERIES METHODOLOGIES

Trend lines and regression analyses are widely used methods of forecasting based on historical activity levels at an airport. Trend line analyses can be linearly or nonlinearly extrapolated and are commonly created using the least squares method. Regression analyses can be linear or nonlinear. In time-series methodologies it is common to have only one variable.

Time-series methodologies are only appropriate when the activity being forecast has a sufficiently long history for trends to be established. At least 10 years is normally required although longer periods are desirable. These methodologies are most robust when the underlying factors that establish the activity levels have not fundamentally changed.

5.3 SOCIOECONOMIC METHODOLOGIES

Though trend line extrapolation and regression analyses may provide mathematical and formulaic justification for demand projections, there are many factors beyond historical levels of activity that may identify trends in aviation and its impact on local aviation demand. Socioeconomic and correlation analyses examine the direct relationship between two or more sets of historical data. Socioeconomic data can include: total employment, total earnings, net earnings, total personal income, and gross regional product. Historical and forecasted socioeconomic statistics are commonly obtained from Federal Agencies, such as the Census Bureau, or private firms, such as Woods & Poole Economics.

In these types of analyses the correlation coefficient, denoted as r, is used to measure the strength of the relationship between two variables. An r can range from -1.00 (one variable increases, the other decreases proportionally) to +1.00 (both variables grow or decline proportionally at the same time). A score close to +/-1.00 suggests a stronger correlation, and a score closer to zero suggests that the two variables are not correlated. Typically an r of at least +/-0.70 is needed to conclude that there is a substantial correlation between the two factors. It is important to understand that correlation does not necessarily imply causality. It could be possible that the two factors are jointly being influenced by another factor. Additionally, it is not

sufficient that there is a high correlation between the variables. There must be a logical basis to believe that there is relationship between the two variables.

5.4 COMPARISON WITH OTHER AIRPORTS

Using comparisons with other airports can be valuable when there is a lack of historical data or when a major change has occurred. The airports selected should be of the same relative size and possess relevant characteristics. Activity data from the comparison airports can be used as a source of trends. For example, growth rates when a low-cost carrier is first introduced to an airport. Activity data from comparison airports can also be used as benchmarks to assess the reasonableness of forecasts. These comparison airports are often referred to as peer airports.

5.5 JUDGMENTAL FORECASTING

Judgmental forecasting is used when there is a lack of historical data or where circumstances have changed so significantly that historical trends no longer apply. Judgmental forecasts must be formulated based upon a clear understanding of the factors that shape the activity being forecast. Forecasts prepared with this methodology are strongest when growth rates can be related to the experiences of similar airports or regional or national trends.

6. FORECASTS

6.1 PASSENGER ENPLANEMENTS

Forecasts of passenger enplanements are used to anticipate facility needs, such as expansion of the passenger terminal or modification of gates to accommodate different classes of aircraft. A passenger enplanement is defined as the act of one passenger boarding a commercial service aircraft. Passenger enplanements include scheduled and non-scheduled flights of over nine passenger seats, and do not include airline crew.

6.1.1 Factors Affecting Forecasts

Several factors made forecasting enplanements at MMH particularly challenging:

- Limited historical data (eight years) after 11 years without service.
- Variability in the amount of snowfall in Mammoth Lakes and the timing of storm/snowfall events.
- Minimum revenue guarantee contracts support scheduled service with load factors lower than is common on flights without revenue guarantees.
- The strategy of the Air Partners group in managing the revenue guarantee program and its associated marketing campaign continues to evolve. Section 3.1 provides a history of refinements to the strategy. Although refinement of the strategy has succeeded in increasing load factors, it has contributed to the decline in annual enplanements for the last three years.
- Flight cancellations due to weather are a seasonal issue, although the percentage varies year to year. Both low visibility and crosswinds have resulted in cancelled flights at MMH. Recent improvements to

instrument departure procedures (available to all aircraft) and instrument approach procedures (currently only available to Alaska Airlines) are expected to reduce cancellations due to low visibility. Future improvements to instrument procedures may further reduce cancellations. However, weather-related cancellations are expected to remain an issue.

- Passengers have shown a strong preference for flights that arrive in the late afternoon or early evening. Because the passenger terminal has only one gate, the ability to serve multiple flights during the preferred time period is constrained.

6.1.2 Methodologies Considered and Rejected

Three common forecasting methodologies were considered and rejected based upon the specific circumstances of MMH. These methodologies are identified in two common forecasting reference documents: *Forecasting Aviation Activity by Airport (July 2001)* which was prepared for the FAA and *ACRP Report 25, Airport Passenger Terminal Planning and Design, Volume 1: Guidebook*.

- **Historical trend lines and regression analyses** are widely used methods of forecasting based on historical performance. With only six years of year-round enplanement data, the legitimacy of forecasts based upon this brief period is questionable. Additionally, the evolving strategy of the Air Partners added another dimension of volatility to normal year-to-year variation.
- **Socioeconomic and correlation analyses** examine the direct relationship between two or more sets of historical data. Because enplanements are predominantly generated by passengers from outside the Mammoth Lakes Area, the socioeconomic variables would need to come from another geographic area. While the strongest economic link is to Southern California, it appears unlikely that socioeconomic factors in that region drive passenger volumes to MMH. Rather it is more likely that the relative attractiveness of Mammoth Lakes as a tourist destination compared to other destinations is driving demand; thus, this methodology is judged to be inappropriate.
- **Market share analysis** assumes a relationship between activities at an individual airport with activity forecast for a larger geographic area. Most commonly this involves assuming a ratio between activities at an airport with FAA national forecasts. This is judged not to be an appropriate methodology for MMH because enplanements at MMH are tied to its competitive position relative to other ski resorts rather than general national trends in passenger volumes.
- **Comparison with other airports** would be a potentially viable methodology if it were possible to identify airports with sufficiently similar characteristics. Given that aviation activities at MMH are strongly linked to skiing, it is appropriate to consider whether there are airports serving ski resorts that have characteristics similar to Mammoth Mountain Ski Resort. While there are ski resorts with comparable facilities, the nature of the ski market makes it infeasible to draw links between facilities and passenger enplanements. Skiing in the United States is a mature market; the number of skier days is not growing. Growth in the number of skier days at one resort comes at the expense of a competing resort. This competitive situation makes it infeasible to draw comparisons between MMH and other airports.

6.1.3 Selected Forecasting Methodologies

MMH's circumstances make using the common statistical methodologies described above inappropriate. Therefore, judgmental forecasts have been prepared. The judgmental forecasts include consideration of:

- Seven years of enplanement data.
- The history of successful and unsuccessful introduction of service to MMH.
- An emphasis in growing the service to fully serve the Southern California market and passengers using Southern California airports as a connection to reach MMH.
- The availability of $2.4 to $3 million to spend on marketing and revenue guarantees annually.
- The growth in airline ticket sales from 2015 to 2016 that did not result in an increase in enplanements due to weather-related flight cancellations.

6.1.4 Forecasting Assumptions

In these forecasts, the pattern of incremental growth will follow three paths:

- Expansion of service from LAX and SAN during the ski season when sufficient demand exists.
- Addition of service from one additional Southern California airport during the ski season and then gradual expansion of the number of weekly flights.
- Addition of limited service from an out-of-state airport.

The specifics of the forecasting assumptions are presented in the paragraphs that follow.

Forecasting Assumption No. 1

The undersized passenger terminal will continue to constrain passenger volumes until a replacement terminal with additional gates is added. The replacement terminal is assumed to become operational in 2021. Until that time, incremental growth in enplanements will be principally due to increasing load factors of existing flights and expansion of the number of flights per week with the existing daily schedule. There may be one or more new flights added to the schedule outside of the peak hour.

Forecasting Assumption No. 2

The Airport had 19,798 enplanements in 2010 and since that time has had over 22,000 annual enplanements each year, despite variations in snow conditions and reduction in flights due to refinements in the Air Partner's marketing strategy. It is forecast that enplanement volumes will continue to be at least this high through the 10-year forecast period.

Forecasting Assumption No. 3

When the replacement terminal becomes operational some existing flights will be rescheduled to occur during the peak early evening period due to strong passenger preference. The addition of terminal peak capacity will increase the ability to successfully add service from southern California and an out-of-state airport by enabling this service to meet passenger schedule preferences.

Forecasting Assumption No. 4

Beginning in mid-December daily service from LAX and SAN is offered in the late afternoon or early evening. There is also a daily mid-morning flight from LAX. After the three-week Christmas-New Year's holiday season is over, the late afternoon/early evening service is cut back to four days per week. The forecasts assume that the marketing campaign will increase awareness of the Mammoth Lakes region and MMSA and expand demand for passenger service. That will permit the four times weekly service to be incrementally expanded until the afternoon flight would be made daily throughout the ski season.

Forecasting Assumption No. 5

By its very nature, the passenger service program managed by the Air Partners will involve investigating the viability of service from additional airports. These forecasts assume that the Air Service Partners will follow their plan to test air service from various airports in the Southern California market over the next three years. This may include scheduled charters originating at general aviation airports to test some markets. However, ultimately the vast majority of scheduled service will originate at commercial (i.e., Part 139 certified) airports. Candidate airports include Burbank Bob Hope Airport (BUR), John Wayne Airport (SNA), and Santa Barbara Airport (SBA).

Forecasting Assumption No. 6

It is expected that initially, the service from a new Southern California airport would start with daily service during the first three weeks of the ski season and four times weekly service the balance of the ski season. If demand increased, this service would be incrementally increased by one additional day per week. When demand was sufficient service would be offered daily throughout the ski season.

Forecasting Assumption No. 7

Both the Seattle and Phoenix areas are being considered for service. Residents from these two areas currently purchase season passes to MMSA and/or own a second home in the Mammoth Lakes area. For forecasting purposes it is assumed that it will take five years of experimentation to establish service from an out-of-state airport. Due to competition, it is assumed that service will be limited to three flights per week during the ski season.

Forecasting Assumption No. 8

Service to the San Francisco Bay Area will continue indefinitely. These flights have historically had lower load factors than flights from Los Angeles and San Diego. However, about 50% of the passengers on these flights originate from outside of California. These connecting passengers are a market segment that the Air Partners strongly desires to grow. Additionally, without these flights Mammoth Lakes would receive very few visitors from the San Francisco Bay Area during the ski season due to the long drive time.

6.1.5 Other Forecast Assumptions

Actual Departures

The forecasts assume that the current average of 12% cancellations due to weather will be reduced to at least 10% due to new instrument approaches. In 2015, instrument departures were established for both runways that are available both day and night. New Required Navigation Performance (RNP) instrument approaches were also established that lowered ceiling minimums from 1,300 feet for both runways to 250 feet for Runway 27 and 265 feet for Runway 9. The forecasts assume a three-year phase of use of new departure and approach procedures. Currently the RNP approaches are available only to Alaska; however, Alaska is responsible for 77% of flights at MMH. The instrument departure procedures are available to all aircraft. The RNP approaches will allow Alaska to make approaches with the cloud ceiling about 1,000 feet lower than possible today. This will reduce the number of flights cancelled due to low ceilings. The instrument departure procedures will allow departures under instrument weather conditions

Total Seats

It is assumed that the CRJ700 with 70 seats remains in service through 2021 and then is replaced with a regional jet with 76 seats. Similarly it is assumed that the 76-seat Q-400 is eventually replaced by a 76-seat regional jet.

Load Factor

The right-sizing of the schedule has resulted in ski season load factors of over 70%. The load factor is forecast to grow over 10 years to provide year-round load factors over 60%.

Summer-Fall Season

These forecasts assume that passenger volumes outside of the ski season will remain static. There are ongoing efforts to increase visitors (including airline passengers) during this summer-fall season through the development of cultural events. Examples include the Mammoth Lakes Film Festival held annually in May and the Half Marathon held in June. However, the introduction of these cultural events is too recent to form the basis of a forecast for a change in summer-fall passenger volumes.

6.1.6 Enplanement Forecasts

Based upon the preceding assumptions, annual enplanement forecasts were prepared for MMH (see **Table 4**). A compounded average growth rate of 1% has been used in this forecast. This relatively low growth rate reflects the variability associated with weather/snow conditions and uncertainty associated with introduction of service from new locations. These forecasts project that enplanements will reach 23,388 in 5 years (2021) and 24,581 in 10 years (2026).

Table 4. Passenger Enplanement Forecast		
	Year	Enplanements
Base Year	2016	22,253
77Forecast Years	2017	22,476
	2018	22,700
	2019	22,927
	2020	23,157
	2021	23,388
	2022	23,622
	2023	23,858
	2024	24,097
	2025	24,338
	2026	24,581
Source: Mead & Hunt		

6.2 PEAK PASSENGER ACTIVITY

Some elements of terminal planning are based upon peak passenger activity. To support these analyses, the peak monthly, daily, and hourly activity levels for passengers for the most recent five calendar years (2011-2015) are first calculated. This data is then used to project these activity levels for the 10-year forecast period.

6.2.1 Peak Month Passenger Activity Forecasts

Monthly passenger enplanement data for the period 2011-2015 is presented in **Table 5**. The peak month has an average of 18.7% of total annual enplanements. In three of the five years, the peak month was March, in two of the five years it was January. The variation is likely due to snow conditions. In forecasting peak passenger activity, it will be assumed that peak month enplanements for this month will remain at 18.7% of the annual total. Applying this percentage to the preferred annual enplanement forecast above yields a peak month enplanement forecast for 2021 of 4,417 and for 2026 of 4,642.

Table 5. Peak Month Enplanements					
Month	**2015**	**2014**	**2013**	**2012**	**2011**
January	4,299	4,540	5,766	4,336	4,211
February	3,841	4,017	5,657	4,865	3,653
March	4,622	4,735	5,652	4,897	4,161
April	1,663	2,741	3,025	3,821	3,379
May	749	1,031	1,149	1,061	1,051
June	975	1,022	1,117	931	1,165
July	1,226	1,330	1,259	1,277	1,189
August	1,228	1,294	1,378	1,478	1,419
September	1,015	1,002	1,171	851	1,004
October	712	717	579	566	807
November	773	827	799	562	882
December	2,401	2,636	3,306	2,601	3,275
TOTAL	23,504	25,892	30,858	27,246	26,196
Peak Month % Annual	**19.7%**	**18.3%**	**18.7%**	**18.0%**	**16.1%**
5-year Average	**18.7%**				

MMH has distinct winter-spring and summer-fall flight schedules with winter-spring being the busier. This prime ski season typically starts on December 15 and runs through Easter. This schedule can vary by a few weeks depending upon snow depths and other factors. **Table 6** shows the schedule for the peak days of the 2015-2016 winter-spring season. Scheduled service from SFO is by United Airlines, while service from LAX and SAN is by Alaska Airlines.

The schedule shows that flights are concentrated in the early evening hours (4:35 p.m. to 6:45 p.m.). Arriving in the evening allows skiers to conduct travel during non-skiing hours to maximize the time available to spend skiing during a vacation. The peak hour is between 5:10 p.m. and 6:11 p.m. (1710 and 1811 in international time). This is graphically shown in **Figure 4**. The peak hour passenger volume was calculated using average enplanement and deplanement load factors for each airline. The average is calculated from flights that occurred from 2010-2015. The peak hour for the most recent (2015-2016) winter-spring season is 163 passengers. This includes passengers associated with an additional arrival that occurs one minute after the calculated peak hour. It should be understood that the Airport has had to negotiate with airlines to ensure that flight schedules will not lead to more than two aircraft on the ground at the same time whenever possible. This constraint has an impact on scheduling which reduces peak hour passengers below that which would otherwise occur. The right-sizing strategy has increased load factors over the last two years (2015-2016). Higher load factors increase the number of peak hour passengers.

6.2.2 Peak Month Average Day Passenger Activity Forecasts

Daily peak activity figures are based on a regularly occurring level of daily activity during the peak, or busiest, month. A review of airline activity schedules for the peak months of March and December indicates that activity is concentrated in the Thursday-Monday block of days. Although some scheduled service

changes from daily to four times weekly service during these peak months, the schedule on peak days remains constant. Therefore, the seat total shown in **Table 6** (596) will be used as the peak day seats. The average passengers on the average day in the peak month equals 3.2% of the peak month's passengers.

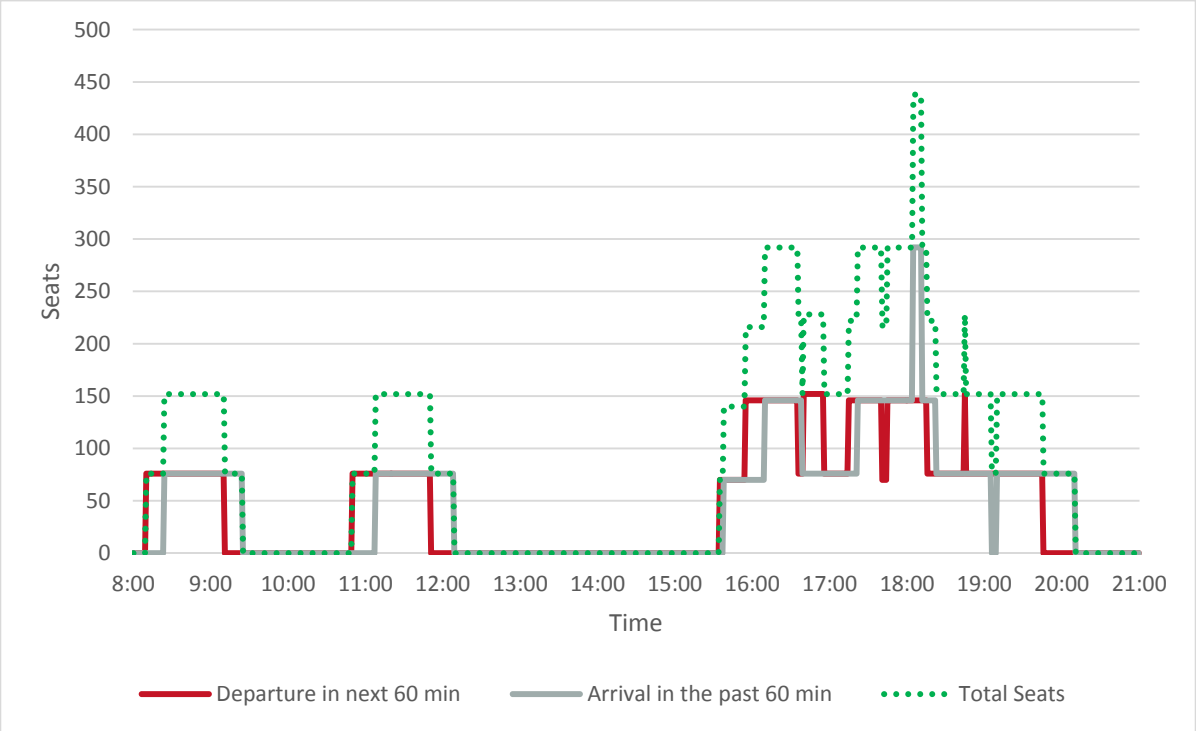
Table 6.
Winter-Spring 2015-2016 Peak Day Flight Schedule

	Time*	Origin / Destination	Aircraft Type	Seats
Arrival	924	LAX	Bombardier Q-400	76
Departure	1050	LAX	Bombardier Q-400	76
Arrival	1638	SFO	Bombardier CRJ700	70
Arrival	1710	LAX	Bombardier Q-400	76
Departure	1715	SFO	Bombardier CRJ700	70
Departure	1745	LAX	Bombardier Q-400	76
Arrival	1811	SAN	Bombardier Q-400	76
Departure	1845	SAN	Bombardier Q-400	76

* Time is expressed as a 24-hour clock

Source: Schedule - Airport

Figure 2.
2015-2016 Ski Season Peak Hour Seats



Source: DEO data base

Peak Hour Passenger Forecast

The number of hourly arriving and departing seats during a typical day in the latter half of the peak month (December) is shown in **Table 5**. Peak hour departing seats currently occur between 5:45 p.m. to 6:45 p.m. (1745 to 1845). Peak hour arriving seats occur between 5:10 p.m. to 6:11 p.m. (1710 to 1811). The peak total arriving and departing seats occurs between 5:10 p.m. to 6:11 p.m. (1710 to 1811).

Peak hour passenger volumes through 2026 were calculated by applying the current peak hour percentages (described above) to the annual passenger volumes previously projected. It is presumed that one additional departure will occur by 2026. These projected peak hour passenger volumes are presented in **Table 7**.

Table 7.
Forecast Peak Hour Passengers

Year	Peak Month Enplanements + Deplanements	Average Day Peak Month Enplanements + Deplanements	Peak Hour Passengers		
			Enplanements	Deplanements	Total
2021	8,833	285	89	81	171
2026	9,284	299	94	131	204

Source: Mead & Hunt

6.3 TERMINAL GATE REQUIREMENTS

An airport's gate requirements are typically examined in terms of the ability of both the airside and terminal building facilities to meet current and projected aviation demand. Commercial airline operations are quantified in peaking characteristics which comprise the "design hour" demand for passengers and aircraft. This approach provides sufficient facility capacity for most days of the year but recognizes that facilities should be neither underbuilt nor overbuilt. Aircraft gate capacity is determined using a design day flight schedule (DDFS), the peak hour of which is the "design hour." For most airports, an average day of the peak month's operations is used to develop a DDFS. The design hour is typically not the absolute peak level activity scheduled throughout a year, nor does it usually represent the total number of people occupying the terminal at a given time. It is a level of activity that is driven by flight schedule and quantified in terms of scheduled aircraft size. For MMH, historical data show the peak hour to be consistent at late afternoon for arrivals and departures during peak winter season travel.

For the peak winter season, Alaska has scheduled a morning arrival and departure at the Airport (see **Table 6**). Alaska and United's next arrivals into the Airport are scheduled between 4:30 p.m. and 5:30 p.m., with corresponding departures between 5:00 p.m. and 6:00 p.m., which constitute the Airport's peak hour for departures. These operations overlap one other with Alaska's Los Angeles flight arriving five minutes before United's San Francisco departure. This requires two gates to accommodate these current operations.

The winter schedule has been developed over time to reflect passenger preferences, which show mid-to-late afternoon departures from originating cities with arrivals at Mammoth Yosemite occurring about 5:00 p.m. to 6:00 p.m. generally. The airlines have attempted to schedule arrivals away from this late afternoon period with little success, noting that passengers generally prefer a mid-afternoon departure from the major

cities. This allows them sufficient time to work in the morning, travel to the airport to catch their flight and still arrive at Mammoth Yosemite with time to enjoy the evening and be ready for a full day of recreation the following day. It also allows time for recreation prior to their departure, it should be noted that the ski lifts at MMSA close at 4:00 p.m. It also allows time for weather events in Mammoth Lakes to clear if their flight is delayed.

Given current passenger preferences for travel from destinations within the state, service to a new market will most likely be scheduled into the peak hour. In order to allow for this as well as provide flexibility for operations generally, an additional aircraft gate will be required (for a total of three). MMH currently has one terminal gate and two aircraft parking positions. To accommodate current and future peak hour enplanements forecast in **Table 7**, two gates will not be adequate. Three gates will allow the Airport and carriers to provide a high level of service to their customers. While on a smaller scale at MMH, air carrier service is generally in line with other resort airports in the west, such as Eagle/Vail in Colorado and Friedman Memorial/Sun Valley in Utah.

Three gates would be in addition to hardstand positions provided to accommodate irregular operations. At MMH the most common irregular operations are associated with weather delays. During the winter-spring season weather delays occur regularly. This results in three airline aircraft being parked at the Airport about 20 times per winter-spring season (about 18%) with rarer occurrences when four aircraft are parked at the Airport. In 2013, when the Airport had seven flights on five days a week, it proved difficult to schedule flights to reduce peak hour passengers to the terminal's capacity and had three or more planes on the ground more frequently.

Advisory Circular 5360-9, *Planning and Design of Airport Terminal Building Facilities at Nonhub Locations,* contains the FAA's general guidance on terminal planning. Paragraph 25.a. states:

> *The initial stage of construction of airport terminal facilities should be designed to accommodate, comfortably, the forecast demands 5 years from the proposed date for occupancy.*

The currently adopted Airport Layout Plan includes development of a replacement passenger terminal. It is anticipated that it would take about five years to complete the process leading to occupancy of the replacement terminal (2021). This time would be needed to complete state and federal environmental review, design, and then build the replacement terminal and associated facilities. Therefore, the likely date of occupancy plus five years is approximately nine years from now (2026). As noted in the paragraph above, three gates are needed to accommodate peak hour departures in 2026**.**

6.4 BASED AIRCRAFT FORECASTING METHODOLOGY

All of the aircraft based at the Airport are piston-driven. Nationally this segment of the general aviation fleet is expected to decline in numbers. The *Aerospace Forecasts* states that "the largest segment of the fleet, fixed wing piston aircraft is predicted to shrink over the forecast period at an average annual rate of 0.6 percent." As noted in Section 3, records of based aircraft at MMH are not sufficiently complete to be used to establish a trend. The most that can be said with confidence is that the number of based aircraft appears to have been stable for the last three years.

With only seven based aircraft, the decisions by individual aircraft owners profoundly effects the number of aircraft that will actually be based at the Airport in the future. Decisions by aircraft owners will be based upon economic factors, such as disposable income and changes in aircraft operating costs, as well the mobility value of owning an aircraft to access a somewhat remote location. Small populations are inherently less stable than larger ones and, therefore, likely to have higher variation.

No local factors have been identified that would suggest that growth in the number of based aircraft will occur. Neither Airport nor FBO staff anticipate turboprop or jet aircraft will be based at the Airport. These aircraft have historically been associated with visitors and owners of vacation homes in the Mammoth Lakes area. Neither group is likely to base an aircraft at the Airport.

6.4.1 Methodologies Considered and Rejected

Four of methodologies presented earlier in this document have been rejected as inappropriate for forecasting based aircraft.

- **Historical trend lines and regression analyses** has been rejected due to the lack of reliable historical data.
- **Socioeconomic and correlation analyses** is rejected because no clear link between the number of based aircraft and available socioeconomic data.
- **Market share analysis** is rejected because poor historical data makes it infeasible to evaluate the relationship between the number of based aircraft at MMH and state or national trends.
- **Judgmental forecasting** is rejected because the comparison with other airports provides a less subjective methodology.

6.4.2 Methodology Selected

Comparison with other airports is the methodology that was used to forecast based aircraft at MMH. Three airports were selected: Bishop Airport, Lone Pine/Death Valley Airport and Independence Airport. As with MMH all of these airports are located in valleys east of the Sierra Nevada Mountains along Highway 395. Bishop Airport is located 35 miles from MMH, Independence 66 miles and Lone Pine 83 miles. In 2015 Bishop had 45 based aircraft, Lone Pine had five and Independence had two. The 2016 TAF forecasts anticipates no change in the number of based aircraft at these airports. Therefore, the forecast of based aircraft for MMH is for the number of aircraft to remain at its current level of seven aircraft. Based upon this forecast, no new hangars are needed to accommodate based aircraft.

6.5 AIRCRAFT OPERATIONS

The forecast of operations will be used to determine whether the airfield will need capacity improvements during the next 10 years to accommodate expected demand. Forecasts for total operations are a composite of individual forecasts by operation type. Individual forecasts were prepared for: scheduled passenger airlines, general aviation aircraft, and military aircraft. General aviation operations forecasts include air taxi. The results are then totaled to produce a forecast of annual operations. Operations are also classified as either itinerant, meaning they originate and depart from different airports; and local, meaning that the flight

remains near the Airport. Local operations are normally only conducted by general aviation and military aircraft for purposes of flight training.

6.5.1 Methodologies Considered and Rejected

Four of methodologies presented earlier in this document have been rejected as inappropriate for forecasting aircraft operations.

- **Historical trend lines and regression analyses** has been rejected for commercial and general aviation operations due to limited available historical data.
- **Socioeconomic and correlation analyses** is rejected for use in forecasting all operations because no clear link exists between the number of commercial or military operations and socioeconomic factors.
- **Market share analysis** is rejected because, as an airport serving a resort/recreational destination, there is not a strong link between operations at MMH and state or national trends.
- **Comparison with other airports** is rejected for general aviation operations because MMH is an isolated airport that cannot be expected to follow operations trends at other airports. It is rejected for commercial and military operations because there is a stronger link between forecast enplanements and operations than operations at other airports.

6.5.2 Methodology Selected

- **Judgmental forecasting** has been used for commercial and military operations. Previously forecast enplanements have been used to forecast commercial operations using assumptions on aircraft seating capacity and load factors. The low number of military operations have been forecast to remain constant due to a lack of data suggesting and change in past activity levels.
- **Socioeconomic analysis** has been used for general aviation operations. Population growth in the Mammoth Lakes area is believed to be the best available indicator of future general aviation operations.

6.5.3 Scheduled Passenger Airlines

Operations by scheduled passenger airlines was calculated by applying assumed load factors and average seats per departure to the enplanement forecast. The current (2016) load factor is 60.9%. The Air Partners group has indicated that the right-sizing strategy is fully in place and no changes are currently planned to boost load factors. For forecasting purposes it was assumed that this percentage will continue through the 10-year forecast period. Similarly the current (2016) number of average seats per departure, 74.5 seats, is presumed to remain unchanged. This reflects the assumption that the current mix of Q-400 aircraft with 76 seats and the CRJ700 aircraft with 70 seats, will remain unchanged through the forecasting period.

Applying the load factor and average seats per departure to the previously presented enplanement forecast would yield the following forecasts of operations:

- 1,040 air carrier operations in 2021.
- 1,094 air carrier operations in 2026.

6.5.4 General Aviation Operations

With only seven based aircraft and no flight school based at the Airport, the majority of general aviation operations are by transient aircraft. The FBO estimates that about 20% of the transient operations are by aircraft owners who own hangars at the Airport because they also own second homes in the Mammoth Lakes area. Because of this link between second home ownership and transient use, the forecast of general aviation operations has been developed by utilizing the rate of population growth projected for Mono County. Mono County includes the Mammoth Lakes area.

Population forecasts for Mono County were taken from the California Department of Finance, Demographic Research Unit Report P-1, *State and County Population Projections: July 1, 2010-2060*. These projections anticipate that Mono County will grow from 14,525 residents in 2015 to 16,671 residents in 2035. The increase represents a compound annual growth rate of 0.69%. Applying this growth rate to the preceding estimate of 2016 noncommercial operations (minus military operations) yields:

- 6,215 operations in 2021.
- 6,432 operations in 2026.

Air taxi operations are forecast to continue to account for 28.2% of total general aviation operations. Itinerant general aviation operations are assumed to remain 69.3% of general aviation operations. Local operation will remain 2.5% of operations

6.5.5 Military Operations

Military operations have averaged about 35 operations annually over the last 5 years. Therefore, for forecasting purposes, annual military activity has been assumed to remain at 35 operations.

6.5.6 Operations Forecasts

A summary of operations forecasts is presented in **Table 8** below.

Table 8.
Operations Forecast

	Itinerant Operations					Local Operations			Total Operations
Year	Air Carrier	Air Taxi & Commuter	General Aviation	Military	Total	Civil	Military	Total	
2016	990	1,634	4,017	32	6,673	143	0	143	6,816
2021	1,040	1,186	1,753	35	7,137	155	0	155	7,292
2026	1,094	1,314	1,814	35	7,403	161	0	161	7,564

6.5.7 Peak Hour Operations Forecasts

There are no sources that directly provide peak hour operations information for the Airport. However, available data for both scheduled airlines and general aviation activity both indicate that March is the peak month. The attraction is the high quality of snow and good weather for skiing that commonly exists in this month. Airport data on actual airline operations indicate that March has accounted for about 20% of total annual operations in 2013-2015. Counts of noncommercial operations (i.e., all nonairline operations) by the FBO show that March 2013-2015 also accounted for about 20% of annual operations for these aircraft. Where peak day counts are not directly available industry practice is to assume equal division of operations during the peak month. The peak day in March would then equal the monthly total divided by 31. Therefore,

the peak day at Mammoth Yosemite Airport would be 20% / 31 = 0.65% of total annual operations. The peak day's percentage of annual operations (0.65%) equated to 44 operations in 2016.

No generic distribution of operations during a peak day is available. Every airport is unique. During the ski season at Mammoth Lakes visitors arriving by air commonly seek to arrive by civil twilight (i.e., sundown). During March this occurs between 6:15 p.m. and 7:45 p.m. During the 2015-2016 ski season three of the four scheduled daily arrivals occur between 4:35 p.m. and 6:45 p.m. General aviation arrivals follow a similar pattern. Based upon FBO landing records, an average peak day in March would see five arrivals by general aviation aircraft during the peak hour. The peak hour is typically 4:30 p.m. to 5:30 p.m. As noted earlier in this report the 2016 peak hour saw three operations by scheduled passenger aircraft. Adding commercial and general aviation peak hour data yields a total peak hour in 2016 of eight operations. In 2016, eight operations would equal 0.12% of total annual operations. Applying this percentage (0.12%) to the 2026 operations forecast yields 9 operations.

6.5.8 IFR Operations Forecasts

Instrument Flight Rule (IFR) operations are recorded in the FAA Traffic Flow Management System Counts (TFMSC). TFMSC operations data for the last four years (2013-2015) ranged from a high of 4,409 in 2013 to a low of 3,699 in 2016. Air carrier operations accounted for about 33% of IFR operations during this four-year period. Total IFR operations accounted for 62% of total operations. Introduction of the RNP instrument approach in the fall of 2016 is expected to increase the total number of air carrier IFR operations by about at least 2%. If air carrier IFR operations increase as projected, the percentage of total IFR operations would increase to 63%. At this rate in 2026 the number of IFR operations will total 4,765.

6.5.9 Cargo Forecasts

Nationally the trend has been a decline in cargo carried as belly-haul in scheduled passenger airline aircraft. The trend at the Airport has followed a declining trend since it started in 2010. Based upon these two trends it is forecast that no air cargo will be handled at the Airport in the future.

7. DESIGN AIRCRAFT

Plans for airport facilities must conform to FAA design standards. Design standards accommodate the physical and operational characteristics of the most demanding 'design aircraft.' The design aircraft must have or reasonably be forecast to conduct 500 annual operations at the Airport. In some cases the design aircraft will actually be a composite of the characteristics of the most demanding aircraft. According to the adopted Airport Layout Plan the current design aircraft for MMH is the Bombardier Q-400 turboprop. The operations counts for the Q-400 for the last four calendar years were:

- 882 operations in 2013
- 1,014 operations in 2014
- 952 operations in 2015
- 796 operations in 2016

The key characteristics of the Q-400 are:

- Aircraft Approach Category: C.

- Airplane Design Group: III.
- Taxiway Design Group: 5.

The Aircraft Approach Category (AAC) relates to aircraft approach speed and is classified by a letter (from A – E). The Airplane Design Group (ADG) component, depicted by a Roman numeral (from I – VI), relates to the aircraft's wingspan and tail height. The Taxiway Design Group (TDG) is based upon the undercarriage (i.e., wheel) spacing of the design aircraft.

The Q-400 is expected to remain the critical aircraft throughout the 10-year forecast period. It should be used as the design aircraft for facility planning.

8. SUMMARY

A summary of the forecasts are shown below in **Table 9**.

Table 9.
Summary of Forecasts

	2016	2021	2026
Passenger Enplanements			
Air Carrier	22,253	23,388	24,581
Commuter	0	0	0
TOTAL	22,253	23,388	24,581
Operations			
Itinerant			
Air Carrier	990	1,040	1,094
Commuter/Air taxi	1,634	1,753	1,814
Total Commercial Operations	2,624	2,793	2,908
General Aviation	4,017	4,309	4,460
Military	32	35	35
Local			
General Aviation	143	155	161
Military	0	0	0
TOTAL OPERATIONS	6,816	7,292	7,564
Instrument Operations	3,699	4,594	4,765
Peak Hour Operations	8	8	9
Cargo (enplaned+deplaned pounds)	0	0	0
Based Aircraft			
Single Engine (Nonjet)	4	4	4
Multi Engine (Nonjet)	3	3	3
Jet Engine	0	0	0
Helicopter	0	0	0
Other	0	0	0
TOTAL	**7**	**7**	**7**