2009

Master Plan Update

2008-2028

CH2MHILL

TB012009001ANC

2009

MISSOULA INTERNATIONAL AIRPORT

Master Plan Update

2008 - 2028

CH2MHILL

TB012009001ANC

Final Report

Missoula International Airport Master Plan Update

2008-2028

Prepared for

Missoula County Airport Authority

2009

CH2MHILL

*Special appreciation to Chris Hart for the cover photo of a jet deicing at MSO

Master Plan Study Participants and Contributors

Study Resource Committee – Airport Community Representatives

Todd Franicevich
Airlines' Representative

Kristen Nicolarsen
Neptune/Northstar

Chris Holm
Neptune/Northstar

Forrest Gue
Minuteman Jet Center

Eddie Ward
US Forest Service

Gary Matson
GA Representative

Henry Barsotti
Air Traffic Control Tower

Kurt Carlson
Transportation Security Agency

Debbie Alke
Montana State Aeronautics Division

Jim Greil
Montana State Aeronautics Division

Gary Gates
FAA Airport District Office

Dave Stelling
FAA Airport District Office

Study Resource Committee – Community Representatives

Roger Millar
Missoula County Office of Planning and Grants

Dick King
Missoula Area Economic Development Corp

Chad DeLong
Missoula Area Economic Development Corp

Kim Latrielle
Missoula Area Chamber of Commerce

Barb Neilan
Missoula Convention and Visitors Bureau

Douglas Reisig
Hellgate Elementary School

Richard Chapman
Pleasant View Homeowner's Association

Steve King
City Public Works Director

Jack Meyer
MCAA Board Member

Larry Anderson
MCAA Board Member

Airport Staff

Cris Jensen
Airport Director

Greg Phillips
Deputy Director – MP PM

Cathy Tortorelli
Administrative Manager

CH2M HILL Planning Staff

John van Woensel

Jon Erion

Cheryl DeGroot

Bob Endres

Emery Weaver

Jonathan Millea

TABLE OF CONTENTS[1]

[1] The Master Plan Update was created over a one-year period, and officially completed March 2009. Individual chapters within the MPU are valid as of the date they were produced.

Table Page

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Chapter 7

Exhibit Page

Chapter 1

Chapter 5

Chapter 7

Appendices

Overview and Executive Summary

Missoula International Airport Master Plan Update

Prepared for

Missoula County Airport Authority

JANUARY 2009

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Contents

Overview and Executive Summary

Missoula International Airport (MSO or the Airport) is a commercial service and general aviation (GA) airport located four miles northwest of the city of Missoula, Montana. MSO started on a 1,300 acre parcel of land that was purchased by Missoula County in 1938. By 1941, the airport was officially opened and the passenger terminal was completed in 1958. From then until 2008, the terminal facility has been expanded on three separate occasions, most recently in 2007 to add more convenient security checkpoints. The Missoula County Airport Authority (MCAA) owns and manages the Airport.

MSO is considered an Origin and Destination (O+D) airport, with most of its passengers either arriving or departing from the Missoula area, as opposed to connecting to other destinations. A sample survey of passengers conducted as part of this Master Plan revealed that business and leisure travelers were almost equal at approximately 52 percent and 48 percent, respectively.[1] Results from that survey revealed that airport location, pricing, and flight frequency were the top factors for passengers selecting an airport. MSO was highly ranked, except for flight availability, as is typical for airports of similar size.

In addition to its role as a commercial service airport, MSO accommodates two other important components of aviation. First, most of the Northern Rocky Mountain Fire tanker fleet is based at the airport, in support of the U.S. Forest Service's Northern Region. Second, the airport is home to a wide range of general aviation users. Served by two fixed base operators (FBO), general aviation at MSO includes flight training, air taxi, corporate aviation, and private aviation.

The Airport Master Plan Defined

The Federal Aviation Administration (FAA) defines an airport master plan as a plan for potential long-term development of an airport. The master plan entails a series of planning steps that analyze how future aviation demand can best be accommodated within a 20-year outlook, including a graphical representation of the findings. The planning period of this master plan spans from 2008 to 2028. The goal of a master plan is to provide solutions that satisfy the expected future needs of an airport in a financially feasible manner, while accounting for the surrounding community, local environment, and socioeconomic factors.

The recommendations provided in a master plan are only recommendations, and implementation of any proposed projects can occur only as warranted by need. This plan will be recognized as the long-term development plan upon endorsement from Missoula County Airport Authority (MCAA) and approval of appropriate sections from the FAA.

[1] Survey conducted by the Missoula County Chamber of Commerce Chamber Members, resulting in 204 responses. A summary of the results are shown in Appendix I.

The recommendations outlined in the plan are also subject to further FAA review and environmental/feasibility studies before implementation.

Timing and Purpose of the MSO Master Plan Update

The most recent full airport master plan for MSO was completed in 1996, and in 2004 a partial update was completed in the form of an Airport Layout Plan (ALP) Update. According to FAA Advisory Circular (AC) 150/5070-6B, airport master plans should be updated periodically—typically every five years—or when specific needs exist. Whereas this Master Plan Update includes a full forecast update and assesses general airport-wide needs through 2028, the plan also seeks to answer a number of specific questions:

- **Parallel Runway.** Previous studies have indicated that future demand may warrant the construction of a third runway to be oriented parallel to Runway 11/29. This plan analyzes the capacity of the airfield compared to newly forecast aircraft operations to determine if a third runway is needed during the planning period.
- **Crosswind Runway.** Previous planning studies for MSO have recommended that Runway 7/25 be decommissioned because of low use and the previously-proposed parallel runway. This study identifies the users and role of the crosswind runway and examines the need of the runway.
- **Terminal Building, Access, and Roadway Expansion.** While a general expansion plan for the terminal exists, MCAA directed CH2M HILL to reconsider the full range of terminal expansion options. The terminal is adequate for today's passenger demand levels, but growth in passengers or the number of airlines over time will require expansion or replacement of the building. Additionally, the access road currently does not provide convenient access to the newer portion of the terminal, and parking demand exceeds capacity during peak travel times. As part of this airport master plan, the terminal is studied and a Landside Master Plan Study was commissioned.
- **General Aviation.** Two immediate general aviation issues existed at the start of this master plan; first, 19 hangars projected to be demolished must be replaced on airport property, and second, interest in additional hangars existed. In order to address these time-sensitive issues ahead of the master plan study schedule, a separate decision-support-document is developed; the *Long-Term Concept Sketch Plan.*

Stakeholders and Public Involvement

To ensure that the needs of the airport and traveling public, the surrounding community, and other stakeholders were considered throughout the study, five meetings were held throughout the Master Plan process with a specially-formed Study Resource Committee (SRC) and two Public Outreach meetings. The presentation materials are provided in **Appendix A.**

Airport Objectives

The MSO Master Plan assesses airport-wide needs through 2028 and provides solutions to accommodate the expected future aviation demand. Specifically, the mission of the plan itself is reflective of the objectives of the MCAA, who is tasked with the ongoing operations of the Airport, including:

- **Maintain or Enhance High Level of Customer Service.** MSO is committed to providing a high level of passenger service, while maintaining a local, friendly feel. The analyses and studies performed ensure that MSO's level of customer service will remain high.
- **Maintaining Low Operating Costs.** Airports pass on their costs not covered by other sources to airlines, therefore it is important that the Airport maintain a low cost structure to retain and attract air service.

Master Plan Update Findings

This MSO Master Plan includes components that are recommended by the FAA. Included in this plan are a documentation of facility improvements since MSO's most recent full MPU inventory chapter; a 20-year aviation forecast, used as a basis of the capacity and facility requirements analysis; an alternatives analysis to determine the most viable development options for MSO; and finally an Airport Layout Plan (ALP) update, which is a graphical depiction of existing and future airport facilities. Related services were also undertaken at the same time, resulting in separate and stand-alone deliverables, including:

- Aerial photography and digital imagery mapping of the MSO site, as shown in **Exhibit ES-1.**
- A *Long-Term Concept Sketch Plan* to allow early evaluation of the preferred location of general aviation and passenger terminal development needed in the near term.
- Nonaviation development plan, including findings of an assessment of the local market.
- Pavement condition evaluation and recommendations.
- Utility survey and mapping plan.
- Terminal parking and roadway plan to evaluate and recommend a layout that alleviates existing peak-period shortfalls.
- Environmental compliance self-review to verify that current airport and key tenant operating practices conform with environmental regulations.

Airport Improvements since the 1996 MPU

Prior to the MPU's analyses, much relevant data was collected about the airport, its surroundings and community setting, and the aviation industry. These data were used throughout the planning process and are presented in the associated sections of the MPU. This section briefly updates previously collected inventory information, for the purpose of highlighting changes at MSO since the 1996 plan:

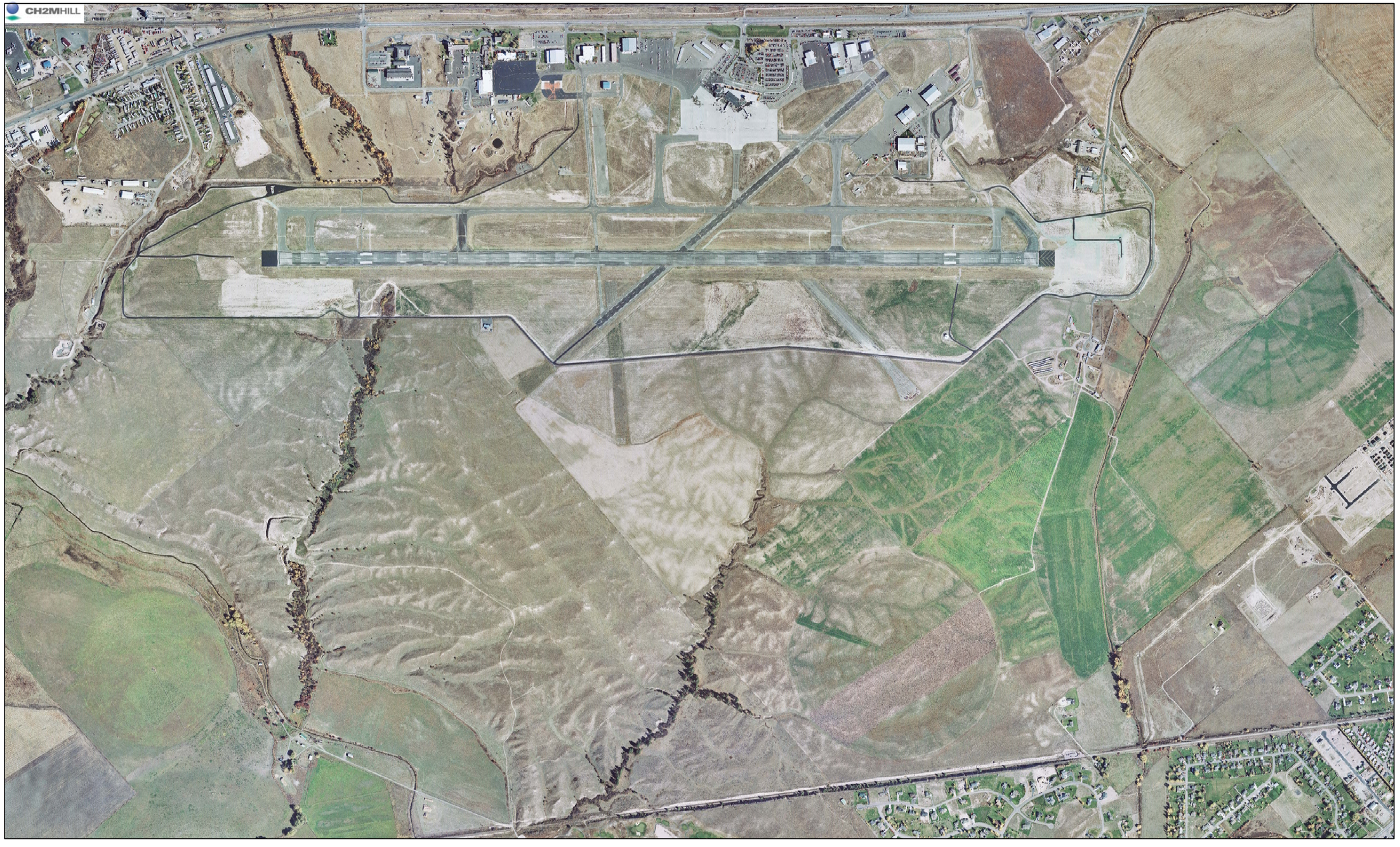
- Extension of partial parallel Taxiway A to the full length of Runway 11/29. (1996)

- Addition of Neptune Aviation headquarters to a new hangar complex. (2006)
- Expansion of the air carrier aircraft ramp, Phases I, II, and III. (2000)
- Expansion of the air carrier aircraft ramp, Phases IV and V. (2001)
- Siting study for a new Air Traffic Control Tower to replace the old facility. (2005)
- Realignment of Taxiway F to 90 degree angle. (1997)
- Realignment of Taxiway D to 90 degree angle. (2003)
- Construction of a connector taxiway between Taxiway A and the east GA ramp. (2006)
- Construction of a U.S. Forest Service (USFS) hangar and administrative complex (adjoining airport property). (2004)
- Construction of Homestead Helicopters hangar. (2005)
- Expansion of the existing passenger terminal and relocation of security checkpoints. (2007)
- Addition of a Special Instrument Landing System (ILS) Approach Procedure (Ceiling: 200 feet, Visibility: 1/2 mile) to the existing ILS minimums of a 1,300-foot ceiling and 1¼ mile visibility. (2001)
- Construction of a satellite aircraft rescue and firefighting (ARFF) building adjacent to the passenger terminal. (2006)
- Addition of two Explosives Detection System (EDS) machines. (2007)
- Grading and relocation the ILS system localizer, and grading for future relocation of the Glideslope. (2006)

The following projects either commenced during the master planning process or remain ongoing:

- Upgrade of the security system, including a new Closed Circuit Television System, and new security airfield access gates with access control.
- The Environmental Assessment (EA) for the proposed Air Traffic Control Tower.
- Construction of a designated aircraft deicing apron west of the passenger terminal.
- Construction of 17 T-hangars near Runway 25.

In addition to documentation of changes that have occurred since the 1996 MPU, **Table ES-1** provides a general overview of existing facilities including information pertaining to runway dimensions and design standards, taxiway dimensions and design standards, lighting, and navigational aids (NAVAIDs).



N
W
E
S

0 600' 1,200' 2,400' 3,600'

GRAPHIC SCALE IN FEET

File: P:\Airports\MSO-Missoula\CAD\IMAGES\Aerial Images.dwg

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Missoula Airport Master Plan Update

Aerial Photography
October, 2007

Exhibit
1

TABLE ES-1
Airside Facilities

	PRIMARY RUNWAY		CROSSWIND RUNWAY	
	Runway 11	**Runway 29**	**Runway 7**	**Runway 25**
Runway Details				
Length (feet)	9,501		4,612	
Width (feet)	150		75 [1/]	
Surface Material	Asphalt Grooved		Asphalt	
Pavement Strength (lbs)				
Single Wheel	145,000		30,000	
Dual Wheel	170,000		50,000	
Dual tandem	255,000		-	
Airport Reference Code	C-III [2/]		B-I [3/]	
Critical Aircraft	MD-80		King Air B100	
Wingspan (feet)	107.9		45.8	
Approach Speed (knots)	135		111	
Weight (lbs)	141,000		11,800	
FAA Design Standards (feet)				
Runway Safety Area				
Width	500		120	
Length Beyond Runway End	1,000		240	
Runway Object Free Area				
Width	800		400	
Length Beyond Runway End	1,000		240	
Runway Protection Zone				
Inner Width	1,000	500	250	
Outer Width	1,750	1,010	450	
Length	2,500	1,700	1,000	
Runway Obstacle Free Zone				
Width	400		250	
Length Beyond Runway End	200		200	
Lighting/Navigational Aids				
Runway Edge Lights	HIRL	HIRL	MIRL	MIRL
Runway Markings	Precision	Nonprecision	Visual	Visual
Visual Approach Aids	PAPI, MALSR	LDIN, PAPI, REIL	-	-
Instrument Approach Aids	Special ILS, ILS, GPS	-	-	-
Lowest Visibility Minimums	1/2 SM [4/]	Visual	Visual	Visual
Lowest Ceiling Height Minimums	200 [4/]	-	-	-
Taxiway Details				
Full Length Parallel Taxiway	Taxiway A		Runway 7/25 is not served by a full length parallel taxiway	
Width	75			
Runway Separation	600			
Taxiway Lighting	Medium Intensity Taxiway Lights			
Taxiway Markings	Yes			

Prepared by: CH2M HILL, December 2008.

Notes:

1/ The FAA recommends that the width of Runway 7/25 be maintained at 75 feet.

2/ The ARC for Runway 11/29 is C-III, based on the FAA-approved Forecast. However, existing safety standards for C-IV are represented and should be maintained wherever possible, in order to preserve maximum flexibility.

TABLE ES-1
Airside Facilities

3/	The users of Runway 7/25 are B-I-Small aircraft only or smaller. However, because MSO is a Part 139 carrier airport, per FAA direction, the existing B-I design standards should be maintained to provide an additional margin of safety.		
4/	Minimums representative of Special ILS, which is not publically available. Only aircraft and pilots authorized to fly this approach achieve these minimums.		
Acronyms:			
AGL	Above Ground Level	MALSR	Medium Intensity Approach Light System with Alignment Indicator Lights
HIRL	High Intensity Runway Edge Lighting	VASI	Visual Approach Slope Indicator
GPS	Global Positioning System	MIRL	Medium Intensity Runway Edge Lights
ILS	Instrument Landing System	PAPI	Precision Approach Path Indicator
LDIN	Lead-in Lights	REIL	Runway End Identifier Lights
		SM	Statute Mile

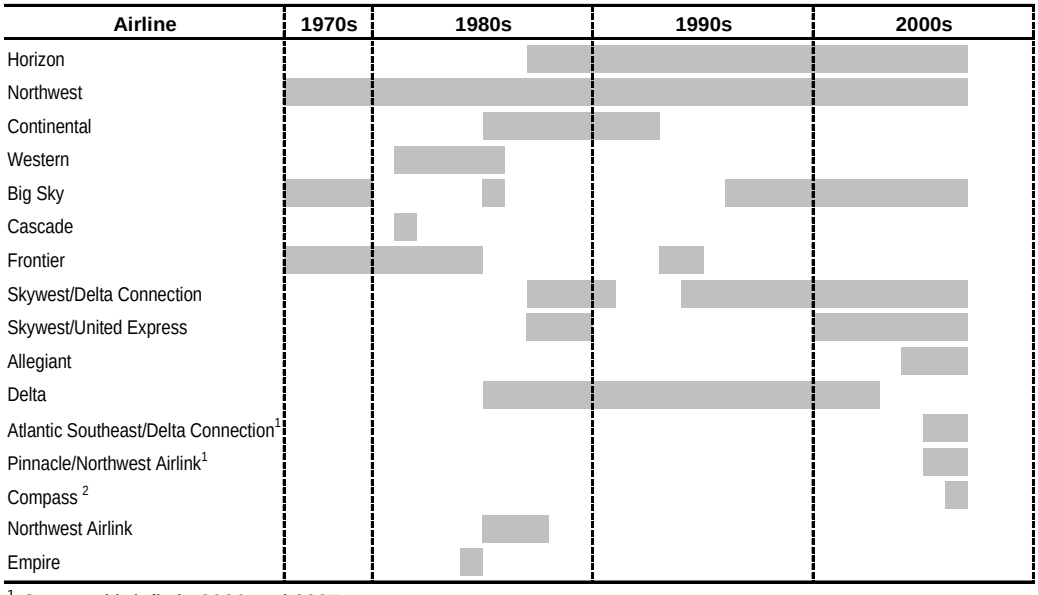
Aviation Forecast

An airport master plan is built on detailed projections of future aviation demand. Because the aviation industry is highly dynamic and cyclical, a number of macro- and micro-level factors are considered in forecasting future aviation traffic, including history, service area demographics, and industry trends. The below forecast is intended for long-term planning purposes, and is less meaningful in the short-term.

Airport History

Understanding historical air service trends is an essential component to understanding the basis of current trends and the likely direction of future development. This forecast analyzes air service across the previous thirty years. **Exhibit ES-2** below shows the periods of service provided by the airlines that have served MSO between 1975 and 2007.

EXHIBIT ES-2
History of Airlines that Served Missoula International Airport from 1975 through 2007



[1] Operated briefly in 2006 and 2007.

[2] Operated for Northwest.

Source: Missoula County Airport Authority.
Prepared by: UCG Associates, Inc.

Industry Trends

A variety of industry trends and some local trends influence aviation demand and several changes were considered in forecasting future aviation demand at MSO. These factors, and their possible influence on the level of future activity at MSO, include:

- **Price of Air Travel.** As the demand for air travel is inversely related to its cost, people travel more frequently when fares decrease. From 1981 to 2007 the average domestic real passenger yield at MSO decreased 2.6 percent per year. This occurred due to a number of factors, including deregulation, price transparency offered by the Internet, competition spurred by low-cost carriers, and growing price consciousness by consumers. Although the future decline in price will be significantly less than previous, airfares are expected to follow national trends projected by the FAA and continue to decline at an average rate of 0.6 percent per year.
- **Income.** As income boosts consumer spending and encourages business activity, an increase in income within MSO's service area is likely to amplify demand for air travel. Between 1981 and 2007, the real U.S. gross domestic product (GDP) per capita increased at an average annual rate of 2.0 percent, while per capita income in Missoula, Ravalli, and Lake Counties increased an average of 1.8 percent per year over the same period. The rate of GDP per capita is anticipated to lessen slightly over the next few decades to an average annual rate of 1.5 percent nationwide and 1.2 percent for Missoula, Ravalli, and Lake Counties.
- **Local Population.** The volume of passenger traffic moves with changes in the population of the service region. The populations of Missoula, Ravalli, and Lake Counties grew at approximately 1.5 percent per year from 1981 to 2007, a trend that is expected to intensify slightly with growth rates increasing to 1.6 percent per year from 2008 through 2028.
- **Structural Changes since 2001.** In the wake of the 2001 economic recession and the terrorist attacks of September 11th, many changes occurred in the aviation industry. For instance, increased security measures at airports have significantly lengthened passenger wait times, sometimes affecting the transportation choices made by consumers. Airlines, including those serving MSO, have streamlined schedules and restructured services to minimize costs. Additionally, traditionally high-yield business travelers have become more price-sensitive as a result of reduced travel budgets.
- **Fleet Mix.** Industry-wide, major network airlines have been replacing large jet aircraft with smaller aircraft, operated by their regional affiliates, to better match supply with demand in smaller markets. Older turboprop aircraft are also being replaced by regional jet aircraft. This trend is expected to continue. At MSO regional carriers are projected to carry the large majority of total enplanements, 72.7 percent over the forecast period.

The FAA accepted the MSO Forecast on June 25th, 2008.

Historical Enplanements

Passenger enplanements have grown steadily over the past few decades and have more than tripled from 81,866 in 1981 to 283,478 by 2007. The FAA classifies MSO as a nonhub airport, with a market share of .029 percent of total U.S. enplanements in 1981 to a peak of 0.039 percent between 2001 and 2003. MSO's market share was 0.037 percent in 2007. As suggested by the

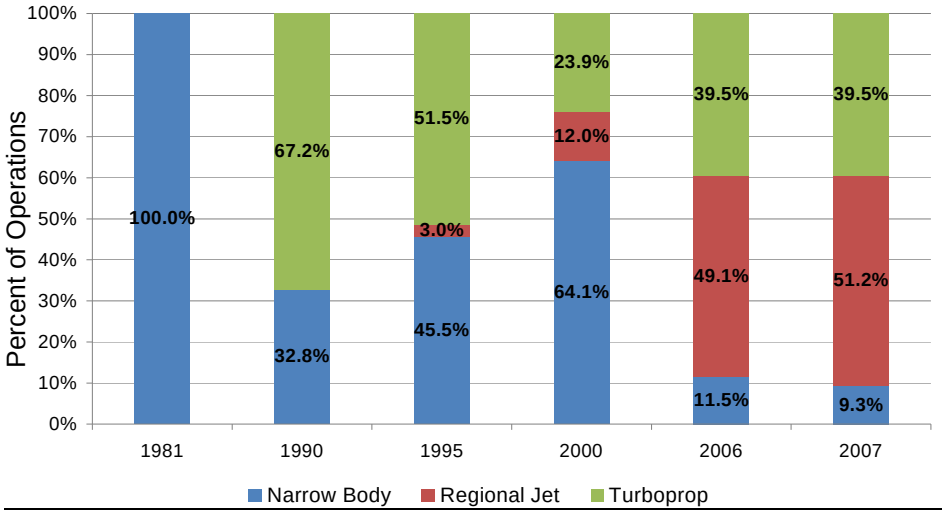
increased market share, annual enplanements at the airport grew at a faster rate between 1981 and 2007, averaging 4.9 percent per year, compared to 3.9 percent nationwide. There have been points of decline, the most recent of which resulted from the terrorist attacks of September 11th, 2001, which compounded with a recession to weaken much of the commercial airline industry and reduce travel demand through 2002. Although growth rates moderated to 2.9 percent during the first half of the 2000s, MSO accommodated record numbers of enplanements from 2003 through 2007, as enplanements continued to grow faster than the national average. Despite difficult points in the national economy and volatility in the airline industry, MSO enplanements continued to increase, due in part to population growth within the Airport's service area. Additionally, the population of MSO's service area is projected to increase 15 percent every ten years over the next several decades. The region is also a popular tourist destination, particularly during the summer months.

Historical Aircraft Operations

Even though passenger enplanements have steadily grown over the past few decades, the total number of aircraft operations at MSO has gradually been decreasing, from a peak of 83,717 operations in 1976 to a low of 51,876 operations in 2006. A significant portion of the decline is a result of changes in GA activity which has declined by 2.6 percent a year on average since 1976. Air carrier operations have decreased by 0.5 percent annually while air taxi and commuter operations have increased by 7.2 percent per year, due largely from an increase in the use of regional jets as air carriers shifted some markets to their commuter affiliates.

Operational activity and future development at MSO will continue to be influenced by a variety of factors. With advancements in technology, many airlines are continuing the move toward the use of smaller regional jets, which offer increased efficiency over widebody mainline aircraft, and generally require smaller facilities to support, such as terminal hold rooms, runways, and taxiways. Regional jets account for approximately 50 percent of all passenger aircraft operations at MSO, as shown in **Exhibit ES-3**. Smaller and more fuel-efficient aircraft provide airlines with a more efficient means of servicing regional destinations, sometimes with the opportunity to increase the number of flights available. The use of regional jet aircraft also helps airlines to maintain high boarding load factors, which have increased at MSO from an average of 57.5 percent in 2003 to 69.7 percent by 2007, and are likely to continue to increase over the next several years. Regional jets have become larger, and 70 to 90 seat aircraft are now common. Although the use of mainline aircraft is expected to increase slightly at MSO to cover long-distance and popular destinations, particularly during the busy summer months, the majority of new operations are still expected to take place on regional aircraft. This continuing trend toward smaller aircraft will result in an increased growth rate of passenger aircraft operations even though the growth rate for enplanements declines.

EXHIBIT ES-3
Missoula International Airport Aircraft Fleet Mix: 1981- 2007



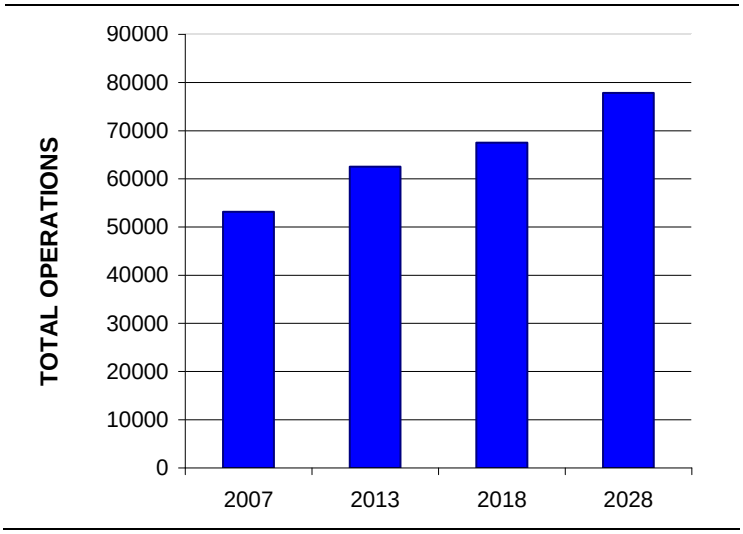
Source: BACK Aviation Services OAG data.
Prepared by: UCG Associates, Inc.

Enplanement and Operations Forecasts[2]

To determine the trajectory of MSO's likely future growth in enplanements and aircraft operations, a variety of forecasting techniques were employed, including Market Share Analysis, Trend Extrapolation, and Multivariate Regression. The selected methodology, Multivariate Regression (Base), was chosen for the ability to quantify multiple explanatory variables on demand and reduce subjective variables. Under this forecast, the rate of passenger enplanement growth is expected to decline from 2.9 percent to 2.3 over the course of the planning period and the number of enplanements will continue to increase from the 283,478 enplanements in 2007 to an estimated 473,518 enplanements by 2028. At the same time, passenger aircraft operations will increase from the 14,041 operations that took place in 2007 to 21,709 by 2028. Air Cargo operations are expected to decrease from 1,245 to 1,151 over the planning period while air taxi service operations will grow slightly and military operations remain constant. GA operations, which comprise about 60 percent of the total operations at MSO, are projected to increase from 32,290 in 2007 to 47,774 by 2028, when it will account for about 61 percent of all operations. Total activity is estimated to reach almost 78,000 operations by the end of the planning period, up 47 percent from just over 53,000 operations in 2007, as shown in **Exhibit ES-4.**

[2] Since the approval of the forecast in mid 2008, the aviation industry has experienced a short-term slowdown because of a global recession. However, no conclusions can be drawn at this time as to whether or not the industry slow down will affect the long-term forecast. Therefore, the forecast is still deemed to be relevant for long-term planning. Should any structural industry changes occur because of the slowdown, the forecast will be reanalyzed as part of a future master plan update.

EXHIBIT ES-4
Missoula International Airport Forecast of Total Operations, 2007-2028



Airfield Demand Capacity

This master plan update examines airfield attributes, ranging from runway lengths to navigation, and superimposes the existing infrastructure's ability with projected demand to project likely deficiencies and opportunities for improvement.

Airport Design Standards

FAA design standards are driven by the Airport Reference Code (ARC), which reflect the design aircraft, or the most demanding aircraft that regularly operates at an airport. MSO has an overall ARC of C-III, indicating that the most demanding aircraft using the airport has a wingspan between 79 and 118 feet and an aircraft approach speed between 121 knots and 141 knots.

Prior to this MPU, MSO was projected to regularly accommodate Boeing 757s, a C-IV aircraft, and therefore was designed to C-IV design standards and separations. However, the approved forecast projects that MSO's most demanding regular aircraft will be the McDonald Douglas MD-80, which has a smaller wingspan and drives MSO's ARC to C-III. Although a C-III ARC reduces dimensional requirements of MSO's design standards, this MPU recommends that actual facilities be constructed to C-III dimensions, but that the separation between airfield facilities should be maintained at C-IV to preserve maximum flexibility.

MSO has two runways, Runway 11/29, which serves as the primary runway, and Runway 7/25, which serves mostly GA activities. Each runway has an individual ARC based on the type of aircraft it accommodates. The ARC for Runway 11/29 is the same as the overall airport, C-III. On the other hand, the users of Runway 7/25 are B-I Small-aircraft-only, or smaller. However, because MSO is a Part 139 air carrier airport, per FAA direction, the existing B-I design standards should be maintained to provide an additional margin of safety.

Capacity Analysis

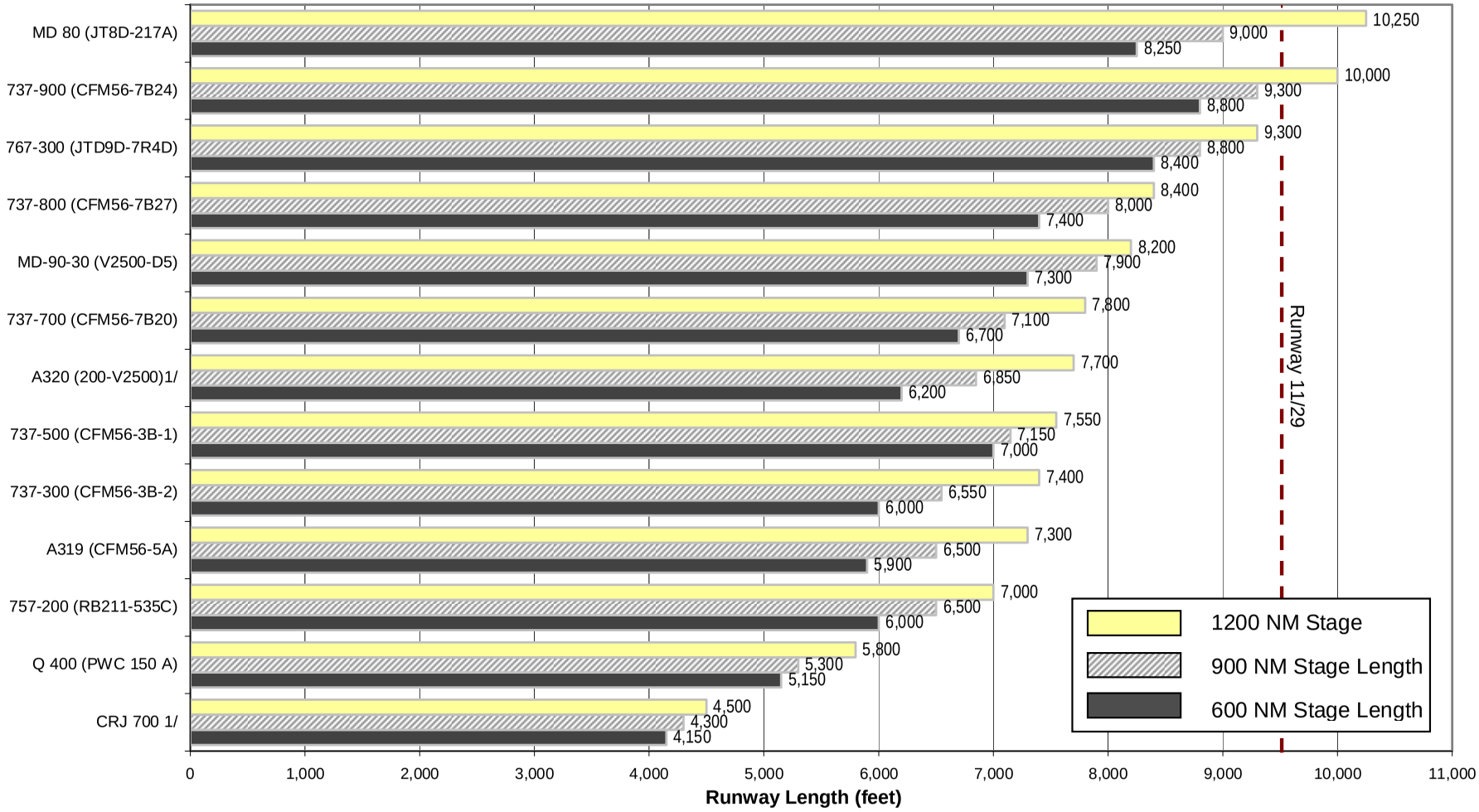
The estimated annual capacity of the MSO airfield is 205,000 aircraft operations, which is expected to remain constant through the end of the 2028 planning period. Actual aircraft operations in 2007 were 53,174. Over the next two decades, the total number of annual operations is expected to increase to 77,852. This represents an increase from a 26 percent ASV in 2007 to 38 percent in 2028. The FAA recommends that airports plan for runway capacity improvements once capacity reaches 60 percent and before capacity exceeds 75 percent of ASV. As such, capacity improvements, such as a parallel runway, are not required at MSO through 2028.

Airfield Facility Requirements and Alternatives

Runway Length

MSO's primary runway, Runway 11/29, is 9,501 feet long and the length of crosswind Runway 7/25 is 4,612 feet. Existing runway length requirements were verified for the design aircraft using aircraft manufacturers' data, following the methodology outlined by the FAA in AC 150/5325-4b, *Runway Length Requirements for Airport Design*. The landing length needs of the existing and future fleet at MSO range from 4,450 feet to 6,900 feet while take-off runway length requirements for long-range stage lengths require up to 10,250 feet, a figure driven by the MD-80 flying to a longer-haul destination. The bulk of air carrier operations serve mid-range stage length destinations, or destinations within 900 nautical miles of MSO. **Exhibit ES-5** below shows the take off runway length demand of the existing and projected fleet. Given the projected fleetmix and general markets served, the existing runway length is sufficient for the planning period.

EXHIBIT ES-5
Missoula International Airport Historical and Forecast Passenger Aircraft Operations, 1981-2028



Notes:

1/ Takeoff weight assumes 92% MTOW for 1200 NM, 89% MTOW for 900 NM and 86% MTOW for 600 NM

Runway elevation 3205.2 feet MSL

Aircraft manufacturers data

Standard day + 27 degrees (F)

757-200 Standard day + 25 degrees (F)

767-300 standard day + 33 degrees (F)

Q 400 Takeoff flaps set at 5 degrees

Taxiway System

The taxiway system at MSO provides unimpeded access to and from movement areas. All taxiways meet FAA separation and dimensional requirements with the exception of Taxiway G, where limited taxiway width renders it underused. To correct this issue, Taxiway G should be widened between Runway 11/29 and Taxiway A. While not critical, straightening the exit to be perpendicular with the runway would also be beneficial. The northern section of Taxiway G from Taxiway A to the Minuteman/USFS apron should also be widened to meet standards. Also, the intersection of Taxiway E, Taxiway A, and Runway 7/25 is inconsistent with the guidance offered by FAA Engineering Brief Number 75 (EB-75): *Incorporation of Runway Incursion Prevention into Taxiway and Apron Design*. Moving Taxiway E away from the intersection of Taxiway A and Runway 7/25 will correct the inconsistency and enhance safety.

Runway 11/29 does not have a high-speed taxiway exit nor is one required based on the FAA-approved forecast peaking characteristics; however such a taxiway could be of benefit to high-speed tanker aircraft operations. In the long-term, a high-speed exit is recommended just beyond Taxiway G on Runway 29.

Finally, although Runway 7/25 is not supported by a parallel taxiway, the runway's low rate of utilization does not warrant additional taxiways.

General Aviation and Apron Requirements

Additional space will be needed to accommodate the future needs of existing and potential new GA businesses. Two full-service FBOs and one helicopter FBO serve MSO's GA needs and are located at opposite ends of the airfield: Minuteman, Northstar/Neptune, and adjacent Homestead Helicopters. Based on the forecast and input from the FBOs, multiple maintenance hangars, additional and replacement T-hangars, and helicopter refueling areas are projected. Both FBOs also experience apron deficiencies during peak days. To meet demand through the end of the planning period, an additional 111,000 total square yards of apron area is required.

Because suitable space is available near Minuteman and Northstar/Neptune, the ability to phase in short- and long-term development exists with minor line of sight (LOS) restrictions and required utility and support infrastructure enhancements. In the long-term, designating an area south of Runway 11/29 for additional GA development, including space for a potential third FBO, is recommended. Positioned by the proposed air traffic control tower (ATCT), future GA development in this area would be the least restricted by LOS, and Part 77 surfaces and have ample space to expand. Additionally, any long-term GA development will likely be able to capitalize on infrastructure being constructed for the proposed ATCT, including utilities, fencing, and security. Development in this area relies on the expected future decommissioning of the airport very high frequency omnidirectional range (VOR) and completion of the proposed ATCT.

The fuel farm on the eastern side of the airfield supplies fuel for aircraft at MSO and will need to be expanded to accommodate a projected 45 percent increase in fuel demand. Expanding the fuel farm in the existing location is preferred because it does not pose a LOS concern, has adequate landside access, appears to have the least environmental impact, and has the smallest effect on other aviation development.

Navigational Aids

Approach lighting, instrument approaches, and other navigational aids are essential to provide safe and efficient access to MSO, particularly in instrument meteorological conditions (IMC). While the majority of aircraft use Runway 29 (85-90 percent utilization), most published runway-specific approaches are for Runway 11, which is used 7 to 10 percent of the time. This is due to terrain issues that, up until recently, have made instrument approaches to Runway 29 impractical.

With the advent of the FAA's NextGen program, a variety of satellite-based approaches have been published for airports across the nation, including at MSO, increasing airport safety and accessibility throughout the national airspace system. The new navigation procedures, enabled by advancements in GPS technology, allow aircraft to receive highly accurate vertical and lateral guidance to runway thresholds without the need for equipment at the airport itself. In special cases, procedures can be published for use only by certified aircrew and equipment. **Table ES-2** outlines the instrument approach procedures currently available or programmed for MSO.

TABLE ES-2
MSO Approach Procedures

Precision/APV Approaches	Ceiling Minimum (AGL)	Visibility Minimum (Mile)
Existing Approaches		
Runway 11 ILS (SPECIAL)	200'	1/2
Runway 11 ILS	1,350'	5
Programmed Approaches		
Runway 29 RNAV/RNP	TBD	TBD
Nonprecision Approaches	**Ceiling Minimum (AGL)**	**Visibility Minimum (Mile)**
Existing Approaches		
Runway 11 RNAV (GPS)	2,220'	1 1/4
Programmed Approaches		
Runway 11 RNAV (GPS)	TBD	TBD
Circling Approaches (Existing)		
GPS-D	1,915'	1 1/4
VOR/DME or GPS-A	1,859'	1 1/4
VOR/DME or GPS-B	1,299'	1 1/4

Existing Approaches Source: NACO: Digital Terminal Procedures Publication, November 2008.
Source of Programmed Approaches: FAA - AVN: Instrument Flight Procedures (IFP) Production Plan, November 2008.
Prepared by: CH2M HILL, 2008.

Given the efficiency and improved accuracy of satellite-based navigation for aircraft equipped to use the technology, new RNAV approaches are replacing traditional approaches for all but Category II and III ILS approaches. Due to the higher accuracy, RNAV approaches are sometimes feasible in places where terrain limits the minimums that can be attained with

traditional technology. Additionally, the new navigation system costs less to maintain than traditional ground-based NAVAIDs. As a result, the FAA has begun the process of phasing out VOR and non-directional Beacon (NDB) stations, although many will be maintained as backup capability. As technology improves, it is likely that ILS approaches will also be supplemented with satellite-based approaches, such as LPVs, and ILSs will be used as redundant capability. To increase airport accessibility under all-weather conditions, it is recommended that MSO requests additional new and lower-minimum RNAV approaches from the FAA on Runway 29. While there are many satellite-based approach procedures that could be developed and published for the runway, an LPV approach provides precision-quality with vertical and lateral guidance. An LPV with an approach lighting system provides the lowest minimums.

While MSO's Runway 11 is equipped with precision approach and REIL lighting, the addition of a MALSR approach lighting system on the Runway 29 end would allow the airport to capture the lowest minimums (200 feet) associated with the LPV approach.[3] In addition, it is recommended that the ILS on Runway 11 be supplemented with satellite-based approaches. Lower minimums will increase the size of the RPZ and POFZ on Runway 29. When evaluated, impacts to existing infrastructure resulting from enlarging the RPZ and POFZ were not identified.

Passenger Terminal Analysis

The passenger terminal complex constitutes a major land use for the airport and is the image for passengers arriving and departing from MSO. Past terminal building expansions have considerably improved the performance of the facility but some existing areas are still functioning with less capacity than required, and forecast future demand is projected to overtax the terminal facilities, such as airline operations and bag claim. Past expansions of existing buildings has also created a terminal layout and flow that is less than ideal, and has created multiple redundant and overlapping infrastructure elements.

Terminal Capacity and Facility Requirements

The following items highlight the present and projected terminal facility requirements through the planning period:

Gates

- Eight gates are projected to be required to meet the projected need within the planning period.

Airline Bag Makeup and Operations Space

- Airline operations space is presently over capacity.
- Additional in-line explosive detection systems (EDS) are required for peak periods.
- Airline ground service equipment (GSE) must be stored on the apron unless space is available in the bag makeup areas.

Checked Bag Screening and Ticket Lobby

- The location of existing EDS equipment in the lobby constrains cross-circulation in the airline ticketing operations area.
- One additional security screening checkpoint will be required within the planning period.
- Secure circulation in the upper holdroom is five feet less than recommended.

[3] Scheduled for August 27, 2009 publish date.

Bag Claim

- Existing bag claim area units are undersized by approximately 50 feet during periods of peak demand.
- The airline bag off-load area is too narrow to accommodate bag trains.
- Spacing between existing bag claim units is slightly less than recommended.
- Rental car queues require additional space in order to alleviate congestion problems during peak times.
- Office and counter space for rental car companies is deemed adequate for current tenants. However, additional rental car companies (located off the airport) have expressed interest in leasing terminal counters and parking.

Concessions

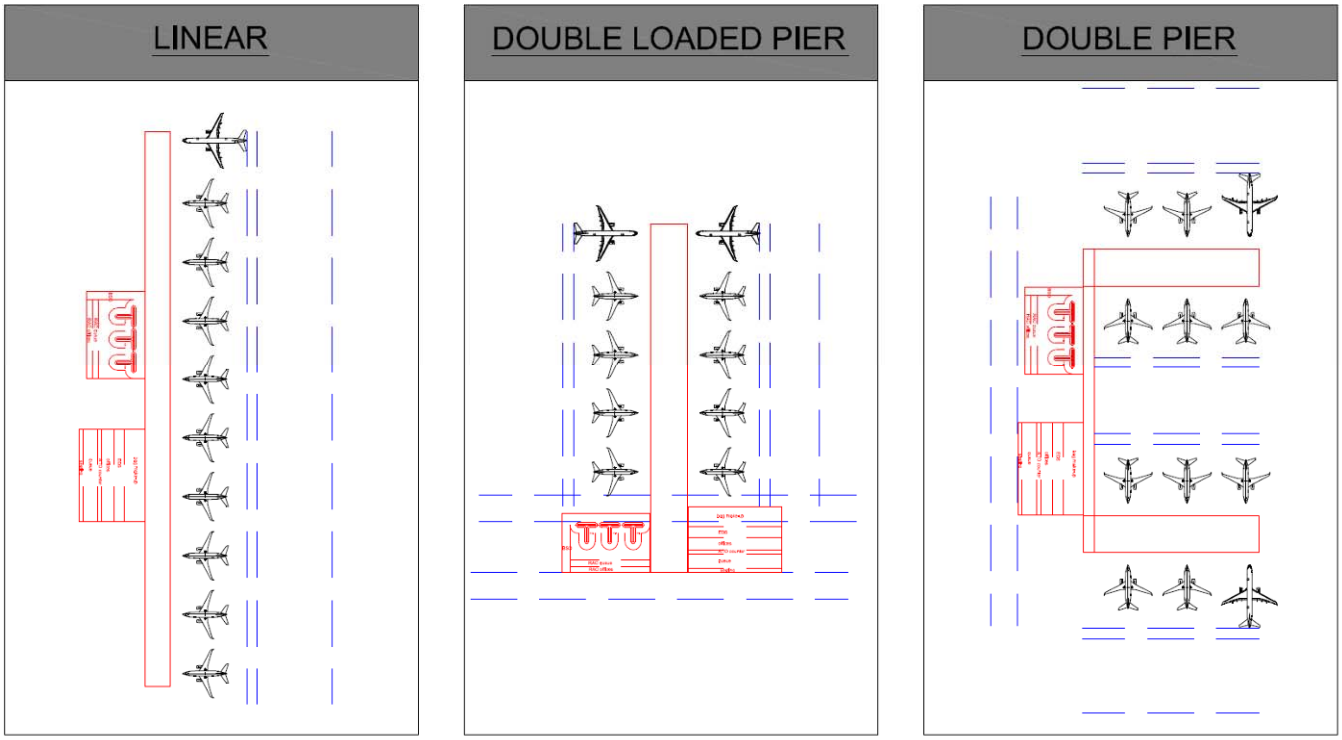
- Although the total space for concessions is adequate to meet demand, only 26 percent of the space is allocated within the secure area, as opposed to locating the recommended 80 to 90 percent of concessions on the secure side.

Terminal Alternatives

The terminal alternatives chapter presents MSO's ideal terminal development options resulting from a comparison of a range of options. Three types of general terminal layouts were considered. The impact of each layout on existing operations and land uses was considered. Aside from passenger boarding and deplaning, space needs for facilities identified was included in the size and layout of each concept. As shown in **Figure ES-6**, there are three conceptual terminal types:

- **Linear Terminal**
- **Double Loaded Pier**
- **Double Pier Configuration**

EXHIBIT ES-6
MSO Terminal Alternatives

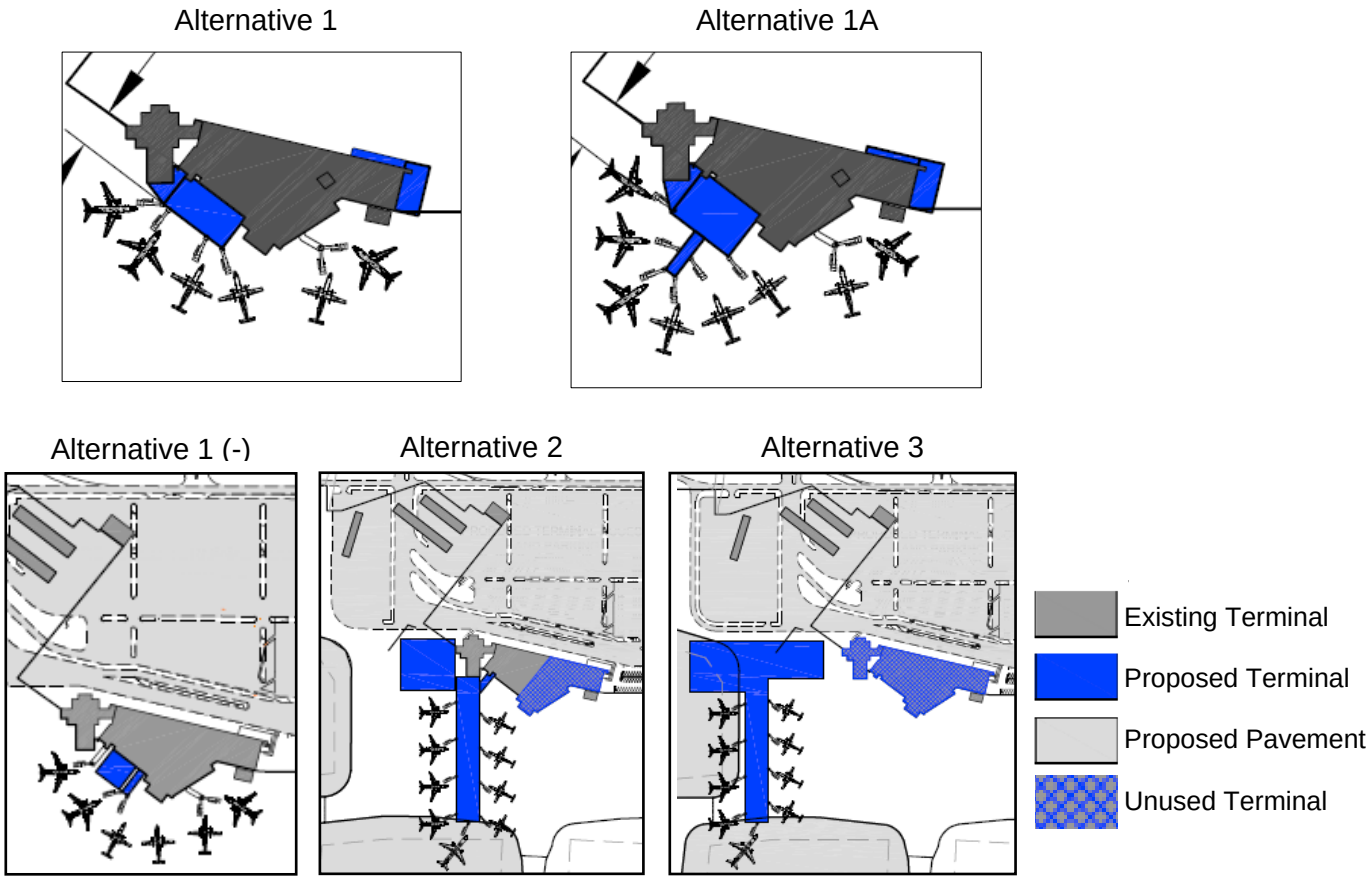


The double loaded pier and double pier configuration are viable terminal concepts for the Airport. When accounting for the deep configuration of the existing site and adjacent GA development, conditions do not generally support the linear terminal development concept at MSO and the alternatives consider only double-loaded pier concepts.

Terminal Building Expansion Alternatives

Five specific passenger terminal alternatives were considered to alleviate existing and projected deficiencies, ranging from minimal expansions of the existing terminal, to partial terminal replacement, and full terminal replacement. Each alternative is assessed for its ability to meet the forecast demand, impact on aircraft maneuverability, ability to phase the project, impacts of construction, approximate cost, and the ability to expand beyond the planning period. An expansion of the existing terminal was deemed the most practical option offering the greatest flexibility for future expansion opportunities. **Exhibit ES-7** illustrates the layout of each alternative. Due to the volatility inherent in the aviation industry, the alternatives were weighed against four potential industry demand scenarios to determine their practicality as well as to gauge the flexibility of future development and terminal expansion.

EXHIBIT ES-7
MSO Terminal Alternatives



The following Industry Scenarios were analyzed:

High Growth Scenario

- In a high growth scenario, such as in the case of higher than projected passenger enplanements and the entrance of new airlines, Alternatives 2 and 3 would be ideal as they would be able to provide a high level of customer service and some long-term flexibility.
- Alternative 1 and 1A would lack the capacity to meet demand in a High Growth Scenario.

Moderate Growth Scenario

- Moderate Growth at MSO could occur in the form of gradual growth in passenger enplanement and an increase in air carrier operations resulting in part from the use of a greater number of smaller aircraft to transport the same number of passengers. Alternative 1 or 1A have the ability to meet expansion requirements, including the provision of additional gates.
- Alternatives 2 and 3 carry high capital costs and create space in excess of demand.

Organic Growth Scenario

- An Organic Growth Scenario is represented by airline consolidations and the introduction of larger aircraft that create demand for larger airline operations areas, concessions, bag

claim areas, and in certain cases hold rooms and security. Alternative 1 would fulfill the minimum expansion requirements under this scenario.

- Alternative 1A, 2, and 3 construct gates in excess of demand and cause disruption during airline operations or carry high capital costs.

No Growth/Baseline Scenario

- A No Growth/Baseline Scenario, characterized by a lack of change in existing conditions or even a temporary loss of an air carrier, would require only limited improvements. In this scenario, Alternative 1 would be the ideal alternative.
- Alternative 1A, 2, and 3 create excess space above demand in the No Growth/Baseline Scenario.

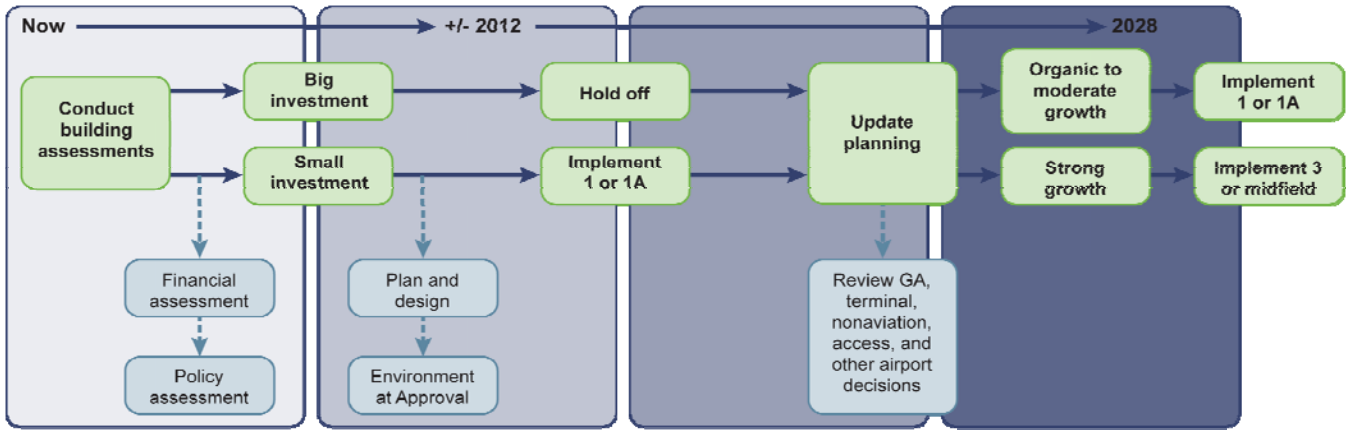
Alternative 1(-)

Alternative 1(–), developed as a small-scale version of Alternative 1, is the Preferred Alternative for the near term because it provides the expansion necessary to stretch the life of the existing building for 5-8 years, allowing the airport to delay the decision to expand the existing terminal more, or to construct a new terminal. In addition to being the least expensive alternative to implement, Alternative 1(-) allows phased improvements, providing MSO with the flexibility to respond to industry changes. It is important to note that upon completion of this alternative, all the other terminal alternatives in this Master Plan remain viable options. Alternative 1(-) assumes that continuing with existing building systems is acceptable for the next 5-8 years. If demand materializes as projected, it appears that Alternative 1A would best meet the Airport's needs for the remainder of the planning period.

Terminal Path Forward

Because of the uncertainty and volatility in the aviation industry, a path forward for terminal development is provided in **Exhibit ES-8** to serve as a general guide to decision making. Providing that existing building systems remain viable, investment in the existing terminal for the near-term years is recommended. A building condition assessment should be undertaken in the near term, allowing informed decision making about future investment. In addition to the flexibility provided by investing in the existing facility, the low expenditures in comparison to terminal replacement will help keep costs low for airlines and other tenants. Also, Alternative 1 and 1A are able to accommodate most industry scenarios, from strong growth to organic and no growth scenarios.

EXHIBIT ES-8
MSO Path Forward



Midfield Terminal Site Opportunity Area

Concepts for a midfield terminal site were also considered. However, because the forecast does not project a need for a parallel runway during the 20 year planning period, this area would not be suitable in the planning period. The midfield site should be preserved for its long-term post planning period potential. The midfield site also holds potential for general aviation development, including FBOs, which should be considered in the overall post planning period land use planning for the Airport.

Additional Services

In addition to the MPU chapters noted above, related services were undertaken at the same time, resulting in separate, stand-alone deliverables.

Nonaviation Development Study

When considering potential needs for an additional runway beyond the planning period, land remains available and underutilized south of the existing airfield, in an area where demand for nonaviation is expected to grow beyond the planning period. The land suitable for nonaviation development and not needed for aviation use is shown in **Exhibit ES-9.** The study included a quantitative analysis of economic data to define target industries that would be viable in the region. Additionally, qualitative information resulted from a series of interviews with officials and existing land use plans in order to discern business and demographic trends. The study concluded that, with appropriate access, connections to utilities, and adequate demand, that the location would best accommodate an industrial business park. Significant nonaviation development of this area within the planning period is not likely, as existing supply will first need to be exhausted and utilities will need to be constructed. Once a development opportunity appears closely at hand, the airport is required to seek a land release from the FAA to lease, or possibly sell, the portion of surplus land to help fund ongoing airport operations and projects. (Review of the planned uses will be necessary as part of the land release, under the National Environmental Policy Act.) The airport must be compensated with fair market rates for use of airport-owned land that benefits the airport by offsetting operating costs.

EXHIBIT ES-9
Nonaviation Development Concept

Environmental Compliance Review

MCAA has rules and regulations in place to protect the environment and to comply with state and federal environmental regulations and permitting processes. As a voluntary effort, MCAA partook in a review of environmental regulations to verify that airport and key tenant operating practices were within conformance or if enhancements could be implemented. The review found that MSO is compliant with state and federal permits and regulations. Areas of opportunity identified for improvement include staff training as part of the stormwater pollution prevention plan, record keeping and training on spill preventions, and miscellaneous tasks such as container labeling and asbestos managements.

Long-term Concept Sketch Plan

The *Long-term Concept Sketch Plan* is a separate analysis completed early in the MPU to support time-sensitive airport decisions. The plan provided conceptual long-range planning options to allow MCAA staff to make early decisions regarding required near-term general aviation hangar construction. Without the benefit of an updated forecast, the study assumed a strong growth rate, so that airfield and passenger terminal locations could be reviewed and identified, showing the land remaining for GA under all possible airport expansion scenarios. The GA layouts in the sketch plan were general in nature and have been refined during the master planning process. From that effort, the airport and FAA agreed that the most ideal near-term layout for GA was at the end of Runway 25. Hangars are currently under construction in that location. Most of the other information in the Sketch Plan has been superseded by this Master Plan and identifies additional areas within the planning period that may be developed for GA.

Airfield Pavement Evaluation

Most of the MSO airfield pavement condition ranges from fair to excellent condition, as documented in the Pavement Condition Evaluation Report conducted as part of this Master Plan. The two pavement areas that are in poor and very poor condition are Runway 7/25, which is programmed to be rehabilitated, and Taxiway E, which is programmed to be reconstructed.