DRAFT

Vance Brand Municipal Airport Master Plan

October 18, 2011

As required by Paragraph 425.B(4) of FAA Order 5100.38C, Airport Improvement Program (AIP) Handbook:

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1.0 INTRODUCTION

1.1 Study Goals

The purpose of this study is to update the Longmont Vance Brand Municipal Airport (LMO) Master Plan and Airport Layout Plan (ALP) and determine the extent, type, and schedule of development needed to accommodate future aviation demand at the airport. The Master Plan and the ALP were last updated in 2004 and aviation has changed significantly since that time. The study's main objectives are to:

- Determine the condition and adequacy of existing facilities
- Forecast aviation activity for a 20-year timeframe, including operations and based aircraft
- Recommend needed improvement over the next 20 years that meet the forecasted and safety requirements at LMO, while addressing the values and economic growth plan of the community
- Prepare a financial plan that considers LMO's budget, revenue, and expenses along with likely grant funding scenarios

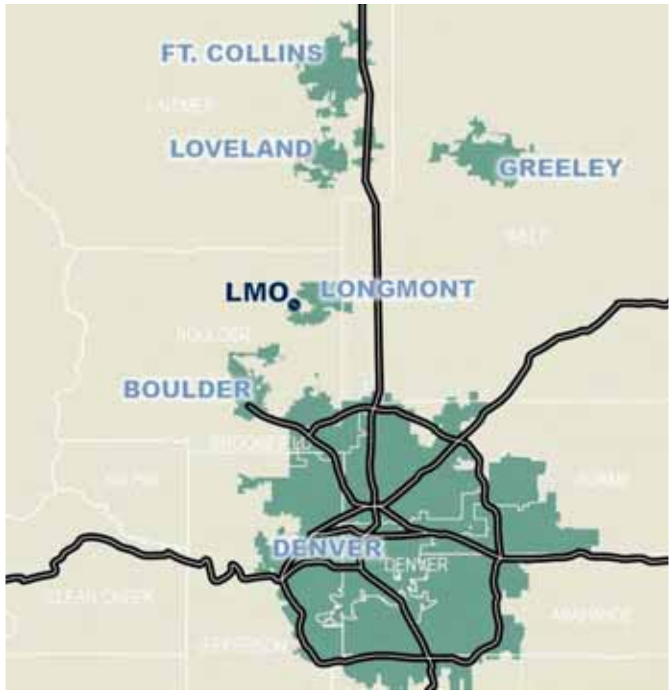
1.2 Local Information

Longmont is an incorporated city of the State of Colorado located in both Boulder and Weld Counties, northwest of Denver, as shown in **Figure 1-1**. According to the U.S. Census Bureau, Longmont is the 14th most populous municipality in the State of Colorado, with 86,270 residents reported in 2010. The region has experienced extreme growth in the recent past, primarily driven by high tech industries and the quality of life that the city provides. In the 1990s alone, Longmont grew by approximately 20,000 residents. The recent economic recession has slowed growth considerably. As the economy stabilizes, some growth should return, however the large growth seen previously is not likely as the city is approaching a full build-out of available land.

The City of Longmont was incorporated in 1871 by individuals from Chicago who decided to build a new community in Colorado. To do so, they sold membership in the new town in order to buy 60,000 acres of land in a carefully chosen site in northern Colorado, calling it "The Chicago-Colorado Colony". They brought people, lumber, and building material to the site, and a new town was formed. They named it "Longmont," after the nearby 14,000-foot tall mountain, Long's Peak.

From its beginnings as a farming community, the City of Longmont has been home to major agriculture-related businesses, including the Great Western Sugar Company and the Kuner Empson Cannery. Such businesses have given way to a new wave of technology-based businesses, beginning with IBM in 1965, and more recently Seagate, DigitalGlobe, and Intrado. The City of Longmont also has extensive manufacturing/production facilities, with large facilities for companies such as Amgen, a global biotechnology firm, and Butterball, the nation's largest turkey processing company. Additionally, in 1952 the Federal Aviation Administration (FAA) selected Longmont as the location for an En Route Air Traffic Control Facility (also known as Denver Center), which currently employees 566 people.

FIGURE 1-1 – DENVER METRO AREA

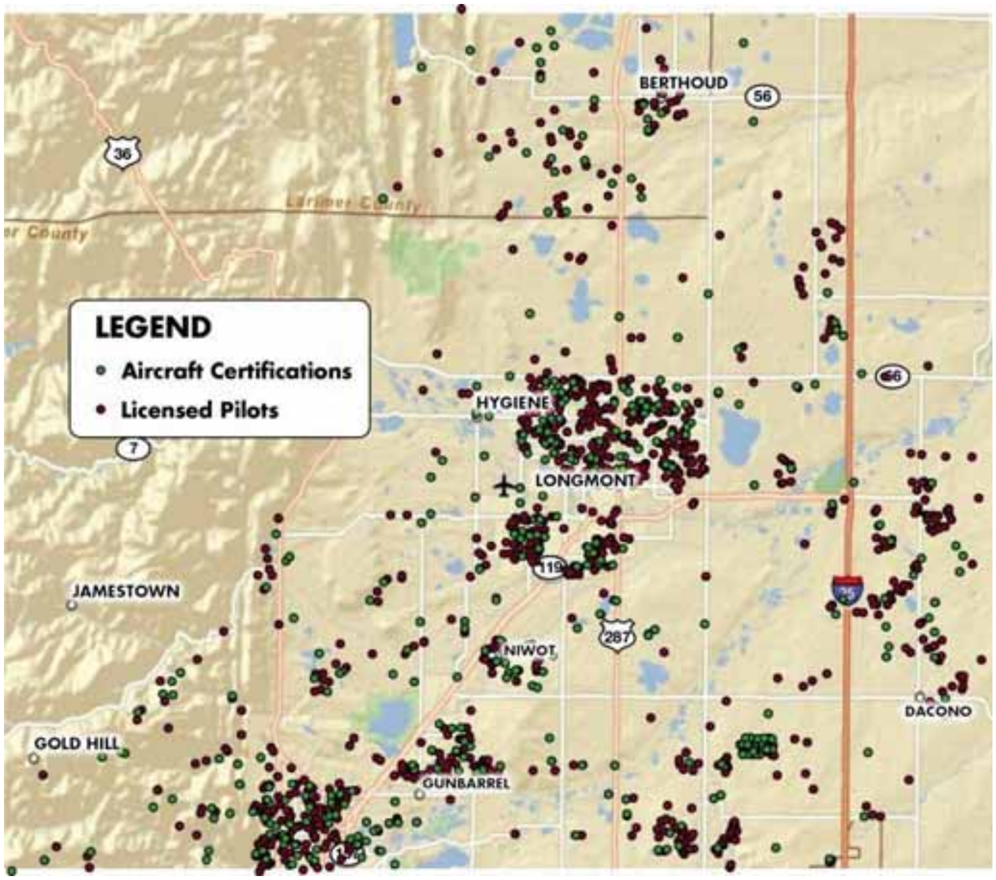


Source: Jviation, Inc.

According to the U.S. Census Bureau, Longmont is the 14th most populous municipality in the state of Colorado, with 86,270 residents reported in 2010.[1] Just like roads, airports are regional assets rather than existing just to serve the residents of one community. Although many of the users of the airport may come from other communities, the money they spend in Longmont on aircraft fuel, services, and other needs while in town benefit the City as a whole. The regional potential for LMO can easily be seen in **Figure 1-2**, which represents addresses of people or businesses who have registered aircraft with the FAA or are licensed pilots.

[1] U.S. Census Bureau. http://factfinder2.census.gov/main.html

FIGURE 1-2 – FAA CERTIFICATED AIRCRAFT AND LICENSED PILOTS



Source: Data: FAA Aircraft Registry Database – Release Version 5/9/2011, GIS Map: Jviation, Inc.

To provide an expanded regional perspective of the communities and population that could utilize LMO, the Boulder Metropolitan Statistical Area (MSA) was also evaluated. The Boulder MSA includes the City of Longmont, the City of Boulder, the portion of the Town of Erie in Boulder County, the Town of Jamestown, the City of Lafayette, the City of Louisville, the Town of Lyons, the Town of Nederland, the portion of the Town of Superior in Boulder County, the Town of Ward, and unincorporated Boulder County, Colorado. According to the U.S. Census Bureau, the Boulder MSA population was estimated at 303,482 in 2009, making it the third largest MSA population in Colorado. Only the Denver-Aurora-Broomfield and Colorado Springs MSAs reported larger population.

Additionally, the cities of Frederick, Firestone and Dacono, as well as unincorporated areas along the I-25 corridor just to the east of Longmont, have experienced extreme growth in the past decade. LMO, along with the Erie Tri-County Airport and the Ft. Collins-Loveland Airport, are the only General Aviation (GA) airports convenient for these communities. Those communities, along with Weld County as a whole, were projected in 2009 by American City Business Journals, Inc., the parent company of the Denver Business

Journal, to be the 17th fastest growing area in the country through 2025[2]. As these communities continue to grow, their demand for GA airport services will likely grow as well.

In 2006 and 2008, Longmont was named one of the "Top 100 Best Places to Live" in the United States by Money Magazine. Money Magazine looks for small livable cities that have the best possible blend of good jobs, low crime, quality schools, plenty of open space, reasonable home prices, and various recreational activities.[3]

1.3 Airport Management and Ownership Structure

LMO is owned and operated by the City of Longmont. Longmont is a home rule city that is run by a Council-Manager form of government. The mayor is the presiding officer of the City Council. The City Council consists of seven elected to officials that have authority over legislative and policy decisions. The Council appoints a City Manager, who manages approximately 800 City employees.

A seven member Airport Advisory Board (AAB) is appointed by City Council to provide them with recommendations regarding long-range planning, land-use, and necessary improvements for LMO. The AAB is compromised of at-large members of the community and an ex-officio member of City Council. The management of the airport resides in the City's Public Works and Natural Resources Department. The Airport Manager is the only full-time City employee assigned to LMO.

1.4 Airport Activity

Longmont was a forward looking community in 1927 when it opened one of the region's first airports near the current location of Roosevelt Park, just a few blocks west of Main Street. In 1942 the airport was moved to its current location. LMO has traditionally not only served the residents of Longmont, but has also served as a key facility for the Rocky Mountain Region.

The airport is named after the Astronaut Vance DeVoe Brand, who was born in Longmont in 1931. In addition to being the command module pilot on the historic U.S. – Soviet (Apollo – Soyuz) joint spaceflight in 1975, he also served on three space shuttle missions before retiring from NASA.

Similar to the GA segment across the country, LMO has experienced a decline in activity levels over the past two years. This decrease is primarily explained by the high price elasticity of demand inherent in recreational use of aircraft to economic conditions. The FAA expects this segment to stabilize and the business aviation sector to grow in the future.[4] In order to ensure that LMO is able to remain financially viable through this transition, this study examines what changes, if any, are needed to react to a changing aircraft environment.

LMO is presently estimated to have 61,211 annual operations. The airport has 340 based aircraft, as shown in **Table 1-1**. Beyond the local recreational uses of the airport, LMO is a destination for many aircraft

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[2] http://www.greeleytribune.com/article/20090604/NEWS/906049994
[3] City of Longmont, http://ci.longmont.co.us/about/index.htm
[4] FAA Aerospace Forecast: Fiscal Years 2010-2030

throughout the United States. Filed instrument flight plans over the course of one year are depicted in **Figure 1-3**, and show flights to and from every corner of the country. Instrument flight plans are typically filed for the business segment of GA rather than the pleasure fliers, and often represent flights of turboprop and business jet aircraft.

TABLE 1-1- 2010 BASED AIRCRAFT COUNT

Single Engine	Multi-Engine	Jet	Helicopters	Gliders	Ultra-Light	Total
266	38	2	7	11	16	**340**

Source: Airport Management Records

FIGURE 1-3 - IFR FLIGHT PLANS FILED TO/FROM LMO (5/2010-5/2011)

Source: Data: GCR, Inc.; Map: Jviation, Inc.

2.0 INVENTORY

The objective of this chapter is to document the type and general condition of the existing facilities that comprise the Longmont Vance Brand Municipal Airport (LMO) for use in future planning phases. It is a complete compilation of all systems, including airfield, terminal area, NAVAIDs, ground access, parking, pavement conditions, utilities, and other characteristics of the airport.

2.1 AIRPORT REFERENCE CODE

The Federal Aviation Administration (FAA) classifies airports in the United States with a coding system known as the Airport Reference Code (ARC). This classification helps apply design criteria appropriate to operational and physical characteristics of the aircraft types operating at the airport. The ARC is made up of two separate components, the Aircraft Approach Category and the Airplane Design Group (ADG).

The Aircraft Approach Category is an ***alphabetical*** classification of an aircraft based upon 1.3 times the stall speed in a landing configuration at their maximum certified landing weight; letter A being the slowest approach speed and E being the fastest. The approach category for an airport is determined by the approach speed of the fastest aircraft that operates at the airport at least 500 times per year. The categories are listed below:

Category A: Speed less than 91 knots.
Category B: Speed 91 knots or more but less than 121 knots
Category C: Speed 121 knots or more but less than 141 knots.
Category D: Speed 141 knots or more but less than 166 knots.
Category E: Speed 166 knots or more.

The ADG is a ***numerical*** classification of aircraft based on wingspan or tail height. If an airplane is in two categories, the most demanding category should be used. Similar to the approach category, the ADG for an airport is determined by the largest aircraft operating at least 500 times per year at the facility. The groups are identified in **Table 2-1**. Examples of ARC aircraft types are shown in **Figure 2-1**.

LMO is currently designed to accommodate aircraft with an ARC of B-II. This ARC includes mid-sized business jets, such as the Cessna Citation, and smaller. An increase in the ARC to design LMO for larger or faster aircraft, such as C-II, would result in a major reconfiguration of existing airport infrastructure. Additionally, aircraft are limited by the strength of the pavement, which is currently designed for B-II class aircraft.

TABLE 2-1 - AIRPLANE DESIGN GROUP (ADG)

Group #	Tail Height (ft.)	Wingspan
I	<20	<49
II	20≤30	49≤79
III	30≤45	79≤118
IV	45≤60	118≤171
V	60≤66	171≤214
VI	66≤80	214≤262

Source: FAA AC 15/5300-13J, Airport Design

FIGURE 2-1 - ARC AIRCRAFT TYPES

Source: Jviation, Inc.

2.2 Existing Airfield Design Standards

The airport is designed to B-II standards. **Table 2-2** and **Table 2-3** summarize the major landside and airside components of LMO. These items are discussed in detail throughout the remainder of this chapter.

TABLE 2-2- AIRPORT PAVEMENT INVENTORY

ITEM	DESCRIPTION	CONDITION
Runway 11/29	4,800' x 75'; Medium Intensity Runway Lighting (MIRL); 30,000lbs (Single Wheel Gear) SWG pavement strength	Excellent
Taxiway A	Full-Length parallel taxiway (4,800' x 35'); north of Runway 11/29; Medium Intensity Taxiway Lighting (MITL); four connectors; 30,000lbs SWG pavement strength	Excellent
Taxiway B	1,412'x 35'; south of RW 11/29; Medium Intensity Taxiway Lighting (MITL); 240-foot centerline-to-centerline separation from the runway; two connectors; 30,000lbs SWG pavement strength	Excellent
Aprons	Two aprons comprised of approximately 31,400 square yards, with a total of 52 tiedowns; 30,000lbs SWG pavement strength	Good

Source: Jviation, Inc.

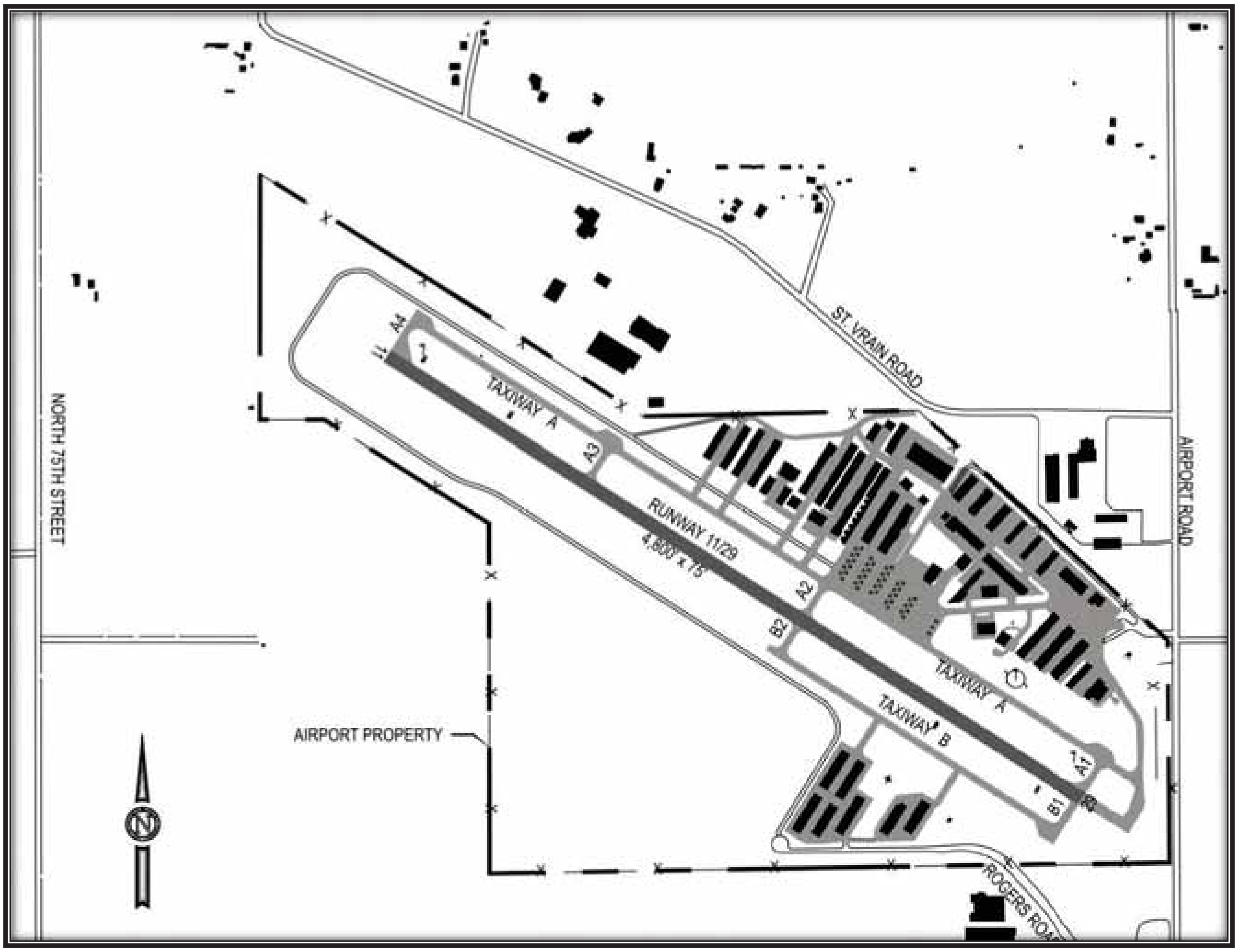
TABLE 2-3 AIRPORT FACILITIES INVENTORY

ITEM	DESCRIPTION
Navigational Aids	NONE
Visual Aids	4-box VASI, standard rotating beacon; lighted wind cone with segmented circle; AWOS
FBO: Twin Peak Aviation	Privately Owned; Full-service FBO
FBO: Air West Flight Center	Privately Owned; Full-service FBO

Source: Jviation, Inc.

The airfield is shown in **Figure 2-2** below. The text on the following pages describes each component of the airport in detail.

FIGURE 2-2- AIRFIELD DIAGRAM



Source: Jviation, Inc.

The previous master plan, completed in 2004, identified several non-standard conditions at LMO. **Table 2-4** lists these conditions and their current status. A review was conducted for this master plan for compliance with current design standards and no additional non-standard conditions were identified.

TABLE 2-4 - EXISTING NON-STANDARD CONDITIONS

DESCRIPTION	STANDARD	2004 CONDITION	CURRENT CONDITION
Runway Protection Zone (RPZ)	Sponsor shall control land within RPZ	Parcels of land within each RPZ not controlled by the City of Longmont	Two parcels of land within each RPZ not controlled by the City of Longmont
Airfield Signage/Supplemental Wind Cones	Airfield signage and wind cones shall employ frangible couplings	Some signs and supplemental wind cones are not frangible mounted	Currently Non-Standard; both runway supplemental windcones need frangible mounts
Taxiway Object Free Area (TOFA)	No objects shall be located in the TOFA	The FAA VASI Building and five tiedowns are within the TOFA	Currently Non-Standard; FAA VASI Operations shed in TOFA
Runway Object Free Area (ROFA)	No objects not essential to air navigation shall be located in the ROFA	Vehicle Service Roads (VSR) inside the ROFA	The VSR has been relocated outside of the ROFA
Runway Markings	Runway shall be marked according to threshold sighting surface requirements	Non-standard markings and signage	The runway markings have been corrected, and the appropriate chevrons were added.

Source: 2004 Airport Layout Plan; Airport Management

2.3 CDOT AERONAUTICS 2005 AVIATION SYSTEM PLAN

The Colorado Department of Transportation Division of Aeronautics (CDOT Aeronautics) conducts an aviation system plan evaluation every five years for the State. The Colorado Aviation System Plan evaluates and measures the performance of each of Colorado's airports. The plan assigns each Colorado airport to one of three roles: Major, Intermediate, or Minor. LMO is classified as a "Major" airport in the system due to the importance of the airport to the State.[5]

The plan divided the airports into the three roles by evaluating and weighing airports based on the following criteria:

- The type and volume of demand that the airport accommodates;
- The ability of the airport to expand to accommodate either of both additional airside or landside facilities;
- The economic support/benefit that the airport provides to the community it serves;
- The use of the airport by local or visiting businesses;

[5] Colorado Aviation System Plan 2005. Colorado Department of Transportation, Division of Aeronautics.

- The use of the airport to support emergency or medical needs;
- The extent of airside and landside facilities and other services available at the airport.

In measuring the state system's performance, the Colorado Aviation System Plan (System Plan) states that all Colorado airports should:

- Operate at a demand/capacity ratio under 80%;
- Ensure planning studies are current
- Take steps to protect and keep clear their 14 CFR Part 77[6] airspace imaginary surfaces; and
- Meet minimum TSA security guidelines.

The System Plan recommends the following for "major" airports:

- Planning study updated every five years;
- Precision approach (or near precision approach provided by GPS);
- Avgas and jet fuel available for purchase;
- Access to rental cars or ground transportation;
- On-site weather reporting equipment; and
- A paved runway with a Pavement Condition Index[7] of 75 or higher that can accommodate the King Air B200 and the Learjet 35 in most emergency operating circumstances.

According to the Plan's measures, LMO meets all objectives, with the exception of a precision or near-precision approach and the runway length to accommodate the Learjet 35, an aircraft used extensively for medical evacuation flights.

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[6]Code of Federal Regulation, Title 14, Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace
[7]Pavement Condition Index (PCI) is a pavement condition rating system as described in ASTM D 5340, Standard Test Method for Airport Pavement Condition Index Surveys

2.4 AIRFIELD/AIRSPACE

2.4.1 Runway

The existing airfield at LMO has one active runway, identified as Runway 11/29. Runway 11/29 is orientated northwest/southeast and is 75 feet wide by 4,800 feet long. The runway is constructed of Portland Cement Concrete and is built to support aircraft with a weight-bearing capacity no greater than 30,000 pounds for Single Wheel Gear (SWG) equipped aircraft. See **Section 2.4.4** for airport pavement condition.

The current Airport Reference Point (ARP) is located at Latitude N 40º 09' 51.465" and Longitude W 105º 09' 49.435" per the FAA Airport Master Record, also known as the "5010 Form". The ARP is the latitude and longitude of the approximate center of the runway. The established airport elevation, defined as the highest point on the airport's runway, is 5,054.92 feet above mean sea level (MSL) and is located on the west end of Runway 11/29.

Aircraft compasses and runway identifiers utilize magnetic north for directional guidance. For this reason, it is important to evaluate an airport's runway numerals every few years to ensure that the numbers painted on the runway truly represent the magnetic heading of the runway. The magnetic forces across the planet are constantly shifting, and therefore a declination must be applied to a compass to arrive at a true north heading. The current true bearing for Runway 11/29 is 122° 51' 44". According to the National Geophysical Data Center, as of March 7, 2011, the current declination for Longmont is 9° 6' east and is changing by 0° 8' per year[8]. Applying this declination to the true bearing results in a magnetic heading of 113.45° for Runway 11 and 293.45° for Runway 29. This means that the current runway designations of 11 and 29 are still correct and do not require adjustment.

The runway meets all design criteria for ARC B-II, including width, gradient and safety area standards.

2.4.2 Taxiways

The existing paved taxiway system at LMO consists of Taxiway A, which is a full-length parallel taxiway located on the north side of Runway 11/29 and Taxiway B, which is a partial parallel taxiway on the south side of the runway. Additionally, Taxiway A has four connecting taxiways: A1, A2, A3, and A4. Taxiway B has two connector taxiways: B1 and B2. All taxiways are 35 feet wide, meeting ARC B-II design criteria and are constructed of Portland Cement Concrete. The taxiways have a pavement strength of no greater than 30,000 pounds for SWG aircraft, which includes small and mid-sized business jets, and is consistent with LMO's ARC. See **Section 2.4.4** for airport pavement condition.

[8] http://www.ngdc.noaa.gov/geomagmodels/struts/calcDeclination

The taxiways meet applicable design criteria for ARC B-II, with the exception of penetrations to the Taxiway Object Free Area as described in **Table 2-4.**

2.4.3 Apron

LMO has two aprons for the parking of based and transient aircraft. One apron is south of Air West FBO, with 47 tiedowns for based and transient aircraft parking. It comprises roughly 26,400 square yards of Portland Cement Concrete. The other apron is located south and east of Twin Peaks Aviation, has 17 tiedowns and is roughly 5,000 square yards of asphalt, shown in **Figure 2-3**. As described in **Table 2-4**, five of the existing tiedowns are penetrations to the Taxiway Object Free Area and need to be relocated.

FIGURE 2-3 - FBO APRONS

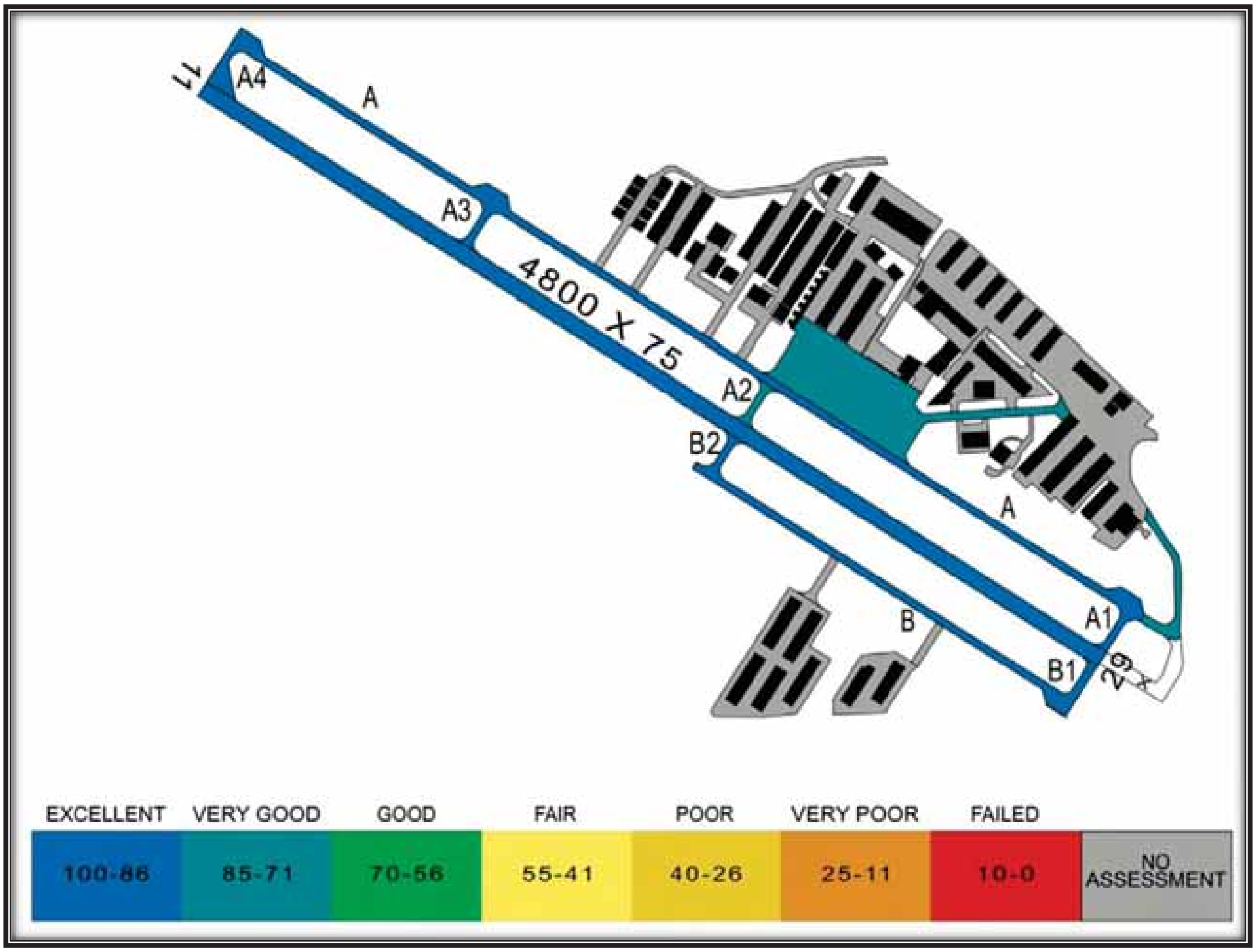
Source: Jviation, Inc.

2.4.4 Pavement Condition

The 2011 Pavement Evaluation and Pavement Management System, produced by CDOT Aeronautics, showed that the pavement at LMO has a Pavement Condition Index (PCI) of 72 to 97. This indicates that the pavement is in either "Excellent" or "Very Good" condition. However, CDOT noted 12 to 15 slabs of randomly spaced panels on Taxiway B that are experiencing heavy cracking. The panels will require rehabilitation measures to include removal and replacement of the existing pavement. The CDOT study forecasts that with the exception of the slabs on Taxiway B, the pavement will continue to be in "Good" to "Very Good" condition in 2015. Scheduled maintenance, such as joint seals and seal coats, will be required to maintain the pavement in proper condition[9]. LMO is executing a crack sealing and seal coating project in 2011, and approximately every three years a seal coat is applied to the asphalt pavement.

[9] Colorado Division of Aeronautics. 2009 Pavement Evaluation and Pavement Management System. http://www.colorado-aeronautics.org/PCI/2009/PCI_2009.html

FIGURE 2-4 - LMO PCI VALUES



Source: CDOT Aeronautics, 2011 Pavement Evaluation and Pavement Management System

2.4.5 Lighting, Markings, and Signage of Runways and Taxiways

Runway 11/29 has white Medium Intensity Runway Lighting (MIRL) and Non-Precision Instrument Runway Markings. Runway lights and markings meet FAA standards for marking and lighting a runway with a non-precision approach, such as Runway 11/29.

In accordance with FAA standards, Taxiways A and B are equipped with blue Medium Intensity Taxiway Lights (MITLs) and are marked with yellow centerline striping and runway hold position markings. Additionally, all of the taxiway and runway lights are equipped with Pilot Controlled Lighting (PCL). PCL is lighting that can be activated by keying an aircraft's microphone on the Common Traffic Advisory Frequency (CTAF) of 122.975 MHz. This allows for a reduction in energy usage and light emissions when the airport is not in use. The lights remain on for 15 minutes after activation. The entire runway and taxiway lighting system was replaced in 2007 and is in excellent condition.

Airfield signage provides essential guidance information that is used to identify items and locations on an airport. LMO is equipped with airfield signage that meets FAA standards, including mandatory instructional signs, location signs, directional signs, destination signs, and informational signs. The airfield signage is in excellent condition.

2.4.6 Visual and Navigational Airport Aids

For visual descent guidance, LMO is equipped with 4-box Visual Approach Slope Indicators (VASIs) installed at the ends of Runways 11 and 29. These landing aids provide a visual three-degree glide slope indication the pilot of to arriving aircraft. The use of red and white lights which, depending on the slope of the arrival path, will change color to indicate to the pilot if the aircraft is on the proper glide path, or too high or too low. These lights are detectable from up to five miles during the day, and 20 miles or more at night.

LMO also has a segmented circle which is located on the north side of Taxiway A, on the east end the airfield. A segmented circle includes a lighted wind cone, and provides a centralized location for wind and traffic pattern indicators of the airport's runway. There are also lighted wind cones near the end of each runway threshold. Additionally, the airfield also has a standard rotating beacon, which is located on the southeast corner of the airport, nearest to the last hangar to the east, west of Airport Road. The beacon operates continually throughout the night with green and white flashes to indicate the location of the airport to pilots. A new beacon was installed in 2007 and is in excellent condition.

LMO has an Automated Weather Observation System (AWOS) located on the south side of the airfield. An AWOS is an automated sensor which transmits weather reports via the radio frequency of 120.0 MHz. The AWOS provides pilots with up-to-date airport weather information, such as temperature and dew point in degrees Celsius, wind speed and direction, visibility, cloud coverage and ceiling up to 12,000 feet, freezing rain, thunderstorm (lightning), and altimeter setting; all required for safe aviation operations. In late 2010, the AWOS was connected to the national system of weather sensors (NADIN), which allows online access to LMO's current weather conditions. The AWOS is maintained in good condition by a private contractor.

2.4.7 Instrument Approach Procedures

LMO has three non-precision published approaches. [10] These include two Global Positioning System (GPS) procedures and one Very-High Frequency Omni Range/Distance Measuring Equipment (VOR/DME) circling procedure. A non-precision approach only provides horizontal guidance, while a precision approach would also provide vertical guidance to approaching aircraft.

[10] A non-precision approach only provides pilots horizontal guidance, while (versus a precision approach that provides pilots both horizontal and vertical guidance).

Runway 29 has a straight-in GPS approach procedure. **Table 2-5** gives information about each approach at LMO, including weather minimums and minimum descent altitudes. Minimum Descent Altitude is associated with non-precision approaches and is the lowest altitude an aircraft can fly until the pilot sees the airport environment. If the pilot has not spotted the airport environment by the Missed Approach Point, a missed approach is initiated. The current instrument approach and departure procedures can be found in **Appendix B**.

TABLE 2-5 - LMO INSTRUMENT APPROACH MINIMUMS

Circling Approaches	Weather Minimums		Minimum Descent Altitude (AGL)*
	Visibility	Ceiling (AGL)*	
VOR/DME – A	1 mile	700'	648'
RNAV (GPS) – B	1 mile	700'	648'

Runway 29 - Approach	Weather Minimums		Minimum Descent Altitude (AGL)*
	Visibility	Ceiling (AGL)*	
RNAV (GPS)	1 mile	700'	636'

Source: LMO Instrument Approach Charts

** Above Ground Level (AGL)*

There are other airports in the vicinity of LMO that also possess instrument approach procedures. These airports include Rocky Mountain Metropolitan Airport (BJC), Greeley-Weld County Airport (GXY), and Fort Collins-Loveland Municipal Airport (FNL). The nearby airports with instrument approaches are listed in **Table 2-6**.

TABLE 2-6 - NEARBY AIRPORTS WITH INSTRUMENT APPROACHES

Airport	Ident.	Distance From LMO	Procedures Available	Lowest Minimums (Decision Height[1] - Visibility)
Rocky Mountain Metropolitan	BJC	18 NM South	GPS, ILS, LOC, VOR/DME	200' – ½ mile
Greely-Weld County	GXY	33 NM Northeast	ILS, LOC, RNAV/GPS, VOR/DME	200' – ¾ mile
Fort Collins-Loveland Municipal	FNL	21 NM Northeast	ILS, LOC, RNAV/GPS, NDB, VOR, TACAN	200' – ½ mile

Source: Jviation, Inc.

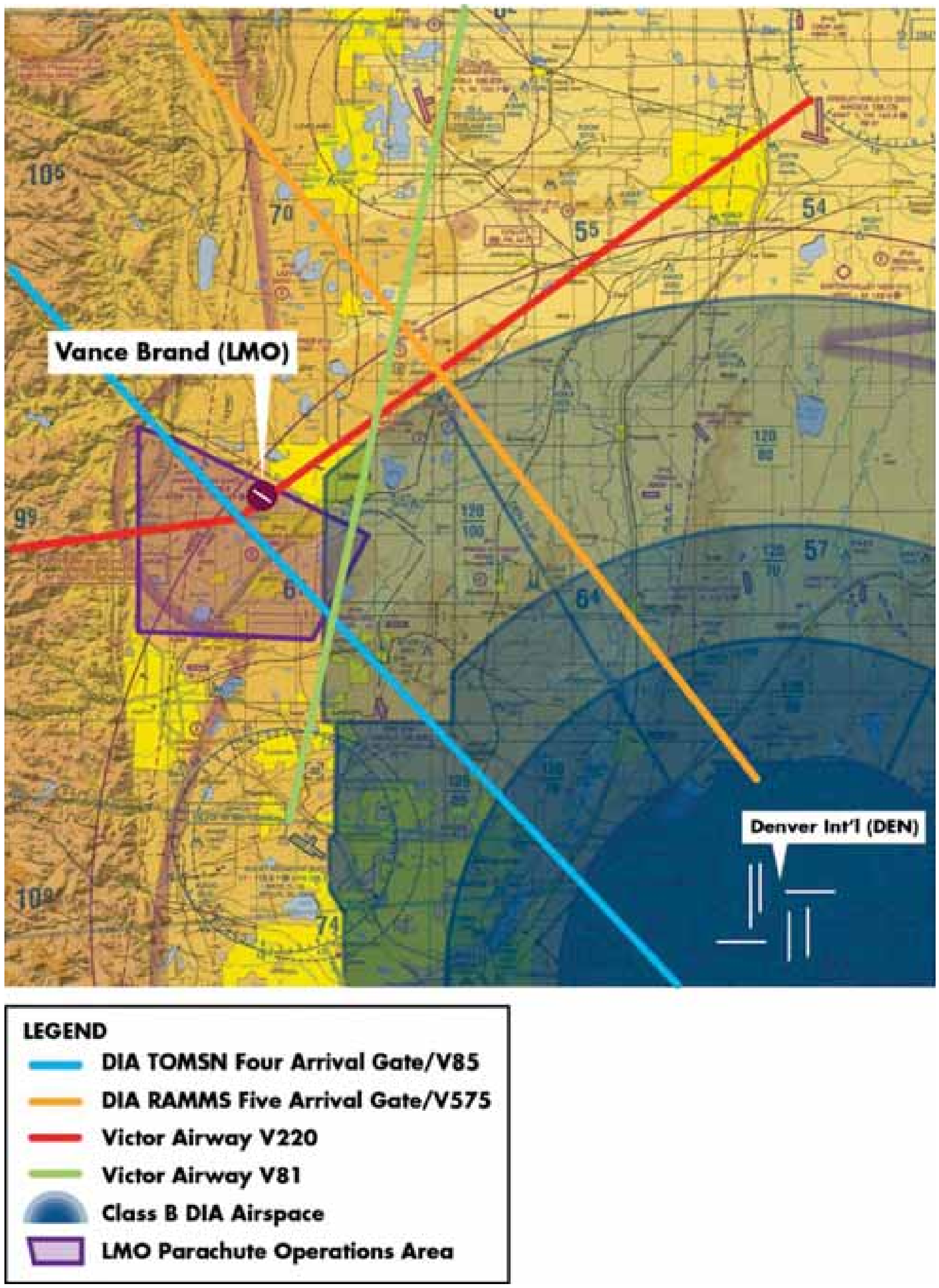
[1]Decision height is Above Ground Level (AGL).

2.4.8 Airspace

Longmont is situated in a location that is heavily traversed by aircraft which are not operating at LMO. There are several FAA-imposed restrictions and airways in the vicinity of the city (i.e. highways in the sky) that promote these aircraft overflights.

While it is apparent that larger, commercial aircraft are operating to and from DEN, and other smaller jets and other aircraft over flying the city may be mistakenly associated with LMO. For example, smaller, recreational GA aircraft avoid DEN's airspace by flying on the west side of the Denver Metro area in a north-south direction that results in overflights directly over the City of Longmont. In addition, LMO is within five miles of ground based navigational equipment used by aircraft flying between the Rocky Mountain Metropolitan Airport and the Cheyenne Regional Airport in Wyoming. The airspace environment at LMO is depicted in **Figure 2-5**.

FIGURE 2-5 - AIRSPACE USAGE



Source: FAA Terminal Area Chart & Jviation, Inc.

1. DIA Airspace – LMO is situated in the heavily used Westside Visual Flight Rules (VFR) airspace corridor. This corridor is used by GA aircraft hoping to avoid DIA's heavily controlled Class B Airspace. If an aircraft enters the Class B airspace, it must be in radio contact with Denver's Terminal Radar Approach Control (DEN TRACON) and must follow ATC instructions to avoid conflicts in the busy airspace environment. Typically, it is much simpler for VFR aircraft to avoid that airspace rather than traverse it. Therefore, aircraft flying on the west side of the Denver area travelling in a north-south direction will often fly between this airspace and the mountains, which can route them directly over Longmont.

2. DIA Arrival Gates – Inbound traffic to DIA is transitioned from en-route air traffic control, to DEN TRACON control through the use of eight flight paths, known as *arrival gates* or *corner posts,* which are located in pairs in the northwest, northeast, southeast and southwest quadrants of the Front Range. According to a 2006 American Institute of Aeronautics and Astronautics (AIAA)[11], the two arrival gates in the northwest quadrant, TOMSN and RAMMS, account for 19.6% of all DIA arrival traffic. As seen in **Figure 2-5**, the TOMSN arrival gate results in DIA aircraft flying directly over Longmont.

3. VFR Victor Airways – One method of aircraft navigation involves the use of instrumentation to guide an aircraft between ground-based navigational aids, known as VORs. A pilot can triangulate a path, fix, or location anywhere in range of a VOR. LMO is within five miles of two intersecting Victor Airways (V81 and V85), making the area a busy flying zone. V81 connects Rocky Mountain Metropolitan Airport to Cheyenne Regional Airport in Wyoming. V85 connects DIA to the ALLAN intersection. V220 connects Greeley to HYGEN intersection, and with a slight course change to Kremmling VOR. V20 passes directly over LMO and HYGEN intersection, within one mile of the runway.

4. **Parachute Operations Area** – Because of all of the restrictions and potential conflicts mentioned previously, Mile-Hi Skydiving is restricted in their ability to fly different routes for noise abatement reasons due to their agreement with DEN TRACON. **Figure 2-5** depicts the LMO Parachute Operations Area, as defined in a Letter of Agreement between Mile-Hi and DEN TRACON. This letter, signed between the two parties on April 2, 2007, stipulates that:

    a. Pilots of jump aircraft shall remain within the confines of the LMO Parachute Operations Area and clear of Denver Class B airspace during all phases of flight. In the event of adverse climb conditions, pilots may request flight following outside of the operations area and clear of Class B airspace. Aircraft shall return to the depicted operations area when the requested altitude is obtained.

[11] Scheduling Aircraft Landings under Constrained Position Shifting

b. Parachute jumping operations will be confined to a 2 nautical mile radius.

The Parachute Operations Area has an area of approximately 85 square miles. More information, as well as a copy of the agreement, is included in **Appendix B**.

There are no restricted or military airspace, or military training routes, in the vicinity of LMO.

2.4.9 Voluntary Noise Abatement Procedures

To address the community's concerns with aircraft noise, LMO has adopted voluntary noise abatement procedures. These procedures encourage pilots operating at LMO to use certain power settings, climb rates and departure headings to help reduce aircraft noise. Due to Federal laws[12] that prohibit Federally-obligated airports[13] from restricting aircraft operation, LMO management encourages pilots to follow noise abatement procedures but has no authority to require compliance or penalize pilots. Rather, the FAA has the regulatory authority to certificate pilots and aircraft and to enforce laws pertaining to flight.

Because Federal laws and restrictions, the City of Longmont also is unable to restrict the hours or type of aircraft that can utilize LMO. As a public-use, publicly funded airport, LMO must be operated for the use and benefit of the public and made available to all types, kinds, and classes of aeronautical activity on reasonable terms, and without unjust discrimination. There are two primary sources of guidance that explain an airport's inability to impose restrictions and/or mandatory procedures explained in the following text.

1. Airport Grant Assurances – Each time the city accepts a Federal grant from the FAA for projects at the airport, the FAA imposes a list of 39 Grant Assurances that an airport must be in compliance with, or funding will be jeopardized. The primary grant assurance dealing with restrictions at the airport is Grant Assurance 22(a), Economic Non-Discrimination. The assurance reads that the City "…will make the airport available as an airport for public use on reasonable terms and without unjust discrimination to all types, kinds and classes of aeronautical activities, including commercial aeronautical activities offering services to the public at the airport."

2. Airport Noise and Capacity Act (ANCA) of 1990 – ANCA was imposed in 1990 to phase out noisy aircraft, known as Stage I and Stage II, and encourage replacement to quieter Stage III aircraft. A further outcome of ANCA was the development of FAR Part 161, which is a statutory method of restricting aircraft and allowing mandatory noise abatement procedures. There has been one Part 161 application approved by the FAA since 1990, which was for a Stage II noise ban at the Naples Municipal Airport in Florida. All other

[12] Airport Noise and Capacity Act (ANCA) of 1990 and Title 49, U.S.C., subtitle VII, as amended

[13] LMO is a Federally-obligated airport as the City of Longmont has accepted Federal funds for its development. Under the current airport financial aid program, the Airport Improvement Program, the City of Longmont has accepted$4.1 million in Federal funds since 1988.

applications have been denied, primarily because mandatory restrictions would cause economic discrimination. Other airports have mandatory procedures and restrictions, such as a nighttime curfew at the Aspen/Pitkin County Airport and a noise abatement departure procedure at John Wayne/Orange County Airport. Some airports, have special procedures or restrictions that are allowed because those restrictions were in place prior to the enactment of ANCA and the airports were "grandfathered" into the program. Additionally, the Aspen/Pitkin County Airport has been granted a nighttime curfew because of the safety concerns of flying through the surrounding terrain.

Since LMO cannot impose mandatory restrictions or flight procedures, the best and only course of action is to develop Voluntary Noise Abatement Procedures (VNAPs). The VNAPs are designed to minimize the exposure of residential and other areas sensitive to aircraft noise, while ensuring safe flight. Pilots are asked to follow the voluntary VNAPs and "fly friendly" in an effort to be good neighbors to the citizens who live under the aircraft flight paths. It should be noted that compliance with the VNAPs are at the pilot's discretion, as safety is a pilot's number one concern. **Figure 2-6** shows the recommended traffic pattern for airplanes. For the complete VNAPs document for LMO see **Appendix C**.

FIGURE 2-6 – RECOMMENDED VOLUNTARY NOISE ABATEMENT PROCEDURES FOR AIRPLANES

Source: Jviation, Inc; City of Longmont

2.4.10 Obstructions to Air Navigation

Federal Aviation Regulation (FAR) 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airports*, defines and establishes the standards for determining obstructions that affect airspace in the vicinity of an airport. Obstructions are defined as any object of natural growth, terrain, permanent or temporary construction equipment, or permanent or temporary manmade structure that penetrates an imaginary surface. Prior to any airport development, a Part 77 evaluation must be conducted regardless of project scale to verify that there will be no hazardous effect to air navigation due to construction. Based on these requirements, this study used obstruction data from LMO's 2004 Airport Layout Plan and the FAA's Digital Obstacle File (DOF) and found that there are no known obstructions on LMO or within approach surfaces. There are high towers in the vicinity, but none that appear to penetrate the imaginary surfaces surrounding the airport. Additional obstruction survey was not included in the scope of this master plan. From visual observation and discussion with airport management, no apparent new structures have been constructed since the last obstruction survey that would impact airport operations.

2.5 GENERAL AVIATION FACILITIES

General Aviation (GA) facilities provide support to GA activities at an airport. GA facilities include the FBO, hangars, and apron/tiedown space.

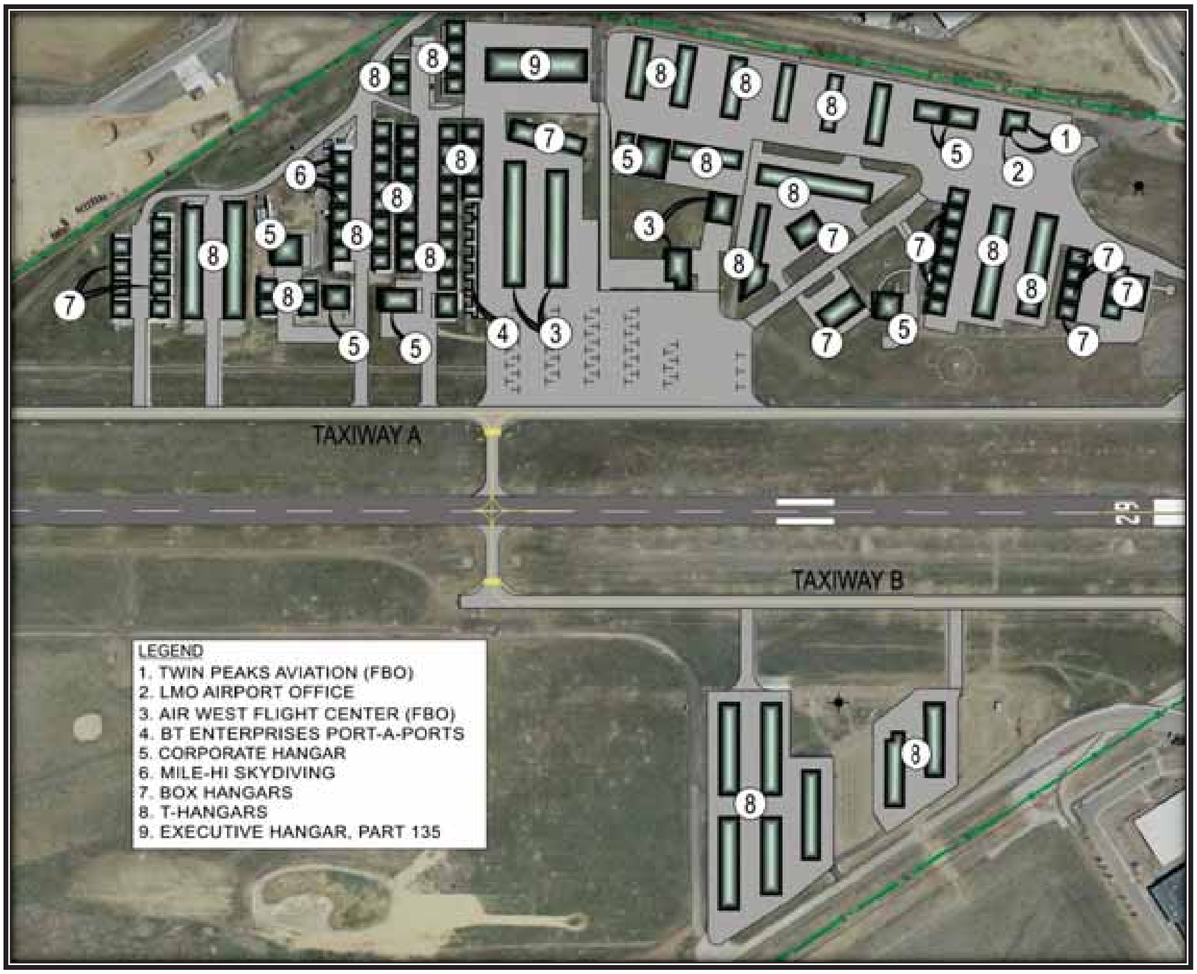
2.5.1 Fixed Based Operator (FBO)

LMO has two FBOs located on the airfield: Twin Peak Aviation and Air West Flight Center. Both are full service FBOs that offer fueling, aircraft parking on the ramp or tiedowns, hangar rental, aircraft maintenance, and Internet access. Air West Flight Center offers 100LL, Jet A, and motor vehicle gasoline; while Twin Peaks only offers 100LL AvGas.

2.5.2 Airport Hangars

The only office space and hangar owned by the City is located at Twin Peaks Aviation, shown in **Figure 2-7** as buildings 1 and 2. The rest of the hangars on airport property are privately owned, and the land is leased. The land leases are 20-year leases, each with the option to renew for another 20 years; there is no reversion clause in the leases. The land lease rate is $0.286 cents per square foot for Fiscal Year 2011, with increases each year according to the Denver/Boulder Consumer Price Index.

FIGURE 2-7 - LMO HANGARS



Source: Jviation, Inc.

2.5.3 Based and Transient Aircraft Parking Tiedowns

There are 52 tiedowns on the apron, of which Air West Flight Center manages 35 and Twin Peaks Aviation manages 17. Of the 35 tiedowns that Air West Flight Center manages, 25 are occupied full-time and 30 are occupied full-time in the summer months. The remaining tiedowns are for transient aircraft. All of Twin Peaks Aviation 17 tiedowns are occupied full-time; none are available for transient aircraft. During busy periods, the lack of transient tiedown spaces can become a concern.

2.6 Airport Maintenance and Equipment

The City of Longmont owns one operations vehicle that is used for the Airport. The snow removal and mowing services are contracted out to various private service providers. These contractors bring their own equipment and do not store it on site.

Maintenance of the airfield lighting systems, such as the runway and taxiway edge lights, is performed by the City of Longmont's Traffic Engineering Division.

2.7 Support Facilities

2.7.1 Maintenance Storage Facilities

All of the maintenance equipment is stored and maintained by the City of Longmont in the Public Works' shop located just north of LMO.

2.7.2 Aircraft Fuel Storage

Fuel for aircraft normally comes in two forms: AvGas or Jet A. AvGas or Aviation Gasoline is a gasoline for aircraft with reciprocating piston engines. The most common grade in use for AvGas is 100 LL, the 'LL' stands for low lead. Jet A is a kerosene type fuel, which contains no lead, and is used for powering jet and turbo-prop engine aircraft. Due to environmental concerns of the lead content in the 100LL fuel, the EPA is currently advancing rulemaking to end the production of this type of fuel. Industries, and fuel refiners alike, are scrambling to find different fuel sources and/or engine conversion methods to allow aircraft engines designed for this type of fuel to continue to operate safely. Both FBOs offer fuel for their customers, and Mile-Hi Skydiving performs its own fueling.

2.7.2.1 Air West Flight Center

Air West Flight Center has one underground self service fuel tank with a capacity of 10,500 gallons. Air West Flight Center also owns three fuel trucks: one holds 2,200 gallon of Jet-A, one holds 1,200 gallons of AvGas (100LL), and one holds 700 gallons of the motor vehicle gasoline.

2.7.2.2 Twin Peaks Aviation

Twin Peaks Aviation has one aboveground self-service fuel tank for AvGas, with a capacity of 8,500 gallons. Additionally, Twin Peaks Aviation has one fuel truck that holds 1,200 gallons of AvGas (100LL).

2.7.2.3 Mile-Hi Skydiving

Mile-Hi Skydiving has one split tank truck that holds 200 gallons of 100LL and 800 gallons of Jet A.

2.8 Vehicle Access and Parking

2.8.1 Airport Access Road Network

The public entrance for LMO is on the east side of the airport, off of Airport Road. Airport Road is a four lane arterial road abutting the airport. It has access to Highway 119, Nelson Road, Rogers

Road, and Hover Road. There is also access on the southeast side of the airport, on Roger Road, and on the northwest side of the airport via St. Vrain Road.

2.8.2 Parking

LMO has free parking, located north and west of each FBO. Additionally, pilots and airport tenants often park inside their hangars and/or at the end of each hangar unit.

2.9 Utilities

The City of Longmont is a full-service municipality, with its electric and telecommunications company, Longmont Power & Communications (LPC). It also provides water and wastewater (through its Public Works and Natural Resources Department), natural gas (through Xcel Energy), sewer, and trash/recycling services.

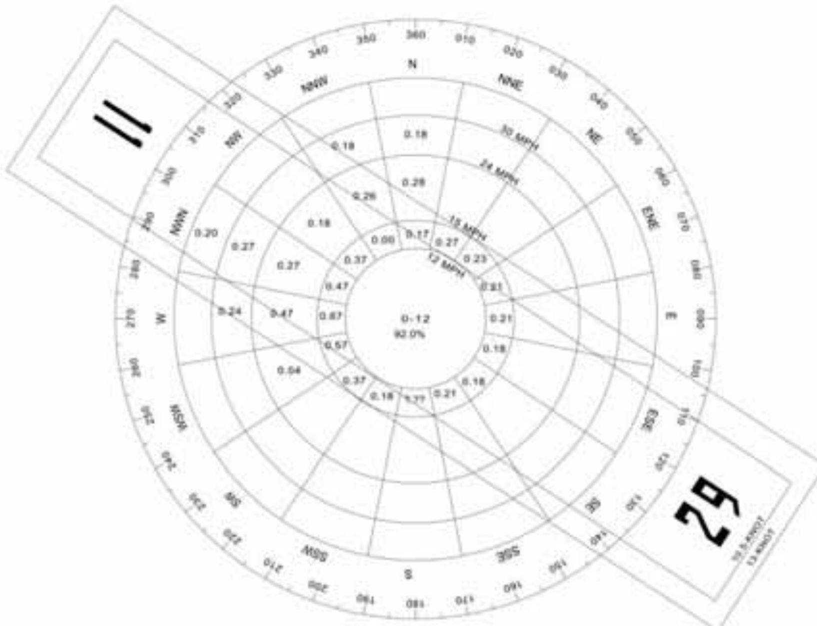
2.10 Meteorological Data

2.10.1 Wind Coverage

Wind conditions are particularly important for runway use at an airport. Each aircraft has an acceptable crosswind component for landing and takeoff. The crosswind component is the speed of wind at a right angle to the runway centerline. When the acceptable crosswind component of an aircraft is exceeded the aircraft must divert to another airport. Per FAA Advisory Circular (AC) 150/5300-13*, Airport Design*, when the current runway(s) provide less than 95% wind coverage for any aircraft that use the airport on a regular basis, a crosswind(s) runway should be considered. The crosswind components of 10.5 and 13 knots are representative of the light aircraft that operate at LMO; they were used for this analysis to look at the allowable crosswind component of different size aircraft.

LMO does not have any current long-term wind/weather observations data available. The last wind study was collected from 1978 to 1980, and has been used in each master plan since. The airport's Automated Weather Observation System (AWOS) was connected to the national system of weather monitoring equipment (NADIN) in December of 2010. With this connection, all of the weather observations will be stored with the National Climatic Data Center (NCDC), as opposed to the previous situation where the system only reported the current conditions through a local radio broadcast and a telephone connection. It is recommended that LMO reevaluate the wind coverage after at least one year of data has been collected by NCDC. The 1980 Wind Rose indicates that the current runway orientation provides 97.79% coverage for a crosswind component of 10.5 knot and 98.04% coverage for a crosswind component of 13 knots. Therefore, using this wind data, a crosswind runway is not justified by FAA criteria. The 1980 Wind Rose is depicted in **Figure 2-8** below.

FIGURE 2-8- 1980 WIND ROSE



WIND ROSE	
SOURCE	ANEMOMETER, WIND VANE AND CONTINUOUS WEATHER RECORDING EQUIPMENT AT VANCE BRAND AIRPORT
PERIOD	NOVEMBER 1978 - FEBRUARY 1980
NOTE	TRUE RUNWAY BEARING USED FOR ALIGNMENT

% WIND COVERAGE		
RUNWAY	10.5 KTS (12 MPH)	13.0 KTS (15 MPH)
11-29	97.79%	98.04%

2.10.2 Temperature

The airport reference temperature, which is defined as the mean maximum temperature of the hottest month, is 88.9ºF and occurs in July[14]. In addition, the average temperature is 27ºF in January and 72ºF in July.

2.10.3 Precipitation

The City of Longmont's total precipitation averages 13.41 inches per year, with the rainiest month being May. The average snowfall for the city averages 34.2 inches per year. [15]

2.10.4 Instrument Meteorological Conditions (IMC)

A review of data from nearby airports, Boulder Municipal Airport and Fort Collins-Loveland Airport, indicates that Instrument Meteorological Conditions (IMC) occurs on average

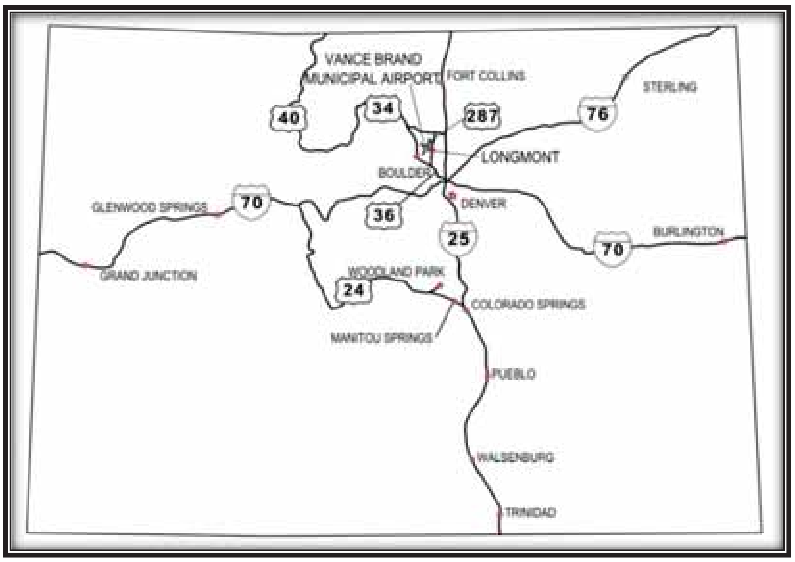
14 Western Region Climate Center, Colorado Climate Summaries. http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?colong
15 Ibid

approximately 6% of the time in the area. Currently there is no existing long-term source for local weather information for LMO; however local airport weather information will be available at a later date with the recent AWOS upgrades.

2.11 Airport Property & Land Use

As shown in **Figure 2-9**, LMO is located in northern Colorado, approximately 31 miles north-northwest of Denver and northeast of the City of Boulder, within Boulder County. It is situated along U.S. Route 287, which gives the Airport easy access to U.S. Route 34, U.S. Route 36, Colorado State Highway 119, and U.S. Interstate 25.

FIGURE 2-9 – LOCATION MAP



Source: Jviation, Inc.

The City owns approximately 264 acres for the airport, encompassing both the airfield and additional land in the immediate vicinity. **Figure 2-10** shows the City of Longmont's zoning areas in the vicinity of the airport. The map depicts the following:

- Blue: Public/Quasi-Public Land
- Pink: Residential
- Orange: Commercial
- Purple: Industrial/Economic Development
- Green: Park, Green Ways, and Open Space
- Non-Shaded Areas: Not part of the City of Longmont.
- Oval Area: The Airport Influence Zone (AIZ) Overlay District

According to the City Code[16], the purposes of the airport influence overlay zoning district are:

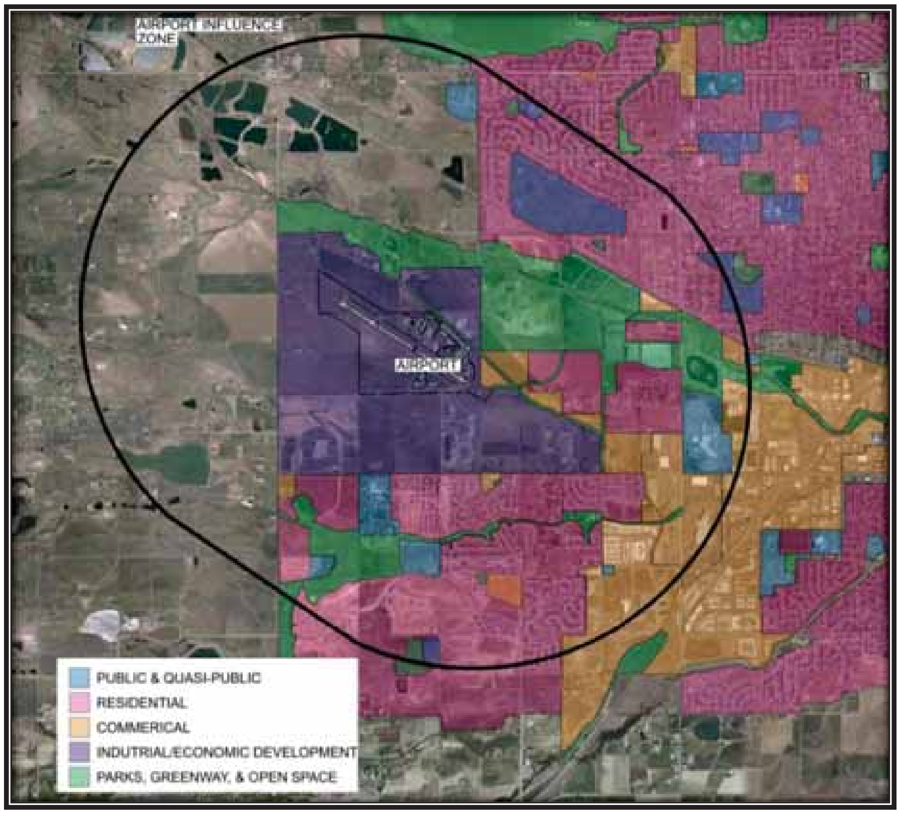
1. To protect the ongoing ability of the airport to serve the city's air transportation needs and protect the public investment in the airport;
2. To minimize risks to public safety and minimize hazards to airport users;
3. To protect property values and restrict incompatible land use; and
4. To promote appropriate land use planning and zoning in the area influenced by the airport.

Furthermore, the AIZ adds restrictions such as:

- *Use Restrictions.* No use shall create any electrical interference with navigational signals for radio communications between the airport and the aircraft, make it difficult for pilots to distinguish airport lights from others, result in glare for pilots using the airport, impair visibility in the vicinity of the airport or otherwise in any way create a hazard or endanger the landing, take-off, or maneuvering of aircraft using the airport.
- *Height Limitations*: No structure or object of natural growth shall be erected, altered, allowed to grow, or be maintained at a height that intrudes into the Federal Aviation Regulation (FAR) part 77 surfaces for the Vance Brand Airport.
- *Nonconforming Uses*: The owner of any existing nonconforming structure or object of natural growth shall permit the installation, operation, and maintenance of markers and/or lights as deemed necessary by the airport manager, to indicate the users of such hazards. If a nonconforming structure is abandoned for a period of 180 consecutive days, no permit such be granted, and a permit may be granted for demolition and removal.

[16] City of Longmont, Part II – Code of Ordinances: Title 15 – Land Development Code, Chapter 15.03. – Zoning Districts

FIGURE 2-10 – CITY OF LONGMONT ZONING



Source: City of Longmont

2.12 Community Socioeconomic Analysis

For the master planning process, it is critical to understand the social and economic health of the community that serves the airport. These socioeconomic indicators, including population, employment, and income, normally will have an impact on the levels of aviation activity forecast at an airport. The foundation for the development of aviation forecasts is typically centered on this information. Any changes in these metrics will likely have an impact on aviation activity levels at the airport.

2.12.1 Population

According to the U.S. Census Bureau, the City of Longmont has grown similar to surrounding cities and the cities of other nearby airports, including the cities of Fort Collins, Loveland, and Greeley, as shown in **Table 2-7**.

TABLE 2-7 - POPULATION DATA

Place	Census 2000 Population	Census 2010 Population	% Change 2000 to 2010
City of Longmont	71,093	86,270	21.35%
Boulder County	269,814	294,567	9.17%
City of Boulder	94,673	97,385	2.86%
City of Lafayette	23,197	24,453	5.41%
City of Fort Collins	118,652	143,986	21.35%
City of Loveland	50,608	66,859	32.11%
City of Greeley	76,930	92,889	20.74%
City of Broomfield	38,272	55,889	46.03%

Source: US Census, American Fact Finder

2.12.2 Employment

St. Vrain Valley School District is the largest employer in Longmont, employing 4,876 people. **Table 2-8** shows the top employers in Longmont.

TABLE 2-8 - LONGMONT PROFILE OF MAJOR EMPLOYERS

COMPANY	EMPLOYEES	PRODUCT/SERVICE
St. Vrain Valley Schools	4,876	Education
Longmont United Hospital	1,282	Medical
Seagate Technology	1,160	Technology
City of Longmont	814	Government
Intrado	807	Technology
Amgen	771	Medical
FAA Aviation Control Center	566	Government/Aviation
DigitalGlobe	562	Technology
Crocs	425	Retail
McLane Western	406	Retail
Con Agra (Butterball), LLC	360	Retail
Longmont Clinic	288	Medical
Circle Graphics	280	Media
Xilinx	270	Technology

Source: Longmont Area Economic Council; June 2011.

The U.S. Bureau of Economic Analysis (BEA) tracks employment by category (NAICS – North American Industry Classification System) for every county in the nation. This type of information is valuable for planning purposes because the prevalent industry types can greatly affect the levels of business aviation demand, as well as disposable income available for private aircraft ownership. **Table 2-9** shows the latest data and numbers for Boulder County. The *Professional, Scientific and Technical Services* classification is the largest sector for the county. Typically, these businesses employ highly skilled, specialized and educated workers.

TABLE 2-9 - 2007 NAICS TOTALS FOR BOULDER COUNTY

		Number of establishments of employment-size class								
	Total	1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1000 or more
Forestry, Fishing, Hunting, and Agriculture Support	17	13	3	1	0	0	0	0	0	0
Mining	30	19	3	2	5	1	0	0	0	0
Utilities	14	9	2	1	0	1	1	0	0	0
Construction	919	675	130	68	33	8	5	0	0	0
Manufacturing	538	222	100	79	83	22	21	5	5	1
Wholesale Trade	505	315	88	57	29	7	8	1	0	0
Retail Trade	1,245	569	327	163	108	41	31	5	0	1
Transportation and Warehousing	94	52	18	10	7	5	2	0	0	0
Information	327	186	46	42	26	10	13	2	2	0
Finance and Insurance	722	503	122	62	28	2	3	1	1	0
Real Estate and Rental and Leasing	662	521	91	31	17	2	0	0	0	0
Professional, Scientific, and Technical Services	2,544	1,941	283	162	96	30	22	7	0	3
Management of Companies and Enterprises	60	23	12	8	10	2	2	1	2	0
Administrative and Support and Waste Management and Remediation Services	539	340	82	43	39	16	15	4	0	0
Educational Services	239	164	30	22	14	8	0	0	1	0
Health Care and Social Assistance	1,159	662	262	127	68	19	10	7	1	3
Arts, Entertainment, and Recreation	221	153	22	22	15	5	3	1	0	0
Accommodation and Food Services	815	189	156	209	200	51	10	0	0	0
Other Services (except Public Administration)	861	532	179	97	38	11	2	2	0	0
Unclassified	6	6	0	0	0	0	0	0	0	
Total	1406	844	283	154	90	25	9	1	0	0

Source: National American Industry Classification System (NAICS)

2.12.3 Income

Table 2-10 indicates that the per capita personal income of Boulder County is considerably higher than both the State of Colorado and the U.S. Average income. However, the 2009 American Chamber of Commerce Research Association (ACCRA) Cost of Living Index for Boulder, Colorado was 125.3. This means, on average, it is 25.3% more expensive to live in Boulder County than the average U.S. city.[17]

TABLE 2-10- PER CAPITA PERSONAL INCOME COMPARISON

Place	2003	2004	2005	2006	2007	2008
Boulder County	$41,105	$42,995	$46,376	$48,654	$50,344	$50,058
State of Colorado	$35,156	$36,652	$38,555	$40,899	$42,449	$43,021
U.S. Average	$32,271	$33,881	$35,424	$39,698	$39,392	$40,166

Source: U.S. Department of Commerce: Bureau of Economic Analysis

2.12.4 Sales & Use Tax

A review of a community's tax receipts is an indicator of the level of economic activity in the area. **Table 2-11** shows the overall sales and use tax for the City of Longmont. From 2008 to 2009, there was a significant drop in sales and use tax, and the City began to experience a partial recovery in 2010.

TABLE 2-11 - CITY OF LONGMONT USE & SALES TAX

	2007	2008	2009	2010
Sales Tax Collected	$38,138,567	$39,089,113	$37,508,855	$38,265,469
Use Tax Collected	$7,156,525	$7,124,994	$5,176,150	$6,310,198
TOTAL	**$46,175,457**	**$46,214,106**	**$42,685,005**	**$44,575,667**

Source: City of Longmont, Sales Tax Reports

2.13 Environmental Overview

FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*, and Order 5050.4B, *National Environmental Policy Act: Implementation Instruction for Airport Actions,* address specific environmental categories that are evaluated in environmental documents through the National Environmental Policy Act (NEPA). In order to understand future environmental impacts of planned development at the airport, an inventory of exiting airport development to the NEPA environmental categories must occur. During the evaluation of alternatives for this master plan, each alternative is evaluated to identify any environmental impacts. The following section inventories these categories and their existence at the airport.

[17] Metro Denver Economic Development Corporation: Cost of Living. http://www.metrodenver.org/cost-living.aspx

2.13.1 Air Quality

The Clean Air Act of 1977 and the National Environmental Policy Act require federally funded projects to evaluate the potential to degrade air quality, specifically, those areas located in a non-attainment area. A non-attainment area is an area that does not meet the air quality levels assigned by the U.S. Environmental Protection Agency's (EPA) National Ambient Air Quality Standards (NAAQS). The airport is located in Boulder County, which is designated by the EPA as a non-attainment area for 8-hour ozone. Ground level ozone, a gas harmful to humans, can be formed from the reaction between sunlight and pollutants emitted from sources such as cars, power plants, industrial boilers, refineries, chemical plants, and various other sources. The 8 hour ozone standards, as defined by the NAAQS, are measured by taking the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentration within an area over each year. The current standard, as set in 2008 is 0.075 parts per million; however this standard is in the process of being modified.

2.13.2 Department of Transportation Act: Section 4(f)

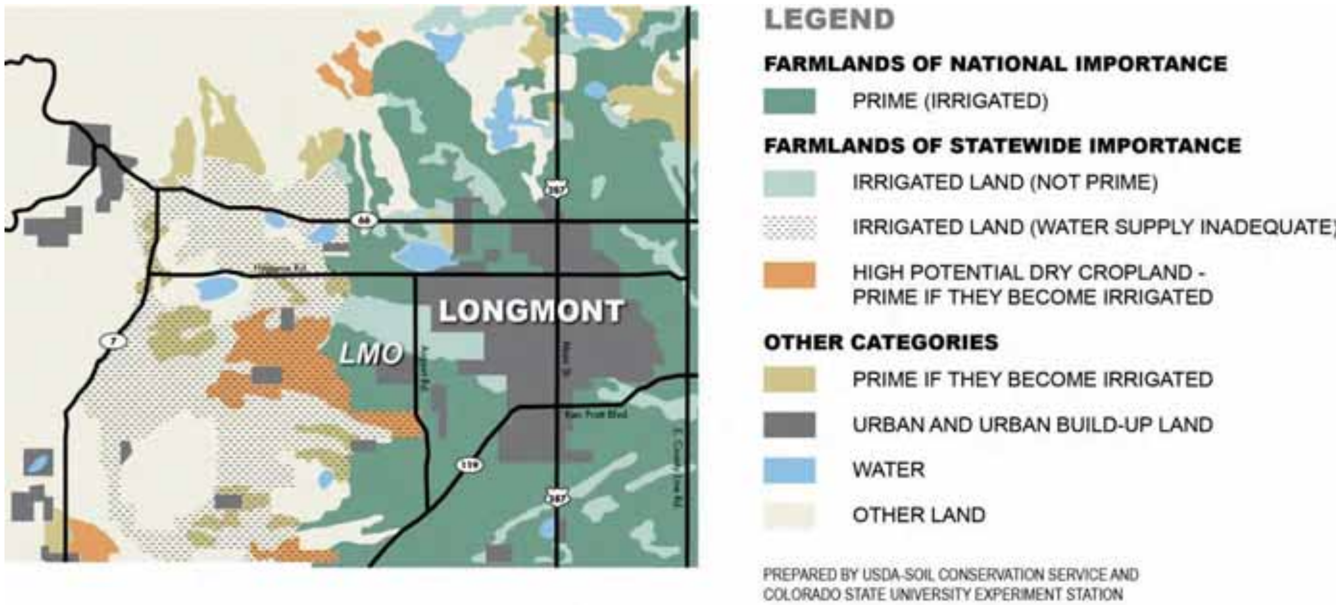
The Department of Transportation (DOT) Act, Section 4(f)[18] provides that the "Secretary of Transportation will not approve any program or project that requires the use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance or land from an historic site of national, state, or local significance unless there is no feasible or prudent alternative and the use of such land includes all possible planning to minimize harm resulting from the use". The nearest property to the airport is Willow Farm Park located one mile away. All other 4(f) properties are more than one mile from the airport.

2.13.3 Farmlands

The Farmland Protection Policy Act (FPPA) regulates federal actions that may impact or convert farmland to a non-agricultural use. FPPA defines farmland as "prime or unique land as determined by the participating state or unit of local government, and considered to be of statewide or local importance." As depicted in **Figure 2-11**, Boulder County has a moderately large amount of prime and/or unique farmland, as well as high development which relates to a relatively rapid loss of high-quality farmland. Further analysis and consultation would be needed for future projects with the potential to convert any existing prime and unique farmland.

[18] *U.S. Department of Transportation Act, section 4(f),* recodified and renumbered as § 303(c) of 49 U.S.C.

FIGURE 2-11 - COLORADO FARMLANDS



Source: USDA-Soil Conservation Service and Colorado State University Experiment Station; Map: Jviation

2.13.4 Fish, Wildlife, and Plants

Requirements have been set forth by the Endangered Species Act[19], The Sikes Act[20], The Fish and Wildlife Coordination Act[21], the Fish and Wildlife Conservation Act[22], and the Migratory Bird Treaty Act[23], for the protection of fish, wildlife, and plants of local and national significance.

Boulder County has several species listed by the U.S. Fish and Wildlife Service as being threatened or endangered. These are listed in **Table 2-12**. The list depicts species that occur in Boulder County as a whole, and therefore does not necessarily reflect species that exist on airport property. An initial analysis of threatened and endangered species is recommended by the FAA for inclusion in the Master Plan to aid in the overall potential for listed species. It is not believed that any of these species exist within the airport property, however, no field surveys were included in this study. The development actions that are generated through this master planning process will be further evaluated on their potential impact to listed species through a coordination effort with the U.S. Fish and Wildlife Service and Colorado Department of Wildlife during the alternatives evaluation phase. Further study will be undertaken at that time, prior to any actual development, if required.

[19] Endangered Species Act of 1973, U.S. Congress, Public Law 93-205, 16 U.S.C §1531-1544
[20] Sikes Act, Amendments of 1974, U.S. Congress, Public Law 93-452
[21] Fish and Wildlife Coordination Act of 1958, U.S. Congress, Public Law 85-624, 16 U.S.C §661-666c
[22] Fish and Wildlife Conservation Act of 1980, U.S. Congress, Public Law 96-366, 16 U.S.C §2901-2912
[23] Migratory Bird Treaty Act of 1981, 16 U.S.C §703-712

TABLE 2-12- BOULDER COUNTY THREATENED AND ENDANGERED WILDLIFE

BOULDER COUNTY		
Species	**Scientific Name**	**Status**
Canada lynx	Lynx Canadensis	Threatened
Colorado butterfly plant	Gaura neomexicana spp. coloradensis	Threatened
Greenback cutthroat trout	Oncorhynchus clarki stomias	Threatened
Least tern (interior population)*	Sternula antillarum	Endangered
Mexican spotted owl	Strix occidentalis lucida	Threatened
Piping plover*	Charadrius melodus	Threatened
Preble's meadow jumping mouse	Zapus hudsonius preblei	Threatened
Ute ladies'-tresses	Spiranthes diluvialis	Threatened
Whooping crane*	Grus americana	Endangered

Source: US Fish and Wildlife Service, Threatened and Endangered Species by County, May 19, 2011

**Water depletions in the South Platte River may affect the species and/or critical habitat in downstream reaches in other states.*

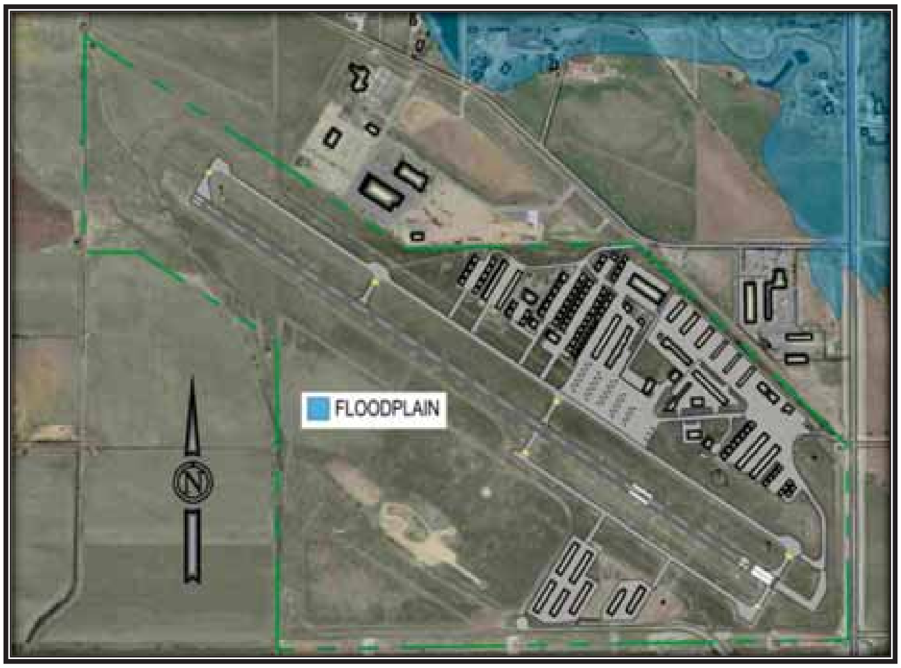
2.13.5 Floodplains

Executive Order 11988, *Floodplain Management*[24] directs federal agencies to "avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative".

An examination of the Flood Insurance Rate Maps (FIRM) for Boulder County shows that there are no flood zones located within airport property. The nearest flood zone is north of the airport by about half a mile along the St. Vrain River, as shown in **Figure 2-12**.

[24] Executive Order 11988, Floodplain Management, 1977

FIGURE 2-12- FLOODPLAINS MAP



Map: Jviation

2.13.6 Hazardous Materials, Pollution Prevention, and Solid Waste

The Resource Conservation and Recovery Act (RCRA)[25], Comprehensive Environmental Response, Compensations, and Liability Act (CERCLA)[26], Superfund Amendments and Reauthorization Act (Superfund)[27], and the Community Environmental Response Facilitation Act (CERFA)[28] are the four predominant laws regulating actions related to the use, storage, transportation, and/or disposal of hazardous materials, chemicals, substances, and wastes. Federal actions that pertain to the funding or approval of airport projects require the analysis of the potential for environmental impacts per the regulating laws. Furthermore, property listed or considered for the National Priority List (NPL) should be evaluated in relation to the airport's location. NPL properties in Boulder Country are listed in **Table 2-13**.

[25] U.S. Code, 1976, Resource Conservation and Recovery Act, 42 USC, §6901
[26] U.S. Code 1980, Comprehensive Environmental Response, Compensation and Liability Act, 42 USC, §9601-9628
[27] U.S. Code 1986, Superfund Amendments and Reauthorization Act, 42 USC
[28] U.S. Code 1992, Community Environmental Response Facilitation Act, Public Law 102-426

TABLE 2-13 - NPL SITES IN BOULDER COUNTY

Site Aliases	Status	EPA ID	Distance to Airport
Captain Jack Mill	Active NPL	COD 981551427	20 miles
Marshall Landfill	Completed NPL	COD 980499255	14 miles

Source: EPA, Colorado Site Locator, 2010

2.13.7 Historical, Architectural, Archaeological, and Cultural Resources

The National Historic Preservation Act[29] and the Archaeological and Historical Preservation Act[30] regulate the preservation of historical, architectural, archaeological and cultural resources. Federal actions and undertakings are required to evaluate the impact on these resources.

The National Register of Historic Places lists ten properties within and near the city of Longmont. The properties are listed in **Table 2-14**. The nearest property to the airport is the Hoverhome and Hover Farmstead, which is approximately two miles southeast of the airport. Therefore, it is not expected that any proposed airport actions would impact any existing historical properties.

TABLE 2-14 - HISTORIC PLACES IN LONGMONT

Property Name	Address	Date Added to Registry	Distance to Airport
Thomas M. Callahan House	312 Terry St.	5/16/1985	2.5
Dickens Opera House	300 Main St.	7/28/1987	2.5
East Side Historic District	Bounded by Long's Peak Ave., Collyer St., 4th Ave. & Emery St.	10/2/1986	3.0
Empson Cannery	15 3rd Ave.	1/5/1984	3.5
Hoverhome and Hover Farmstead	1303-1309 Hover Rd.	1/15/1999	2.0
Longmont Carnegie Library	457 4th Ave.	11/3/1992	3.0
Longmont College	546 Atwood St.	8/12/1987	3.0
Longmont Fire Department	667 4th Ave.	5/16/1985	3.0
St. Stephen's Episcopal Church	470 Main St.	2/24/1975	3.0
West Side Historic District	Roughly bounded by 5th, Terry, 3rd and Grant	1/7/1987	3.0

Source: National Park Service, U.S. Department of the Interior, Updated as of 5/10/2011

29 U.S. Code, 1966, National Historic Preservation Act of 1966, Public Law 89-665
30 U.S. Code, 1974, Archaeological and Historical Preservation Act of 1974, 16 USC 469

2.13.8 Light Emissions and Visual Impacts

Federal regulations do not specifically regulate airport light emissions; however, the FAA does consider airport light emissions on communities and properties in the vicinity of the airport. A significant portion of light emissions at airports are a result of safety and security equipment and facilities. The airport has four primary sources of light including:

- Medium Intensity Runway Lighting (MIRL): white lights outlining the runway and classified by the intensity or brightness the lights are capable of producing
- Medium Intensity Taxiway Lighting (MITL): blue lights outlining the taxiways and classified by the intensity or brightness the lights are capable of producing
- Visual Approach Slope Indicator (VASI) system: arrangement of red and white lights offering descent guidance to approaching aircraft
- Airport beacon: rotating green and white light used to locate the airport after dark

All four sources of light aid in the safety of operations at the airport and produce an insignificant amount of light on the surrounding communities. Furthermore, the MIRLs, MITLs, and VASIs are pilot controlled, meaning, the lights are activated by approaching pilots and do not remain on throughout the night when there is no activity. Nighttime operations at LMO are very infrequent in relation to daytime operations, so the lights typically remain off for most of the night.

2.13.9 Noise

Noise from aircraft operations is a critical consideration for airport development and operations. Any actions that may change runway configurations, aircraft movements, aircraft types, or flight patterns, may alter the noise impacts on the communities in the vicinity of the airport and must be carefully examined. 65 Day-Night Level (DNL) noise contours will be developed during this master plan for the current and ultimate (20 year) time frames. The FAA has adopted the DNL metric as the official way to measure noise impacts. The following is an excerpt from Chapter 17 of the FAA *Environmental Desk Reference for Airport Actions* document:

> DNL is the standard Federal metric for determining cumulative exposure of individuals to noise. In 1981, FAA formally adopted DNL as its primary metric to evaluate cumulative noise effects on people due to aviation activities.
>
> (1) Past and present research by the Federal Interagency Committee on Noise (FICON) verified that the DNL metric provides an excellent correlation between the noise level an aircraft generates and community annoyance to that noise level;
>
> (2) DNL is the 24-hour average sound level in decibels (dB). This average is derived from all aircraft operations during a 24-hour period that represents an airport's average annual operational day;

(3) It is important to note that due to the logarithmic nature of noise, the loudest noise levels control the 24-hour average; and

(4) DNL adds a 10 dB noise penalty to each aircraft operation occurring during nighttime hours (10 p.m. to 7 a.m.). DNL includes that penalty to compensate for people's heightened sensitivity to noise during this period. This penalty contributes heavily to an airport's overall noise profile.

Noise issues and abatement procedures are covered in detail in **Section 2.4.9**.

2.13.10 Water Quality

The Clean Water Act[31] provides the federal government the "authority to establish water quality standards, control discharges, develop waste treatment management plans and practices, prevent or minimize the loss of wetlands, location with regard to an aquifer or sensitive ecological area such as a wetland area, and regulate other issues concerning water quality."

The City of Longmont has developed several initiatives to preserve and improve the quality of the city's water so that it can continue to support the city's demand for water, recreation, agriculture, aquatic life, and other uses now and in the future. Some of the initiatives include:

- Watershed Management Plan
- Participation in "Keep it Clean Partnership" – a collaborative effort to protect water quality
- Water Conservation - rebates and community education
- Pollution Prevention - community education and disposal resources
- Maintain all required Storm Water Management Plan documentation

[31] U.S. Code, 1977 The Clean Water Act, 33 U.S.C. §1251-1387

2.13.11 Wetlands

Executive Order 11990, *Protection of Wetlands*, defines wetlands as "those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction." Federal agencies are required to minimize the destruction, loss, or degradation of wetlands.

An examination of the National Wetlands Inventory depicts that no wetlands exist on LMO property. As a result, no development within the current airport boundary should create a wetlands concern.

FIGURE 2-13 - WETLANDS

Map: Jviation

2.13.12 Wild and Scenic Rivers

The Wild and Scenic Rivers Act of 1968, as amended[32], describes those river segments designated as, or eligible to be included in, the Wild and Scenic Rivers System. Impacts should be avoided or minimized to the extent possible when the rivers or river segments that fall under this Act may be affected by a proposed action. In addition, the *President's 1979 Environmental Message Directive on Wild and Scenic Rivers*[33] directs federal agencies to avoid or mitigate adverse effects on rivers identified in the Nationwide Rivers Inventory that have the potential for designation under the Wild and Scenic Rivers Act.

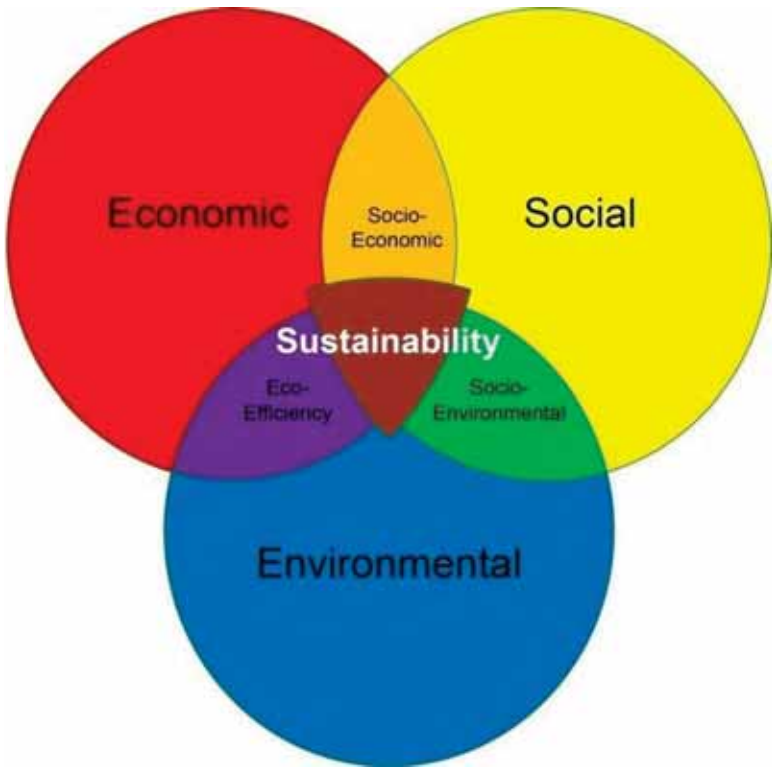
[32] U.S. Code, The Wild and Scenic Rivers Act of 1968, 16 USC 1271-1287, 1977
[33] Office of Environmental Policy, 1979, Policy Guidelines for Wild and Scenic Rivers, 1980

The Cache La Poudre River is the only nationally designated Wild and Scenic River in Colorado. The River is approximately 30 miles northwest of the airport and will not be impacted by airport development.

2.14 Sustainability

Sustainability is an important value of the City of Longmont. Sustainability in relation to airports goes beyond just the concept of environmental sustainability. In order to truly be effective, sustainability measures must not only consider the environment, but also the effects on social and economic benefits. A balance of these three elements is essential, and is known as the "triple bottom line". The concept of the triple bottom line is shown in **Figure 2-14**.

FIGURE 2-14 - TRIPLE BOTTOM LINE OF SUSTAINABILITY



Source: City of Longmont

2.14.1 Aviation Industry Sustainability Initiatives

The aviation industry has developed numerous sustainable initiatives that are utilized throughout the country. These initiatives can be federal, state, or local mandates; however, they are more effective when the local governing body independently realizes sustainability makes good business sense. A few of the benefits airports can gain from embracing sustainability are:

- Reduced capital asset life cycle costs

- Reduced operating costs
- Better customer service and satisfaction
- Enhanced relationships with the community

The Sustainable Aviation Guidance Alliance (SAGA)[34] is a coalition of aviation interests which formed in 2008 with the mission to assist airport operators in developing and maintaining sustainability programs. This organization has an online database of sustainable practices that are used at other airports for construction and operational activities. An additional source for airport-specific sustainability information is the Sustainable Airport Manual developed by the City of Chicago Aviation Department[35]. These two sources can be referenced during the planning and design of specific projects to determine if there are any sustainability measures that can be employed.

2.14.2 Local Sustainability Initiatives

The City of Longmont adopted the "Enhance the Natural Environment" policy direction in 2006 to both improve and create a sustainable environment in the city. The Environmental Sustainability Vision states, "To be a sustainable community we must be able to meet the needs of the present without compromising the ability of future generations to meet their own needs". The City has identified several strategies to be used to promote sustainability in the community, such as:

- Reduce energy and water use
- Provide renewable and alternative energy sources
- Recycle and reuse materials to minimize waste and pollution associated with production and disposal
- Protect open space to preserve wildlife habitat
- Utilize land use controls to protect and preserve environmental resources
- Provide a water supply to meet the needs of people and their environment
- Reduce emissions of air and water pollutants
- Promote local agriculture

In addition to the sustainable strategies, the City has implemented several programs and initiatives to further promote sustainability, to include:

- Energy efficiency/conservation
- Green build program
- Watershed protection

[34] http://www.airportsustainability.org/
[35] http://www.airportsgoinggreen.org/Content/Documents/CDA%20SAM%20-%20v2%200%20-%20November%2015%202010%20-%20FINAL.pdf

- Stream restoration
- Storm water quality
- Water conservation
- Enhanced recycling programs
- Continuation and use of open space tax funds

2.15 Surveys

To further assess the adequacy of the airport facilities and desired improvements, surveys were sent to local aircraft owners and pilots, airport business tenants, and corporate businesses that have operated at LMO in the past year, and local Longmont businesses. Examples of the surveys are located in **Appendix D**.

2.15.1 Local Aircraft Owner and Pilot Surveys

A total of 84 local aircraft owner and pilot surveys were completed. From the returned surveys, the respondents overwhelmingly indicated the desire for a year-round restaurant, crosswind runway, additional hangar space and availability, and a runway extension for Runway 11/29. The survey also asked the respondents to specify the most essential facilities and capabilities of the airport. Eighty-one out of 84 respondents completed this section. The respondents most frequently indicated that self-service fuel, aircraft maintenance, tiedowns/hangars, and flight instruction as the most essential facilities at the airport. The least essential were fire and rescue and tourism/entertainment related activities. The most commonly specified "other" facilities needed were 24-hour bathrooms, an area to wash aircraft, courtesy cars and the for old airport beacon to be turned back on.

Respondents were asked to rate the airport's facilities and capabilities from "1" to "10", with "1" being poor and "10" being excellent. **Table 2-15** shows the average rating and mode for each category. Additionally, respondents were asked to indicate which category should have the highest priority. The most commonly specified categories were runway length (23%); hangar availability, space, and lease rates (15.7%); condition of pavement (14.5%); and the need for a crosswind runway (10%).

TABLE 2-15 – AIRCRAFT OWNER AND PILOT RATINGS OF AIRPORT FACILITIES

Category	Average Score*	Mode (Most common number indicated)*
Runway Orientation	7.8	8
Runway Length	6.9	8
Condition of Pavement	7.6	8
Unicom Service	6.8	9
Apron Space	6.6	8
FBO Services	6.6	5
Visual Aids	6.5	8
Navigational Aids	5.6	5
Instrument Approaches	5.3	5
Hangar Space	5.3	5
Hangar Availability	4.9	5
Hangar/Pad Lease Rates	4.9	5

Source: Jviation, Inc.

**Rating Scale: 1 is "Poor", 10 is "Excellent"*

A majority of the respondents stated the airport is extremely important, if not vital, to the local community and businesses. Some of the comments stated that the airport is "essential for economic development," an "integral component of the community infrastructure," and that it is "the lifeblood of Longmont". Comments for the surveys are located in **Appendix D**.

2.15.2 Airport Business Tenant Surveys

Nine Airport Tenant Surveys were completed. From the completed surveys, the respondents strongly indicated the need for a runway extension for Runway 11/29. Additionally, a majority of the respondents requested additional apron space, dedicated snow removal, and a better instrument approach into the airport.

The survey also asked to specify the most essential facilities and capabilities of the airport. The respondents were asked to rank the same categories as aircraft owners and pilot surveys for the most and least essential facilities at an airport. They indicated that self-service fuel, aircraft maintenance, tiedowns/hangars, and flight instruction are the most essential facilities at the airport; and Fire and Rescue, and Tourism/Entertainment Related Activities are the least essential.

Respondents were asked to rate the airport's facilities and capabilities from "1" to "10", with "1" being poor and "10" being excellent. Table 2-16 shows the average rating and mode for each category. The survey respondents rated the airport as (9.5), indicating that the airport is very important, or "essential", to the local community and businesses. Comments for the surveys are located in **Appendix D**.

TABLE 2-16 – AIRPORT TENANT RATINGS OF AIRPORT FACILITIES

Category	Average Score*	Mode (Most common number indicated)*
Runway Orientation	7.3	5
FBO Services	6.9	5
Condition of Pavement	6.8	9
Unicom Service	6.7	8
Apron Space	5.9	5
Visual Aids	5.8	4
Instrument Approaches	5.4	5
Navigational Aids	5.3	7
Runway Length	4.9	6
Hangar Space	4.6	4
Hangar Availability	4.4	3
Hangar/Pad Lease Rates	4.4	4

Source: Jviation, Inc.

**Rating Scale: 1 is "Poor", 10 is "Excellent"*

2.15.3 Corporate Aircraft Business Surveys

Businesses that have used LMO for their corporate aircraft within the last two years were sent surveys, however, as of April 25, 2011 only four of 22 surveys were returned. **Table 2-17** shows the average rating for each category. The respondents also indicated the need for deicing and a better instrument approach. All the comments for the surveys are located in **Appendix D**.

TABLE 2-17 - BUSINESS USER RATINGS OF AIRPORT FACILITIES

Category*	Average Score*
Runway Orientation	10
Unicom Service	9.5
FBO Services	9.5
Condition of Pavement	9.0
Visual Aids	9.0
Safety of Apron	8.5
Navigational Aids	6.7
Instrument Approaches	6.7
Runway Length	3.3

Source: Jviation, Inc.

**Rating Scale: 1 is "Poor", 10 is "Excellent"*

2.15.4 Longmont Area Business Surveys

As of April 25, 2011, 28 local Longmont area business surveys have been completed. Surveys were sent electronically from the Longmont Area Economic Council (LAEC) and Chamber of Commerce to Longmont businesses in order to assess the local business perspective of the airport.

Respondents were asked to rate how important they felt the airport was to the local community from “1” to “10”, with “1” signifying low importance and “10” signifying high importance. The local businesses deemed the airport very important to the local community, with an average score of “9”. Nineteen of the 28 responses rated the importance of the airport as a “10”. Many of the businesses made comments stating that the airport’s growth has a “reciprocating effect” on the growth of Longmont and that all Longmont businesses benefit directly or indirectly from the airport. Two of the businesses stated that they have operated private aircraft at the airport for company business, while the rest stated they use commercial airline flights at Denver International Airport (DIA) for all business travel. All of the comments from the surveys are located in **Appendix D**.

3.0 AVIATION ACTIVITY FORECASTS

Aviation activity forecasts are essential for airport master planning because they are used as a basis to estimate future facility needs. Per FAA Advisory Circular (AC) 150/5070-6B: *Airport Master Plans*, aviation forecasts should be realistic, based upon the latest available data, reflect current conditions at the airport, and provide adequate justification for airport planning and development. Additionally, forecasts must be prepared for short- (5 year), medium- (10 year), and long-term (20 year) periods, and specify the existing and future critical aircraft.

While forecasting is essential for a successful master plan, forecasts are only approximations of future activity based on a current snapshot in time. There are many factors that can influence forecasts positively and negatively throughout time. Some of these include fuel prices, insurance costs, terrorist acts, national and local economic health, and the possibility of fees for general aviation (GA) users in the National Airspace System. For this reason, forecasts and the projects that they justify should be revisited frequently. Forecasts are used to develop an overall direction for future development. However, actual future construction will require decisions to be made at a later date, based on actual need.

3.1 DATA SOURCES

The following sources of data and guidance were used in the development of the aviation activity forecasts.

3.1.1 FAA Terminal Area Forecast (TAF)[36]

The TAF is updated annually and is used by the FAA to determine budget and staffing needs of the FAA, as well as being a resource for airport operators, the general public and other interested parties. Due to limited staff resources, the FAA cannot forecast in as great of detail at small airports as they can at large airports.

3.1.2 ACRP Report: Counting Aircraft Operations at Non-Towered Airports[37]

This 2007 report was prepared for the Airport Cooperative Research Program, a research arm of the Transportation Research Board of the National Academies. It explains methodologies used across the country to estimate operations at airports without an air traffic control tower.

[36] http://aspm.faa.gov/main/taf.asp
[37] http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_004.pdf

3.1.3 ACRP Report: Airport Aviation Activity Forecasting[38]

This 2007 report was also prepared by the ACRP. It discusses methods and practices for aviation activity forecasting.

3.1.4 Forecasting Aviation Activity by Airport[39]

Written by GRA, Inc. under contract to the FAA, this 2001 document provides guidance to individuals who prepare airport activity forecasts as well as those who review the forecasts.

3.1.5 FAA Aerospace Forecasts, Fiscal Years 2010-2030[40]

The FAA annually prepares this document to explain the current economic and aviation outlook, as well as macro level forecasts of aviation activity and the U.S. aircraft fleet.

3.1.6 FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*[41]

This report was last updated in 2000 and is used to set criteria for managing the NPIAS. According to Section 3.2(c) of this report:

> When forecast data of aircraft operations is not available, a satisfactory procedure is to forecast based aircraft using the statewide growth rate from the TAF and to develop activity statistics by estimating annual operations per based aircraft. A general guideline is 250 operations per based aircraft for rural general aviation airports with little itinerant traffic, 350 operations per based aircraft for busier general aviation airports with more itinerant traffic, and 450 operations per based aircraft for busy reliever airports. In unusual circumstances, such as a busy reliever airport with a large number of itinerant operations, the number of operations per based aircraft may be as high as 750 operations per based aircraft. An effort should be made to refine such estimates by comparing them to activity levels at similar airports or by conducting an activity survey.

As the order was written in 2000, it may not reflect current GA aircraft utilization due to aviation security and usage changes following 9/11, current fuel prices, economic conditions, and other factors that affect aircraft usage.

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38 http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_002.pdf
39 http://www.faa.gov/data_research/aviation_data_statistics/index.cfm?print=go
40 http://www.faa.gov/data_research/aviation/aerospace_forecasts/2010-2030/media/2010%20Forecast%20Doc.pdf
41 http://www.faa.gov/airports/resources/publications/orders/media/planning_5090_3C.pdf

3.1.7 FAA Advisory Circular 150/5070-7B, *Airport Master Plans*[42]

This advisory circular explains the steps required for the development of a master plan, including the preparation of aviation activity forecasts and what elements should be forecasted.

3.1.8 Woods & Poole Economics[43]

Historical and forecast socioeconomic data for Boulder County was obtained from Woods & Poole Economics of Washington, DC. Use of this data source is recommended by the FAA in the document "Forecasting Aviation Activity by Airports."

3.1.9 Local Data Sources

Other sources of data, such as city and county comprehensive plans and economic development information was obtained and researched to understand local economic issues. These include the Longmont Area Economic Council Annual Industry Reports and the City of Longmont Community Profile.

3.1.10 Federal and State Data Sources

Additional information was obtained from the State of Colorado and the U.S. Department of Commerce, Bureau of Economic Analysis to support data needs as necessary and described throughout this section.

3.2 FORECASTING MEASURES AND METRICS

The FAA's NPIAS[44] categorizes LMO as a GA airport as it does not receive scheduled commercial service, has more than 10 based aircraft, and is at least 20 miles from the nearest NPIAS airport (public airports included in the National Airspace System and included in the NPIAS).

As a GA airport, the forecasts focus for LMO is concentrated on the number of operations and based aircraft. The forecasts take into account demographic and economic activity, two primary drivers of aviation demand.

3.2.1 General Aviation Overview

3.2.1.1 Aircraft Operations

Generally, the most important activity forecast for airfield planning is the level and type of aviation demand generated at the airport. This is measured by aircraft operations as well as the

[42] http://www.faa.gov/documentLibrary/media/advisory_circular/150-5070-6B/150_5070_6b_chg1.pdf
[43] http://www.woodsandpoole.com/
[44] Federal Aviation Administration, National Plan of Integrated Airport Systems (NPIAS), 2011-2015, Report to Congress,; http://www.faa.gov/airports/planning_capacity/npias/reports/media/2011/npias_2011_narrative.pdf

critical aircraft for design purposes. An aircraft operation is defined as either a take-off or a landing of aircraft, and is used to define the runway and taxiway requirements.

Two types of operations will be forecast. *Local* operations are those that operate in the general vicinity of LMO. These include training flights, local sightseeing flights, skydiving flights and other types of flights that do not leave a 20 miles radius of the airport. *Itinerant* operations are all other flights, and generally include departures to or arrivals from other airports.

LMO does not have air traffic control facilities located on-site. At an airport with a tower, the FAA records the number of operations. Since LMO is an uncontrolled airport, it is more difficult to obtain an exact count of the airport's current and historical operations. For this study, operations counts were estimated by averaging the three most reliable estimates methods: the FAA radar information, comparison of operations in TAF, and local reported operations by based aircraft, as discussed in **Section 3.4.4**.

3.2.1.2 Based Aircraft

Based aircraft forecasts generate the need for specific types of hangars and aircraft parking aprons. Based aircraft include all aircraft that are registered with the FAA at LMO as their home base, or aircraft that spend more time on the ground at LMO than any other airport. Airport management records were used as the baseline for this forecasting and indicate that 340 aircraft are currently based at LMO.

3.2.2 Demographic and Economic Factors

The demand for aviation is largely a function of demographic and economic activity, given there is a direct causal relationship. When preparing forecasts, socioeconomic data, such as population, disposable income, and geographic attributes are considered. This socioeconomic data was collected from Woods & Poole Economics, an independent firm that specializes in long-term economic and demographic projections. Woods & Poole Economics has a database for every county in the United States, with forecasts through 2040 for more than 900 variables.

According to Woods & Poole Economics' 2011 Profile, the Western region, consisting of the Southwest, Rocky Mountain (including Colorado), and Far West regions, will experience the most growth of any region in the nation for the next thirty years. The population in the Western region is forecasted to increase by 44.4 million people between 2009 and 2040. By the year 2040, 36% of all Americans are expected to reside in the West; this is up from 24% in 1970 and 33% in 2009. It is also expected to generate 25.3 million jobs from 2008 to 2040, with a projected total U.S. job gain of 39%. Moreover, Woods & Poole Economics predicts that Boulder County will grow between 0.0% and 0.91% annually through 2040, meaning that the population is U.S. projected to increase up to 33.6% by 2040.

3.3 NATIONAL AVIATION OUTLOOK

3.3.1 FAA Forecasts

The FAA prepares a national aviation forecast each year. This forecast attempts to project commercial and GA activity levels so that the FAA can use the data to determine funding needs for various sections of the FAA, such as Air Traffic Control. The current forecast document is for Fiscal Years 2011-2031[45].

For GA, the economic downturn has slowed near-term growth, but the long-term forecast remains encouraging. Due to the high costs of fuel, maintenance and insurance, flying as a recreational activity has and will continue to decline as economic conditions have impacted disposable income available for such activities. The growth in the GA segment is projected to be more in the business market, which will likely result in a gradual slightly larger ratio over time of business aviation to recreational aviation at LMO. The FAA predicts growth for business aviation demand over the long-term due to future growth of the U.S. and world economies. As the fleet grows, the number of GA hours flown is forecasted to grow by an average of 2.2% each year through 2031. This means that GA hours flown is anticipated to increase by 54.5% by 2031. The following is an excerpt from the *FAA Aerospace Forecast, Fiscal Year 2011-2031*, and explains FAA's expectation for the future of GA operations.

> After growing rapidly for most of the past decade, the demand for business jet aircraft has slowed over the past few years. While new product offerings, the introduction of very light jets, and increasing foreign demand have helped to drive this growth in the earlier part of the decade, the past few years have seen the hard impact of the recession on the business jet market. Despite the impact of the recession felt in the business jet market, the forecast calls for robust growth in the long term outlook, driven by higher corporate profits and continued concerns about safety/security and flight delays, increasing the attractiveness of business aviation relative to commercial air travel and predicts business usage of general aviation aircraft will expand at a faster pace than that for personal/recreational use.
>
> The active general aviation fleet is projected to increase at an average annual rate of 0.9 percent over the 21-year forecast period, growing from an estimated 224,172 in 2010 to 270,920 aircraft by 2031. The more expensive and sophisticated turbine-powered fleet (including rotorcraft) is projected to grow at an average of 3.0 percent a year over the forecast period, with the turbine jet portion increasing at 4.2 percent a year.
>
> The number of active piston-powered aircraft (including rotorcraft) is projected to decrease from the 2009 total of 160,623 through 2018, with declines in both single

[45] FAA Aerospace Forecast Fiscal Years 2011-2031.
http://www.faa.gov/about/office_org/headquarters_offices/apl/aviation_forecasts/aerospace_forecasts/2011-2031/

and multi-engine fixed wing aircraft, but with the smaller category of piston-powered rotorcraft growing. Beyond 2018 active piston-powered aircraft are forecast to increase to 168,140 by 2031. Over the forecast period, the average annual increase in piston-powered aircraft is 0.2 percent. Although piston rotorcraft are projected to increase at a faster rate (2.9 percent a year), they are a relatively small part of this segment of general aviation aircraft. Single-engine fixed-wing piston aircraft, which are much more numerous, are projected to grow at a much slower rate (0.3 percent) while multi-engine fixed wing piston aircraft are projected to decline 0.9 percent a year. In addition, it is assumed that new light sport aircraft could impact the replacement market for traditional piston aircraft.

The number of general aviation hours flown is projected to increase by 2.2 percent yearly over the forecast period. FAA is projecting that in 2012 and 2013 above average growth in hours will occur as utilization rates for certain aircraft types will rebound from low utilization rates experienced in 2009 and return to normal levels, particularly in the turbine jet category. As with previous forecasts, much of the long term increase in hours flown reflects strong growth in the rotorcraft and turbine jet category. Hours flown by turbine aircraft (including rotorcraft) are forecast to increase 3.7 percent yearly over the forecast period, compared with 0.8 percent for piston-powered aircraft. Jet aircraft are forecast to account for most of the increase, with hours flown increasing at an average annual rate of 5.3 percent over the forecast period. The large increases in jet hours result mainly from the increasing size of the business jet fleet, along with measured recovery in utilization rates from recession induced record lows. Rotorcraft hours, which were less impacted by the economic downturn when compared to other categories, are projected to grow by 2.9 percent yearly. The light sport aircraft category is expected to see increases in hours flown on average of 5.4 percent a year, which is primarily driven by growth in the fleet.

3.3.2 General Aviation Manufacturers Association (GAMA)

GAMA is an industry association for the companies that manufacture GA aircraft. GAMA prepares an annual document entitled the *Statistical Databook and Industry Outlook*[46]. The latest version of the report is for 2010, and offers a review of the aircraft marketplace in 2010, as well as future projections.

According to GAMA, the number of GA aircraft deliveries declined in 2010 for the third year in a row. At the same time, the total dollar value of aircraft delivered has increased. This signifies an increase in the number of expensive jet and turboprop aircraft relative to less expensive piston powered aircraft. The forecasts in this report are based on the FAA forecasts discussed in **Section 3.3.1** and therefore show the same picture of a slow recovery, which is led by the business jet sector.

[46] GAMA Statistical Databook and Industry Outlook. http://www.gama.aero/files/GAMA_DATABOOK_2011_web.pdf

3.3.3 Aircraft Owners and Pilots Association (AOPA)

AOPA is an advocacy group for GA users and represents a significant percentage of the flying public. Among other functions, AOPA tracks issues and trends that effect users and the industry. Their latest report, entitled *AOPA General Aviation Trends Report – 4th Quarter 2010*[47], indicates a mixed picture of the current state of GA. According to the AOPA statistics, aircraft operations handled by en route air traffic control facilities increased by 6% in 2010, indicating an overall increase in all types of aviation activity. AvGas fuel sales increased by 10% from 2009, and was the first increase since 2004 in that category. However, just as GAMA and the FAA showed, deliveries of new GA aircraft have significantly declined. Also, the issuance of private pilot licenses has decreased 25% from the previous year, although student pilot certificate issuance has increased 2%.

3.4 Historical Aviation Activity

A review of historical aviation activity is essential to determine how the airport is traditionally used, and it forms the basis of the aviation activity forecasts.

3.4.1 Hangars

The 1994 and 2004 Airport Master Plans were examined to show the historical hangar growth at the airport. The 1994 Master Plan indicated a total of 55 hangars on airport, the 2004 Master Plan indicated 123 hangars on the airport, and currently there are 128 hangars on the airport. This indicates a sizeable growth between 1994 and 2004, and only a slight growth from 2004 and 2011.

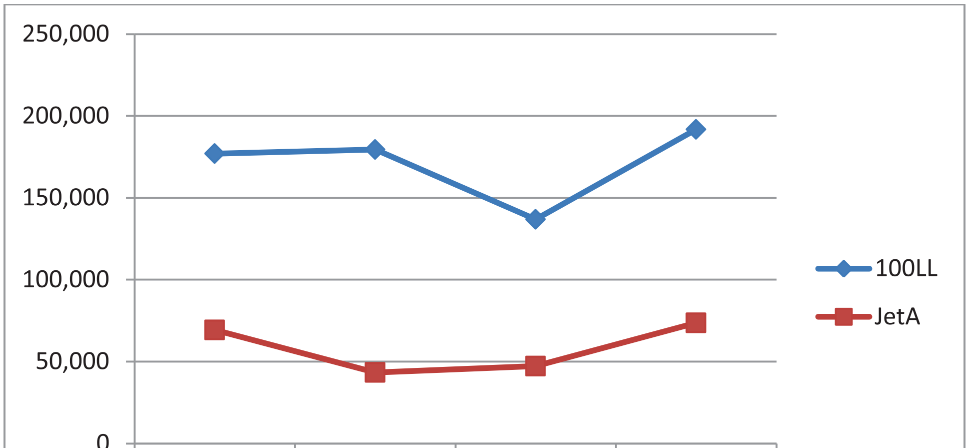
3.4.2 Fuel Sales Data

A review of fuel sales data is an important indicator for airport activity. The CDOT Aeronautics Division refunds airports a portion of the sales and excise taxes that are collected for each gallon of fuel sold. As previously discussed, there are two types of fuel sold at the airport. Piston powered aircraft, normally represented by single engine and small twin engine aircraft, uses 100 octane low lead gasoline (100LL or AvGas). Jet A is a fuel type which is used in jet and turboprop aircraft, which are normally associated with business aircraft activity.

Due to incomplete CDOT records, accurate data on the sales activity of 100LL versus Jet A is only available back to 2008. Historical fuel sales are determined through a CDOT reimbursement program for the two fuel types. As can be seen in **Figure 3-1**, the fuel sales declined due to economic conditions but appear to be rebounding.

[47] AOPA General Aviation Trends Report, http://www.aopa.org/whatsnew/trend.html

FIGURE 3-1 - GALLONS OF FUEL SOLD*



	2008	2009	2010	2011
100LL	177,000	179,475	136,850	191,775
JetA	69,300	43,375	47,225	73,625

Source: Airport Management/CDOT Aeronautics
**2011 sales are partial year (July 2010-April 2011)*

Note: The quantity of gallons shown has been calculated from CDOT Aeronautics fuel sales reimbursements based on the State of Colorado's fiscal year (July 1-June 30). The quantity is not necessarily reflective of actual annual fuel sales as the date of reimbursement may be delayed. The 2011 figure indicates a partial year (July 2010 – April 2011).

3.4.3 Number and Mix of Based Aircraft

According to information provided by the airport manager, LMO has 340 based aircraft. The 340 aircraft includes 266 single engine aircraft, 38 multi-engine aircraft, two jets, seven helicopters, 11 gliders, and 16 ultra-light aircraft. The 2004 Master Plan indicated that LMO had 339 based aircraft, indicating that in the last seven years based aircraft at LMO has remained constant.

Additionally, as previously discussed in **Section 2.3**, LMO is considered a "Major" airport in the 2005 Colorado Airport System Plan. Among the airports in the Major category, LMO ranks fourth in the number of based aircraft in the state of Colorado.

TABLE 3-1 - MAJOR COLORADO AIRPORTS BASED AIRCRAFT COUNT (TAF)

Airport	Number of Based Aircraft
Centennial	807
Rocky Mountain Metropolitan	439
Front Range	395
Vance Brand Municipal	308*
Colorado Springs Municipal	296
Greeley/Weld County	226
Fort Collins/Loveland Municipal	222
Pueblo Memorial	133
Grand Junction Regional	115
Eagle County Regional	95

Source: FAA Terminal Area Forecast (TAF);

**Airport Management 2007 Hangar Inspection Records indicated 340 Based Aircraft*

3.4.4 Aircraft Operations

An aircraft operation is a landing, take-off, or touch-and-go procedure. Since LMO does not have an air traffic control tower, it should be noted that there is no official count of each and every aircraft operation. Five different methods were used to estimate aircraft operations. These include the FAA Terminal Area Forecast, a national average of operations per based aircraft, a local average of operations per based aircraft obtained from survey information, a review of recorded FAA radar flight tracks, and a comparison to other local airports.

3.4.4.1 FAA Terminal Area Forecast (TAF)

The FAA collects data from non-towered airports from estimates of operations provided to the FAA by the airport management. The operations count for the TAF was originally derived from an acoustical counter that was placed at the runway end in 2005. This device counts an operation by the noise emitted by arriving or departing aircraft. The acoustical counter was loaned from CDOT Aeronautics. However, CDOT Aeronautics no longer has the acoustical count program, so the airport has been unable to revalidate those numbers in recent years. From the TAF provided by the FAA, the aircraft operations count has not changed in the last ten years at LMO.

3.4.4.2 National Average Operations per Based Aircraft

The FAA Order 5090.C3, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), provides guidance for determining facility needs and planning necessary to recommend airfield improvements. This order includes guidance in determining the current and forecasted operations at an uncontrolled airport based on the total number of based aircraft. Chapter 3, Airfield Development, of the order provides guidelines to estimate the annual number of operations per based aircraft from an examination of national averages. The general guideline is to use 250 operations per based aircraft for general aviation airports with little itinerant traffic, 350 operations per based aircraft for busier general aviation airports with more itinerant traffic, and 450 operations per based aircraft for busy reliever airports. For this analysis, both 250 and 350 operations per based aircraft were calculated for LMO. Using 250 operations per based aircraft, the airport would have 85,000 annual operations per year; and 350 operations per based aircraft yields 119,000 annual operations. It is the consultant's opinion that FAA Order 5090.3C was written during positive economic times and does not reflect the current economic conditions; therefore this method will not be used to determine operations counts.

3.4.4.3 Surveys of Local Pilot Reported Operations and Flight Schools

Data was collected via survey and informal polling of local aircraft owners, the flight schools at LMO, and the surrounding areas to estimate how often each of these user groups operate at the airport. This data was further subdivided into estimated operations per category (itinerant and transient) and combined with other sources of operations in order to arrive at a realistic operations estimate for the airport.

Generally, local aircraft owners use the airport to visit another location for recreational or business purposes, or to enjoy scenic flights outside of the local area. However, local pilots will operate in the immediate airport area on occasion in order to remain current with their pilot's license requirements and maintain the performance of their aircraft. It is estimated that 80% of local pilots' flights are the result of them flying outside the local area, therefore categorizing the operations as itinerant. The remaining 20% of their flights remain in the immediate vicinity of LMO and are classified as local operations.

Several aircraft based at the airport are used extensively for flight instruction purposes. These aircraft utilize the airport differently than the typical GA pilot, as they will routinely practice takeoffs and landings at LMO as well as use practice areas close to Longmont to practice inflight maneuvers. These aircraft also will leave the LMO area to be used on cross country training flights, as required for pilot training. It is estimated that these local training aircraft will be remain in the area 70% of the time, with flights outside of the LMO area occurring 30% of the time.

LMO is utilized by many flight schools based at other airports to practice touch and gos in order to avoid congestion at their respective airports. This primarily includes the flight schools at Rocky Mountain Metropolitan Airport in Broomfield, but other area airports also practice at LMO. Flight schools at LMO and the surrounding airports were asked to provide an estimate of the number of training flights they conduct at LMO. This data is summarized in **Table 3-2**. Utilizing these estimates, approximately 32,004 flight instruction operations take place at LMO annually. Similar to the local training aircraft, it is estimated that 70% of the training operations that originated at other airports remain in the local LMO area, while 30% leave the local area, which includes the flights to and from the other airports.

TABLE 3-2 - TRAINING FLIGHT ESTIMATES AT LMO

Airport	Flight School*	Number of LMO Operations
Boulder Municipal	Journeys Aviation	462
	Specialty Flight Training	2,600
Rocky Mountain Metropolitan	McAir	14,500
	Rotors of the Rockies	2,800
	Western Air Flight Academy	5,200
FT Collins/Loveland Municipal	CO Contrails Aviation	65
	Leading Edge Flight Training	120
	Front Range Helicopters	480
Greeley-Weld County	Poudre Aviation	75
Vance Brand Municipal	Air West Flight Center	4,902
	Twin Peaks Aviation	2,400
	TOTAL	**33,604**

Source: Jviation, Inc.

Surveys were sent to the local pilot community which included a question about how often the local pilots operate at LMO. Of the 84 responses, operations per local aircraft owner varied from 4 to 2,400 annually. Using this information and by removing the outlying numbers and training flights by flight instructors from the equation, the average operations per aircraft owner was 91.54 and a mode of 50. By using the rounded average of 90 and multiplying it by 308 aircraft (total of 340 based aircraft reduced to account for pilots who own multiple aircraft, training aircraft, etc.) results in 27,720 annual operations by locally-based aircraft. As previously described, this figure is further divided into 80% itinerant and 20% local operations.

An additional source of local operations is Mile-Hi Skydiving. Mile-Hi keeps accurate records and currently has an average of 5,000 annual operations at LMO. The remaining itinerant operations by aircraft not based at LMO in **Table 3-3** are estimated to be 10 per day on average throughout the year. This results in 3,650 annual operations of the itinerant classification.

Table 3-3 summarizes the aircraft operations estimates calculated using this methodology.

TABLE 3-3 – OPERATIONS COUNTS – SURVEY METHODOLOGY

Operations Category	Number of LMO Operations
Local Operations	**34,067**
Flight Instruction	23,523
Local Pilots (Non-Instructional)	5,544
Mile-Hi	5,000
Itinerant Operations	**35,907**
Flight Instruction	10,081
Local Pilots	22,176
Other*	3,650
TOTAL	**69,974**

Source: Jviation, Inc.

**Other – itinerant operations not included in flight instruction or local pilot flights.*

3.4.4.4 FAA Recorded Radar Flight Tracks

The coverage area for the FAA's Airport Surveillance Radar (ASR) at Denver International Airport (DIA) extends past LMO. The FAA records radar flight tracks from three-dimensional positional information of an aircraft's flight paths using the aircraft's transponder. A flight track is a continuous track of an aircraft in flight from the moment the pilot turns on the transponder until it is turned off or Air Traffic Control directs the pilot to switch transponder codes. This information was obtained for the years 2008-2010 from DIA's Airport Noise and Operations Monitoring System (ANOMS).

Radar data collected provided the estimate number of flight tracks, rather than the number of operations. Even so, this information provides additional insight on aircraft using LMO and surrounding airspace and provides additional insight into LMO's aircraft operations. Radar data used in this study is shown in **Table 3-4**.

Of the estimated 70% of local traffic[48], it is assumed that most of the local traffic is flight training activity, resulting in a total of 48,065 operations in 2010. Based on this assumption, radar tracks were converted into operations counts, as shown in **Table 3-5**. This table shows the break-out of local traffic versus itinerant.

[48] Based on consultant experience and discussions with pilots at the airport, the estimated average training flight conducts six to eight operations per hour (or three or four touch-and-gos per hour).

TABLE 3-4- FAA RADAR FLIGHT TRACK & OPERATIONS COUNTS

	Track Counts			Operations Estimate		
	2008	2009	2010	2008	2009	2010
January	524	542	736	2,620	2,710	3,680
February	546	593	487	2,730	2,965	2,435
March	587	723	633	2,935	3,615	3,165
April	694	658	642	3,470	3,290	3,210
May	911	963	1,012	4,555	4,815	5,060
June	920	960	1,011	4,600	4,800	5,055
July	1,024	1,061	1,213	5,120	5,305	6,065
August	1,055	1,141	1,139	5,275	5,705	5,695
September	967	971	880	4,835	4,855	4,400
October	828	864	762	4,140	4,320	3,810
November	612	776	589	3,060	3,880	2,945
December	482	510	509	2,410	2,550	2,545
Total	**9,150**	**9,762**	**9,613**	**45,750**	**48,810**	**48,065**

Source: Jviation, Inc.

Table 3-5 shows the break-out of local traffic versus itinerant. Mile-Hi Skydiving is a large, local operation who tracks their activity. From 2008 through 2010, their operations have accounted for approximately 4,000 to 5,000 of the total local operations.

TABLE 3-5 - FAA RADAR BREAK OUT

	Local Total (70%)	Itinerant (30%)
2008	28,182	12,078
2009	30,067	12,886
2010	29,608	12,689

Source: Jviation, Inc.

3.4.4.5 Operations Comparison to Other Local Airports

Airports with FAA Air Traffic Control Towers have accurate counts of traffic levels as the FAA air traffic controllers record this information for staffing and other purposes. Three local GA airports have control towers, Centennial, Rocky Mountain Metro, and Front Range airports. The operations reported at these airports for both 2005 and 2010 were evaluated to determine the recent regional decline in operations. Rocky Mountain Metropolitan Airport in Broomfield experienced a 40.5% decrease during this period, while Front Range Airport in Watkins and Centennial Airport in Englewood experienced 39% and 23.6% declines, respectively. The reduction in traffic at these three airports averages 34.4%. Applying this decrease to the previously reported 2005 LMO operations count of 99,990; results in an adjusted number of 65,593 operations in 2010.

3.4.5 Preferred Baseline 2010 Aircraft Operations

The five methods explored for estimating current operations are summarized for 2010 in **Table 3-6**. The different methods indicate a variance of between 48,065 and 119,000 operations for 2010. Since the first two methods (FAA TAF and National Average Operations per Based Aircraft) do not appear to take into account current economic conditions, they are not considered to provide accurate estimates of 2010 activity and have been removed from the analysis. As the final three estimates are based on sound principles, but vary in their outcomes, an average of the three methods has been used as the preferred baseline. This average results in an estimated 61,211 operations for 2010.

TABLE 3-6 - COMPARISON OF 2010 OPERATIONS COUNT METHODS

Method	Total Operations
FAA TAF	99,990
National Average Ops/Based Aircraft	85,000 – 119,000
Local Reported Ops/Based Aircraft	69,974
FAA Radar Data	48,065
Comparison of TAF to other airports	65,593
Preferred Baseline (Avg. of last three)	**61,211**

Source: Jviation, Inc.; FAA TAF and National Average Ops/Based Aircraft were not used to establish the preferred baseline.

3.5 Review of Existing Forecasts

Several existing forecasts for LMO were examined. Each of the existing forecasts that were examined are discussed in the following text.

3.5.1 1994 and 2004 Master Plan Forecasts

The forecasts that were prepared for the 1994 and 2004 LMO Airport Master Plans are shown in **Table 3-7** and **Table 3-8.** Clearly, the 1994 Master Plan was less optimistic than the 2004 Master Plan. The 1994 Master Plan used a smaller compound annual growth rate (CAGR) for its forecasts, with a CAGR of 1.14% for the operations projections and CAGR of 0.95% for based aircraft growth. The 2004 Master Plan included a CAGR of 1.69% for aircraft operations and 2.52% for based aircraft. The economy and GA were in a much stronger position in 2004, as such, growth projections at the time normally reflected that optimism. Additionally, the estimated baseline number of operations estimated appears to be higher for the baseline for both master plans than the refined estimates used from actual acoustical count data in 2005.

TABLE 3-7 - 1994 LMO AIRPORT MASTER PLAN FORECAST

	1994	1998	2003	2013	CAGR
Operations	92,926	96,410	104,460	116,650	1.14%
Based Aircraft	192	209	216	232	0.95%

Source: 1994 Vance Brand Municipal Airport Master Plan

TABLE 3-8 - 2004 LMO AIRPORT MASTER PLAN FORECAST

	2001	2006	2011	2021	CAGR
Operations	112,000	136,080	145,180	156,520	1.69%
Based Aircraft	340	432	475	559	2.52%

Source: 2004 Vance Brand Municipal Airport Master Plan

3.5.2 FAA Terminal Area Forecast

The FAA prepares a Terminal Area Forecast (TAF) annually for each airport identified in the NPIAS. The latest TAF for LMO was published in 2010 and is presented in **Table 3-9**. The TAF forecasts for airports similar in size to LMO often show little, or in the case of LMO, no growth. These forecasts are not always site specific, so the FAA uses a conservative approach when site specific data cannot be obtained. The TAF operations counts were estimated during good economic times, and do not reflect the current activity at the airport.

TABLE 3-9 - FAA TAF FORECAST FOR LMO

	2010	2015	2020	2025	2030
Itinerant Operations					
Air Taxi & Commuter	0	0	0	0	0
GA	29,980	29,980	29,980	29,980	29,980
Military	10	10	10	10	10
Total Itinerant	29,990	29,990	29,990	29,990	29,990
Local Operations					
GA	70,000	70,000	70,000	70,000	70,000
Military	0	0	0	0	0
Total Local GA	70,000	70,000	70,000	70,000	70,000
TOTAL OPERATIONS	99,990	99,990	99,990	99,990	99,990
Based Aircraft	308	308	308	308	308

Source: 2010 FAA Terminal Area Forecast

3.6 Forecasting Methodologies

There are several types of methodologies that can be used when developing aviation forecasts. At a minimum, FAA requires for Federally-obligated airports to provide a forecast for the short-term planning range (5 years), medium-term planning range (10 years), and long-term planning range (beyond 10 years) periods. While mathematical relationships are used in the development of the forecasts, all forecasts must ultimately withstand the test of rationality and judgment. The different methodologies used in this study are briefly described below.

3.6.1 Time Series Analysis

A Time Series Trend Analysis, also known as a Linear or Trend Analysis, uses historic patterns of activity and projects the trend into the future. This type of forecasting is widely used and is highly valuable because it is relatively simple to apply. However, its limitation is that it simply uses past historical data and does not consider current conditions that may not have been present in past data, such as rising fuel prices and the economic downturn. Also, a recent major increase or decrease in the historical data has the potential to significantly impact the overall trend, even if it was a short-lived change.

3.6.2 Regression Analysis

Regression Analysis is a statistical technique that ties aviation demand (dependent variable) to demographic and economic measures (independent variables), such as population and income. The economic measures used for forecasting both operations and based aircraft for this study were all obtained by Woods & Poole Economics, one of the FAA recommended sources for this data. The Boulder Metropolitan Statistical Area (MSA) was used to indicate the regional use of the airport. The Boulder MSA includes the City of Longmont, the City of Boulder, the portion of the Town of Erie in Boulder County, the Town of Jamestown, the City of Lafayette, the City of Louisville, the Town of Lyons, the Town of Nederland, the portion of the Town of Superior in Boulder County, the Town of Ward, and unincorporated Boulder County, Colorado. All of the variables studied indicate that the Boulder MSA economy will grow at a rate greater than the population growth, with all indicators trending positive. The variables analyzed in this forecast, including their rounded Compounded Annual Growth Rate (CAGR), are as follows:

- Population (1.52% CAGR; equates to 35.4% increase from 2010 to 2030) – This metric is useful to determine the total number of people who will reside in the study area, which typically has a direct correlation to the number of pilots in a community.

- Total Earnings (2.48% CAGR; equates to 63.4% increase from 2010 to 2030) – Represents the total earnings of employees, including wages and salaries, other labor income, and proprietors income.

- Personal Income (2.69% CAGR; equates to 69.9% increase from 2010 to 2030) – All income sources, including but not limited to wages and salaries for individuals, nonprofit institutions serving individuals, private uninsured welfare funds and private trust funds.

- Total Retail Sales (1.86% CAGR; equates to 44.53% increase from 2010 to 2030) – Represents sales of all retail sources within the Boulder MSA, a good representation of economic health and disposable income.

- Gross Regional Product (2.51% CAGR; equates to 64.1% increase from 2010 to 2030) – The market value of all final goods and services produced within the MSA. This metric is an excellent representation of the future business environment.

- Hybrid Model (2.06% CAGR; equates to 50.4% increase from 2010 to 2030) – A hybrid model was developed from the above data which used Gross Regional Product as the method to forecast transient aircraft activity (30% of total), and Retail Sales to forecast the local (e.g. recreational) aircraft activity (70% of total).

3.6.3 Market Share Analysis

Market Share Analysis is a top-down model that uses a relationship between national, regional, and local forecasts to predict the trends at the airport. This approach uses the forecast of large aggregates, such as the entire nation, which are used to derive forecasts for a smaller area (e.g. airport). One example is to determine an airport's percentage (market share) of the national forecasts and then forecast the airports growth rate based on the national forecast growth rate. The market share analysis approach to forecasting has a weakness; however, the national forecasts are composed of airports that are growing rapidly, those that are growing slowly, and those that are not growing at all or declining. Since this methodology is based on the national or larger aggregate, analysis must take into account historical trends, as well as local airport judgment, to better estimate the forecast.

3.7 Aircraft Operations Forecast

The 2010 operations count of 61,211 was estimated by averaging the three most reliable estimates methods, the FAA radar information, comparison of operations in TAF, and local reported operations by based aircraft, as previously discussed in **Section 3.4.4**.

Different forecasting methodologies were tested when forecasting the airport's operations:

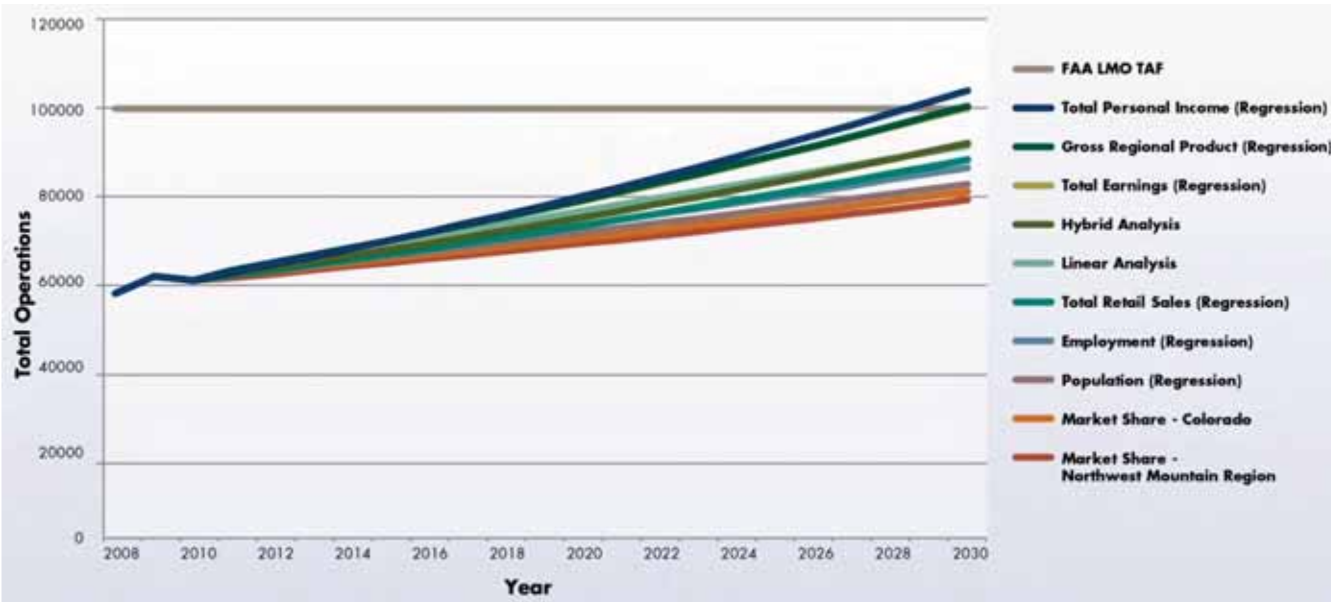
- Socioeconomic regression analyses were employed using population, employment, total earnings, personal income, gross regional domestic product and retail sales as the independent variables. Data was obtained from Woods & Poole Economics, as previously discussed in **Section 3.2.2**.

- The regression analysis that uses the demographic and economic activity has a compound annual growth rate ranging from 1.52% to 2.69%.

- Two market share analyses were also employed for forecasting aircraft operations. The market share analyses were based on the percentage of operations at LMO compared to the FAA forecast of the State of Colorado and the Northwest Mountain Region and applied the growth trends of these two markets to LMO's forecast, as shown in **Figure 3-2**.

* The FAA-derived TAF forecasts show that LMO operations will remain constant through the 20-year planning period at a level substantially above the other metrics, and is not considered reasonable. As seen in **Figure 3-2**, all of the indicators trend towards positive growth.

FIGURE 3-2 – LMO OPERATIONS FORECAST SCENARIOS



Source: Jviation, Inc.

Table 3-10 represents most probable high, medium and low operations forecasts, which are used in the forecasting analysis. The lowest forecast is the FAA Northwest Mountain Region market share analysis, the medium is the hybrid model analysis and the high is the personal income regression analysis. The forecasting scenarios used represent a range in the total operations of 79,299 to 104,013 in the final year of the forecast period (2030). This represents a range in annual compounded growth rates of between 1.28% (FAA Northwest Mountain Region Market Share) and 2.69% (Total Personal Income).

TABLE 3-10 – LMO OPERATIONS FORECAST

Year	LOW	MEDIUM	HIGH
2010	61,211	61,211	61,211
2015	65,157	67,987	70,092
2020	69,428	75,239	80,069
2025	74,113	83,247	91,350
2030	79,299	92,067	104,013

Source: Jviation, Inc.

3.7.1 Military Operations

Military operations at LMO historically have not accounted for a significant number of operations. Since military operations are not dependent on the same stimuli as general aviation or commercial activity, it is projected that military operations will remain constant throughout the forecast period at approximately 10 annual operations.

3.7.2 Local/Itinerant Operations

Local operations are aircraft operations performed by aircraft that are based at the airport and operate in the local traffic pattern and/or within sight of the airport. These operations are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport. They also include simulated instrument approaches at the airport. Itinerant or transient operations are operations by aircraft that leave the local airspace and are usually operations by aircraft not based at the LMO. The majority of operations (70%) at LMO are estimated to be GA local operations.[49]

3.7.3 Aircraft Operations Forecast Summary

The preferred forecast is the Hybrid Model Analysis because it best takes into account the different factors that influence both local and itinerant traffic. This model represents an overall 20 year annual compounded growth rate of 2.06% and is summarized in **Table 3-11**. The data presented in **Table 3-11** assumes that: 1) the current distribution of aircraft per operations category will remain the same in the future; 2) GA operations were directly tied to the economic variables and projected using that data; and 3) the split between itinerant and local operations was assumed to remain at 30% and 70%, respectively.

TABLE 3-11 – LMO AIRCRAFT OPERATIONS FORECAST SUMMARY

	2010	2015	2020	2025	2030
Itinerant Operations					
Military	10	10	10	10	10
GA Itinerant	18,353	21,028	23,762	26,793	30,130
Local Operations					
GA Local	42,848	46,949	51,467	56,444	61,927
Total Operations	**61,211**	**67,987**	**75,239**	**83,247**	**92,067**

Source: Jviation, Inc.

3.7.4 Design Hour Operations

An additional measure of airport activity is the design hour operations. The design hour is the estimate of the peak hour of the average day in the busiest month for an airport. Since LMO does not have an air traffic control tower, design hour has been estimated from a combination of monthly trends gathered from the FAA's DIA radar information.

[49] http://airnav.com/airport/KLMO

- Peak Month Operations is the month with the most operations. The Peak Month for LMO is August, consisting of approximately 11.7% of the annual operations, or 7,155 in 2010.

- Design Day is the Peak Month Operations divided by 30 days. The Design Day for LMO in 2010 is 238 operations and 359 in 2030.

- Design Hour is the average highest amount of operations within the most active hour of the day. Typically, these operations will range between 10 and 15 percent of the design day operations. For planning purposes, 12.5 percent was used to determine the Design Hour. The Design Hour Operations at LMO is 30 for 2010 and 45 for 2030.

Table 3-12 shows the forecasted Design Hour for the planning period of this report.

TABLE 3-12 – LMO DESIGN HOUR OPERATIONS FORECAST

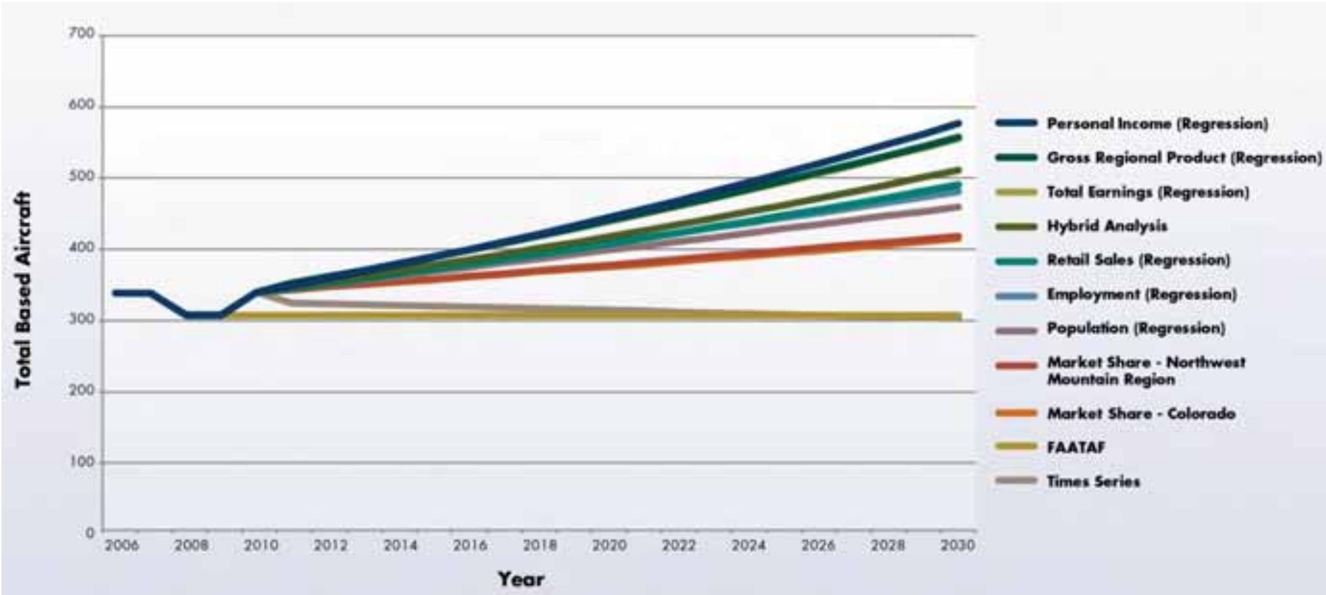
Operations	2010	2015	2020	2025	2030
Annual	61,211	67,987	75,239	83,247	92,067
Peak Month	7,155	7,947	8,795	9,731	10,762
Design Day	238	265	293	324	359
Design Hour	30	33	37	41	45

Source: Jviation, Inc.

3.8 Based Aircraft Forecast

The based aircraft forecast is a valuable indicator for expanded or improved airport facilities, particularly apron areas and hangars. Airport management records indicated a higher number of current based aircraft (340) than the FAA TAF (308). Airport management records were used as a baseline for this forecasting. The same forecasting methods were used for based aircraft as operations: regression analysis, times series analysis and market share analysis. **Figure 3-3** shows the different forecasting methods used for the projected based aircraft amounts.

FIGURE 3-3 – LMO BASED AIRCRAFT FORECAST SCENARIOS



Source: Jviation, Inc.

The FAA TAF and the times series analysis were not used for the based aircraft forecast. The FAA TAF shows a constant 308 based aircraft through the 20-year planning period, which is unlikely. Additionally, the times series analysis uses historical data and projects those trends into the future. The recent loss of based aircraft causes the times series analysis to project a continual decline in based aircraft through the 20 year planning term. A long-term continual decline is not considered to be a reasonable forecast. **Table 3-13** represents the probable high, medium and low based aircraft forecasts, and are used in this forecasting analysis. The lowest forecast is the Colorado market share analysis, the medium is the population regression analysis, and the high is the personal income regression analysis. The forecasting scenarios represent a range in the total based aircraft of 415 to 578 in the final year of the forecast period (2030). This represents a range in compound annual growth rates (CAGR) of between 1.01% (CO Market Share) and 2.69% (Total Personal income). The medium forecasts (population regression analysis with a CAGR of 1.52%) will be carried forward for planning purposes since it best estimates the demand for recreational aircraft, which will be the majority of based aircraft.

TABLE 3-13 – BASED AIRCRAFT FORECAST

Year	LOW	MEDIUM	HIGH
2010	340	340	340
2015	358	369	389
2020	376	399	445
2025	395	430	507
2030	415	460	578

Source: Jviation, Inc.

Table 3-14 shows the aircraft distribution for the planning period (2010-2030). It is anticipated that total based aircraft will grow at the rate of 1.52% (population regression analysis), as previously discussed. The FAA national growth rate for each aircraft type was used for forecasting the composition of the total based aircraft based on the chosen forecast. Nationally, the FAA projects strong growth in the business market, including jets and turboprops, with less growth expected for single-engine and multi-engine piston powered aircraft. The based aircraft are expected to grow to a total of 460 over the planning period, with the largest increase in the number of jets (5.44% CAGR). The based aircraft forecast also reflects movement towards national distribution of types of GA aircraft.

TABLE 3-14 - LMO BASED AIRCRAFT FORECAST SUMMARY

	2010	2015	2020	2025	2030	CAGR
Single Engine Piston	266	287	310	335	361	1.54%
Multi-Engine Piston	38	40	41	42	42	0.49%
Turbo Prop	0	1	1	1	2	2.51%
Jet	2	3	4	5	6	5.44%
Helicopter	7	9	11	14	15	4.04%
Other (Glider, Ultra-Light, Experimental, etc.)	27	29	32	33	34	1.21%
Total	**340**	**369**	**399**	**430**	**460**	**1.52%**

Source: Jviation, Inc.

3.9 Critical Aircraft

Once reaching a level of 500 annual operations of an aircraft that falls into the next highest Aircraft Reference Code (ARC) level, the FAA considers that the airport should upgrade its facilities to meet the design standards for that aircraft type. ARC is further explained in **Section 2.1**. Presently, LMO has an ARC of B-II, meaning that it is designed for aircraft with a maximum approach speed of 91 knots but less than 121 knots, and maximum wingspan of 49 feet but less than 79 feet or tail height of 20 feet but less than 30 feet. Aircraft that are in this category include general aviation aircraft and smaller corporate jets. The Critical Aircraft for LMO are the Twin Otter for wingspan and weight, and Beach King Air C-90 for approach speed, both of which are flown by Mile-Hi Skydiving. The current ARC of B-II for LMO should be appropriate for the current and forecasted critical aircraft types, therefore no significant increase in aircraft size expected.

3.10 Annual Instrument Operations

As previously discussed in **Section 2.10.4**, it is estimated that Instrument Meteorological Conditions (IMC) occur approximately 6% of the time in the Longmont area. Local operations occur almost exclusively during VFR weather and IFR training during IFR weather is minimal. The 6%, when applied to the 2010 itinerant operations, results in 1,102 current IFR operations. This figure is potentially over simplified since no precise count exists for the number of instrument operations; nonetheless, it certainly accounts for a reasonable percentage of current operations. **Table 3-15** details the estimated instrument operations based on the chosen operations forecast, without exploring the effect of high cost instrumentation enhancements needed, such as an Instrument Landing System. This type of investment by the FAA is highly unlikely at LMO. However, GPS-based technologies will continue to evolve and present airports and pilots with cost effective means of improving instrument approach capabilities without large capital expenditures for ground-based equipment.

TABLE 3-15 - FORECAST IMC OPERATIONS

	2010	2015	2020	2025	2030
Instrument Operations	1,102	1,224	1,354	1,498	1,657

3.11 Comparison to Existing FAA TAF

The FAA requires that study-related forecasts be consistent with the TAF or include sufficient documentation to explain the difference**. Table 3-16** summarizes the forecast comparison to the TAF as recommended in Appendix C of the FAA document, *Forecasting Aviation Activity by Airport*.

3.11.1 Aircraft Operations Forecast

The FAA forecasts almost no growth in operations for LMO, with an operations forecast of 99,990 in 2030 with no compound annual growth rate (0%). The preferred forecasts for this study results in 92,067 operations projected for 2030, using the mid-range forecast from the Hybrid Model. The chosen operations forecast differs from the FAA TAF through the 20-year forecasting period for this study. The 5-year forecast differs from the FAA TAF by 32.0%, the 10-year differs by 24.8%, and the 20-year forecast differs by 7.9%. This difference is a result of the FAA TAF showing 99,990 operations throughout the 20-year forecasting period.

3.11.2 Based Aircraft Forecast

The FAA predicts no growth for based aircraft, with 308 shown for the duration of the forecast, which is less than the current number of based aircraft. The preferred forecast indicates 460 based aircraft at the end of the planning period, which differs from the TAF because of the difference in the initial baseline number of aircraft and the projected growth.

TABLE 3-16 - TEMPLATE FOR COMPARING AIRPORT PLANNING AND TAF FORECASTS

AIRPORT NAME: Vance Brand Municipal Airport

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Total Operations				
Base yr.	2010	61,211	99,990	-38.8%
Base yr. + 5yrs.	2015	67,987	99,990	-32.0%
Base yr. + 10yrs.	2020	75,239	99,990	-24.8%
Base yr. + 15yrs.	2024	83,247	99,990	-16.7%
Base yr. + 20yrs.	2030	92,067	99,990	-7.9%

NOTES: TAF data is on a U.S. Government fiscal year basis (October through September).

Source: Jviation, Inc.

3.12 Factors that May Create Changes in the Forecast

A forecast of aviation activity attempts to predict the future based on known factors and conditions. Numerous factors, on a local and/or national scale, can greatly affect the future of the airport and are unknown at this time. Oil prices, local economic activity, disposable income, costs of aircraft owner's insurance and the potential for national GA user fees are just a few items that are beyond that airport's control that may change future activity dramatically.

For this reason, implementation of development outlined in this report must be validated with the current conditions prior to the commencement of any further action.

3.13 Summary of Preferred Forecasts

Appendix B of the FAA document, *Forecasting Aviation Activity by Airport*, recommends formatting the preferred forecast data into a particular tabular format for ease of readability. This format is shown in **Table 3-17.**

TABLE 3-17 - SUMMARIZING AND DOCUMENTING AIRPORT PLANNING FORECASTS

Summarizing and Documenting Airport Planning Forecasts

A. Forecast Levels and Growth Rates

AIRPORT NAME: Vance Brand Municipal Airport **Specify base year:** 2010

	2010	2015	2020	2025	2030	Average Annual Compound Growth Rates 2010-2015	2010-2020	2010-2025	2010-2030
Passenger Enplanements									
Air Carrier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Commuter	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Operations									
Itinerant									
Air carrier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Commuter/air taxi	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Commercial Operations	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
General aviation	18,353	21,028	23,762	26,793	30,130	2.76%	2.62%	2.55%	2.51%
Military	10	10	10	10	10	0.0%	0.0%	0.0%	0.0%
Local									
General aviation	42,848	46,949	51,467	56,444	61,927	1.84%	1.85%	1.85%	1.86%
Military	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
TOTAL OPERATIONS	61,211	67,987	75,239	83,247	92,067	2.12%	2.08%	2.07%	2.06%
Instrument Operations	1,102	1,224	1,354	1,498	1,657	2.12%	2.08%	2.07%	2.06%
Peak Hour Operations	30	33	37	41	45	1.92%	2.12%	2.10%	2.05%
Cargo/mail (enplaned+deplaned tons)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Based Aircraft									
Single Engine (Nonjet)	266	287	310	335	361	1.53%	1.54%	1.55%	1.54%
Multi Engine (Nonjet)	38	41	42	43	44	1.53%	1.01%	0.83%	0.74%
Jet Engine	2	3	4	5	6	8.45%	7.18%	6.30%	5.65%
Helicopter	7	9	11	14	15	5.15%	4.62%	4.73%	3.88%
Other	27	29	32	33	34	1.44%	1.71%	1.35%	1.16%
TOTAL	340	369	399	430	460	1.65%	1.61%	1.58%	1.52%

B. Operational Factors

	2010	2015	2020	2025	2030
Average aircraft size (seats)					
Air carrier					
Commuter	N/A	N/A	N/A	N/A	N/A
Average enplaning load factor					
Air carrier					
Commuter	N/A	N/A	N/A	N/A	N/A
GA operations per based aircraft	180	184	189	194	200

NOTE: Right hand side of worksheet has embedded formulas for average annual compound growth rate calculations.

Source: Jviation, Inc.

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4.0 FACILITY REQUIREMENTS

The primary objective of the Airport Master Plan is to determine the adequacy of the existing facilities and to identify recommended and required improvements based on current and future aircraft operating at LMO. As discussed in **Section 3.9**, *Critical Aircraft*, the airport is designed for aircraft with an Airport Reference Code of B-II and smaller, and is anticipated to remain at this classification throughout the forecast horizon. As such, this chapter assesses the airport facilities based on needs of the current category of aircraft that routinely use the airport (i.e. small business aircraft). In **Chapter 5**, *Alternatives Analysis*, key facility requirements identified in this chapter will be further evaluated to determine the best strategy to meet the needs of airport users and the community.

A summary of the requirements and recommendations for this chapter can be found on page 4-38.

4.1 2005 COLORADO AVIATION SYSTEM PLAN

In 2005, CDOT Aeronautics published the Colorado Aviation System Plan (Plan). As discussed in **Section 2.3**, the Plan evaluated and measured the performance of the Colorado System of publicly owned airports. The Plan assigned each Colorado airport to one of three functional categories: Major, Intermediate, or Minor. LMO is classified as a Major airport in the Plan due to the importance of the airport to the State.

Table 4-1 details the State's goals for LMO as described in the Plan, based on criteria the State establishes for Major airports. The State evaluated the airport's current facilities against the Plan's objectives and identified facilities and services that need improvement, which are discussed in later sections of this chapter.

TABLE 4-1 - CDOT AERONAUTICS AVIATION SYSTEM PLAN LMO REPORT CARD

Facility/Service Objective	Existing Condition	CDOT Objective	Objective Met
Runway Length	4,800 feet	4,620 feet*	Yes
Runway Width	75 feet	75 feet	Yes
Runway Strength	30,000 lbs.	30,000 lbs.	Yes
Taxiway Type	Full Parallel	Full Parallel	Yes
Published Approach	Non-Precision	Precision	No
Visual Aids	Rotating Beacon; Lighted Wind Cone; VASIs	Rotating Beacon; Lighted Wind Cone; REILs; PAPIs/VASIs	No - REILs
Runway Lighting	MIRL	HIRL	No
Weather Reporting	AWOS	ASOS or AWOS	Yes
Public Telephone for Airport Users	Public Telephone	Public Telephone	Yes
Public Restrooms	Public Restrooms	Public Restrooms	Yes
FBO	FBO	FBO	Yes
Aircraft Maintenance On-Site	Maintenance	Maintenance	Yes
Fuel	100LL and Jet A	100LL and Jet A	Yes
Ground Transportation	Rental Car Access	Rental Car Access	Yes
Terminal Facilities	Terminal	Terminal	Yes
Apron	Apron	Apron	Yes
Hangar Storage	Hangars	Hangars	Yes
Auto Parking	Auto Parking	Auto Parking	Yes

Source: Colorado Aviation System Plan 2005; Table: Jviation, Inc.

**Since 2005, the FAA has updated AC 150/5325-4B, Runway Length Requirements for Airport Design to incorporate increases in overall aircraft size in the national fleet. As a result the runway length recommended in the 2005 CDOT System Plan of 4,620 feet is no longer a recommended length per the FAA AC 150/5325-4B. The new 2011 CDOT System Plan will incorporate this change and will likely result in a recommended runway length requirement of approximately 6,200 feet.*

4.2 Airport Tenant & Corporate Aircraft Business User Facility Improvement Requests

The facility requirements included in this chapter were developed following a series of meetings with airport tenants, as well as reviewing letters received from corporate flight departments. The specific users of the airport are the most accurate source to understand safety and operations concerns that affect the flying public. This information was taken into consideration in determining the facility requirements and recommendations. For more information on these facility improvement requests see **Appendix E**.

4.3 AIRFIELD REQUIREMENTS

4.3.1 Runway Capacity

FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*, determines the capacity of an airport based on the number and configuration of its runways. The single runway configuration at LMO has a theoretical airfield hourly capacity of 98 aircraft operations in VFR conditions and 59 aircraft operations in IFR conditions.

Additionally, the airfield has an Annual Service Volume (ASV) of 230,000 operations per year. ASV is a reasonable estimate of an airport's annual activity at which the average delay per operation is 4 minutes.[50] It accounts for differences in runway use, aircraft mix, weather conditions, etc., that would be encountered over a year's time. FAA planning standards state that when 60% of the ASV is reached (138,000 operations per year for LMO), the airport should start planning to increase runway capacity, including construction of a new runway or the extension of an existing runway. Once 80% of ASV is reached (184,000 operations per year for LMO), construction should begin in order to increase capacity of the existing facilities.

It is anticipated that LMO will not exceed these hourly and annual capacities in any year of the 20-year planning range, even in 2030, which has the highest estimate of 82,310 annual aircraft operations. ***Since the operations forecasted in the 20-year planning period will not exceed the ASV, no additional runways are required on the basis of capacity.***

4.3.2 Runway Orientation

The most important factor that affects a runway's orientation (in relation to magnetic north) is the wind. The ideal runway orientation is a runway aligned with the prevailing wind so aircraft can maximize landing and takeoff performance. Per the FAA AC 150/5300-13*, Airport Design*, the current runway system should provide 95% or greater wind coverage for aircraft that use the airport on a regular basis to ensure safety of the users.

All aircraft have an acceptable level of crosswind they can handle during landing. When the acceptable crosswind component of an aircraft is exceeded, the aircraft must divert to another runway or airport. For this reason, the runway orientation must ensure the prevailing crosswind does not exceed certain speeds. Given the average prevailing wind, the FAA requires a runway be oriented so that the average crosswind component is minimized. The aircraft regularly using LMO range from A-I to B-II category, meaning the runway orientation should not exceed a 10.5 knot crosswind component for accommodate the A-I and B-I aircraft categories.

LMO does not have any current long-term wind/weather observations data available. The last wind study was performed from 1978 to 1980. The airport's Automated Weather Observation System

[50] FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*

(AWOS) was connected to the national system of weather monitoring equipment (NADIN) in December 2010. With this connection, all of the weather observations will now be stored with the National Climatic Data Center (NCDC). Prior to December 2010, the current wind/weather conditions observed were only reported through a local radio broadcast and telephone connection.

Based on data collected from the 1980 Wind Rose, as discussed in **Section 2.10.1**, the current runway orientation provides 97.79% coverage for a crosswind component of 10.5 knot and 98.04% coverage for a crosswind component of 13 knots. ***The existing runway orientation at LMO is adequate and reconfiguration of the existing runway or an additional crosswind runway is not justified according to FAA criteria. It is recommended that LMO reevaluate the wind coverage after at least one year of data has been collected from the AWOS by NCDC.***

4.3.3 Runway Length

The purpose of the runway length analysis is to determine if the length of the existing runway is adequate for the existing and projected aircraft fleet operating at LMO. The current length of Runway 11/29 is 4,800 feet.

Runway length is dependent on numerous factors including: airport elevation, temperature, wind velocity and direction, ambient air temperature, aircraft weight, flap settings, length of haul, runway surface (wet or dry), runway gradient, presence of obstructions, and any imposed noise abatement procedures or other prohibitions. While the FAA does not have standards for runway lengths, FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance to determine the recommended runway length for an airport based on the above factors.

The process to determine runway length begins by determining the landing weight of the critical aircraft that is anticipated to regularly use the airport within the planning period. For aircraft weighing 60,000 pounds or less, the runway length is determined by family groupings of aircraft having similar performance characteristics (i.e. small and large airplanes). Small airplanes are defined by the FAA as airplanes weighing 12,500 pounds or less at Maximum Takeoff Weight (MTOW), while large airplanes in this context exceed 12,500 but weigh less than 60,000 pounds. For aircraft weighing more than 60,000 pounds, the required runway length is determined by aircraft specific length requirements. The aircraft families are shown in **Table 4-2**. The various runway lengths are generated for the aircraft families are, as shown in **Table 4-3**.

TABLE 4-2 - AIRPLANE WEIGHT CATEGORIZATION FOR RUNWAY LENGTH REQUIREMENTS

Airplane Weight Category Maximum Certificated Takeoff Weight (MTOW)			Design Approach
≤12,500 Pounds	Approach Speed <30 knots		Family groupings of small airplanes
	Approach Speed ≥30, but <50 knots		Family groupings of small airplanes
	Approach Speed ≥50 knots	With <10 Passengers	Family groupings of small airplanes
		With ≥10 Passengers	Family groupings of small airplanes
Over 12,500 pounds, but < 60,000 pounds			Family groupings of large airplanes
≥60,000 pounds or more, or Regional Jets[1]			Individual large airplane

Note[1]: All regional jets, regardless of their MTOW are assigned to the 60,000 pounds or more weight category.
Source: AC 150/5325-4B, Runway Length Requirements for Airport Design

Table 4-3 shows the FAA recommended runway lengths for LMO computed using information provided in FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*. This information is dependent upon the airport's elevation, average maximum daily temperature of hottest month, the runway gradient, and the length of haul for aircraft weighing more than 60,000 pounds. It is important to note that the runway lengths determined by AC 150/5325-4B indicates the recommended length requirements on the average hottest day of the summer with no wind conditions

TABLE 4-3 - FAA RUNWAY LENGTH REQUIREMENTS

FAA RUNWAY LENGTH REQUIREMENTS

AIRPORT AND RUNWAY DATA	
Airport elevation	5,055′
Mean daily maximum temperature of the hottest month	88.90° F
Maximum difference in runway centerline elevation	24′
Length of haul for airplanes of more than 60,000 pounds	500 miles
Dry runways	
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with approach speeds of less than 30 knots	450′
Small airplanes with approach speeds of less than 50 knots	1,200′
Small airplanes with less than 10 passenger seats	
95 percent of these small airplanes	6,220′
100 percent of these small airplanes	6,390′
Small airplanes with 10 or more passenger seats	6,390′
Large airplanes of 60,000 pounds or less*	
75 percent of these large airplanes at 60 percent useful load	6,890′
75 percent of these large airplanes at 90 percent useful load	8,840′
100 percent of these large airplanes at 60 percent useful load	10,790′
100 percent of these large airplanes at 90 percent useful load	11,240′

*Runway 11/29 pavement strength is rated at 30,000lbs Single Wheel Grear (SWG).
Reference: Chapter 2 of AC 150/5325-4B, Runway Length Requirement for Airport Design.
Calculated using FAA Airport Design Software Version 4.2B

LMO's critical aircraft places the airport in the small airplanes with approach speeds greater than 50 knots. Within this grouping of aircraft, FAA recommends choosing a runway length to accommodate 95% or 100% of small airplanes based on the airport's location and the amount of existing or planned aviation activities. The "95 percent small airplanes with less than 10 passenger seats" criterion applies to airports that are primarily intended to serve medium size population communities with a diversity of usage. It also applies to those airports that are primarily intended to serve low-activity locations, small population communities, and remote recreational areas. The "100 percent of small airplanes with less than 10 passenger seats" criterion applies to an airport that is primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area. The City of Longmont could arguably fall into either category: 95% or 100%. ***Runway 11/29's current length of 4,800 feet is not sufficient to accommodate the 95% or the 100% family groupings of small airplanes***.

While the number of large aircraft operations as defined by AC 150/5325-4B at LMO is small in comparison to overall operations, the runway length recommended to support large airplanes with less than 60,000 pounds has also been determined and is shown in **Table 4-3**. Aircraft types that comprise the 75% of fleet category in **Table 4-3** are shown in **Table 4-4**, while **Table 4-5** shows the remaining 25% of airplanes that require longer runway lengths and comprise 100% of the large airplane fleet. The term, useful load of an airplane, is the difference between the maximum allowable structural gross weight and the operating empty weight. Operating empty weight is normally compromised of the airplane's empty weight, crew, baggage, engine oil, unusable fuel, and other removable supplies and emergency equipment. The useful load consists of passengers, cargo, and usable fuel.

TABLE 4-4 - AIRPLANES THAT MAKE UP 75% OF LARGE AIRPLANE FLEET

Manufacturer	Model	Manufacturer	Model
Aerospatiale	Sn-601 Corvette	Dassault	Falcon 10
Bae	125-700	Dassault	Falcon 20
Beech Jet*	**400A**	**Dassault***	**Falcon 50/50 EX**
Beech Jet	Premier I	**Dassault***	**Falcon 900/900B**
Beech Jet	2000 Starship	Israel Aircraft Industries (IAI)	Jet Commander 1121
Bombardier	Challenger 300	IAI	Westwind 1123/1124
Cessna*	**500 Citation/501 Citation Sp**	Learjet	20 Series
Cessna*	**Citation I/II/III**	Learjet	31/31A/31A ER
Cessna*	**525A Citation II (CJ-2)**	**Learjet***	**35/35A/36/36A**
Cessna*	**550 Citation Bravo**	Learjet	40/45
Cessna*	**550 Citation II**	Mitsubishi	Mu-300 Diamond
Cessna*	**551 Citation II/Special**	Raytheon	390 Premier
Cessna*	**552 Citation**	Raytheon Hawker	400/400 XP
Cessna	560 Citation Encore	Raytheon Hawker	600
Cessna*	**560/560 XL Citation Excel**	Sabreliner	40/60
Cessna*	**560 Citation V Ultra**	Sabreliner	75A
Cessna	650 Citation VII	Sabreliner	80
Cessna*	**680 Citation Sovereign**	Sabreliner	T-39

**These aircraft currently operate at LMO*
Source: FAA AC 150/5325-4B

TABLE 4-5 - AIRPLANES THAT MAKE UP THE REMAINING 25% OF THE LARGE AIRPLANE FLEET

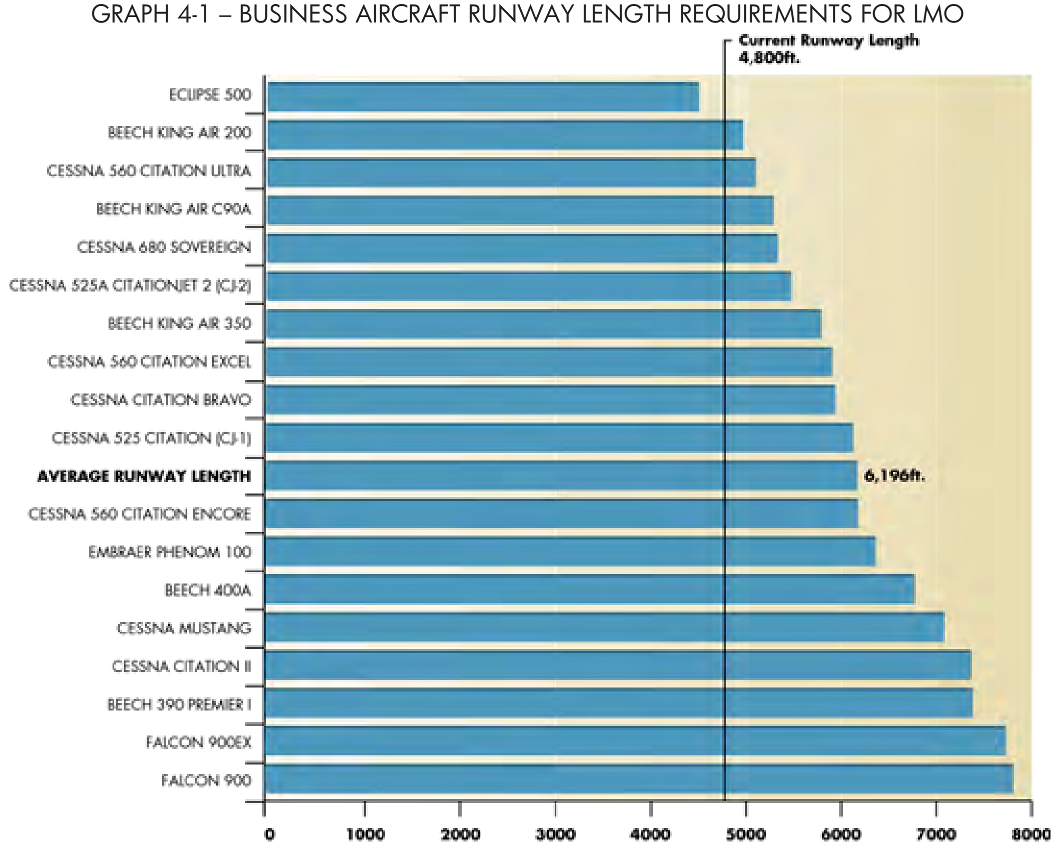
Manufacturer	Model	Manufacturer	Model
Bae	Corporate 800/1000	Israel Aircraft Industries (IAI)	Astra 1125
Bombardier	600 Challenger	IAI	Galaxy 1126
Bombardier	601/601-3A/3ER Challenger	Learjet	45 XR
Bombardier	604 Challenger	Learjet	55/55B/55C
Bombardier	BD-100 Continental	Learjet	60
Cessna	S550 Citation S/II	Raytheon Hawker	Horizon
Cessna	650 Citation III/IV	Raytheon Hawker	800/800 XP
Cessna*	**750 Citation X**	Raytheon Hawker	1000
Dassault*	**Falcon 900C/900EX**	Sabreliner	65/75
Dassault	Falcon 2000/2000EX		

**These aircraft currently operate at LMO*
Source: FAA AC 150/5325-4B
Note: Airplanes in Table 4-4 and Table 4-5 combine to compromise 100% of the large airplane fleet.

Graph 4-1 shows the runway length needs for a variety of B-II type business jets that currently operate at LMO. The runway length needs were established based on data from their respective operations manuals adjusted for airport's altitude, mean maximum temperature of the hottest month, and effective gradient of the runway.[51] [52] Additionally, the runway lengths indicated in the graph displays the length requirement for a fully loaded aircraft with no wind. Aircraft can operate on a shorter runway by altering the amount of useful load (i.e. passengers, fuel, or cargo). If a significant change in the useful load is required or an intermediate stop is required to refuel the aircraft, an aircraft operator may choose to not operate at the airport. These lengths are not a substitute for calculation required by the airplane operating rules, and does not include the insurance requirements for specific aircraft or their runway length requirements.

As indicated in **Graph 4-1**, the average takeoff runway length requirement for the fully loaded B-II business jet fleet that currently operates at LMO is 6,196 feet. ***Runway 11/29's current length is not sufficient to accommodate the most common types of small business jets that currently operate at LMO without weight penalties***.

GRAPH 4-1 – BUSINESS AIRCRAFT RUNWAY LENGTH REQUIREMENTS FOR LMO



*Runway Requirements are approximations only from manufacturer. Balanced Field Length or Take Off Field Length at Max Takeoff Weight adjusted for mean max temp (88.9°F) and elevation (5,055 ft).
Source: Aviation Research Group, Inc.; FAA Central Region, Airport Planning Division, 2005

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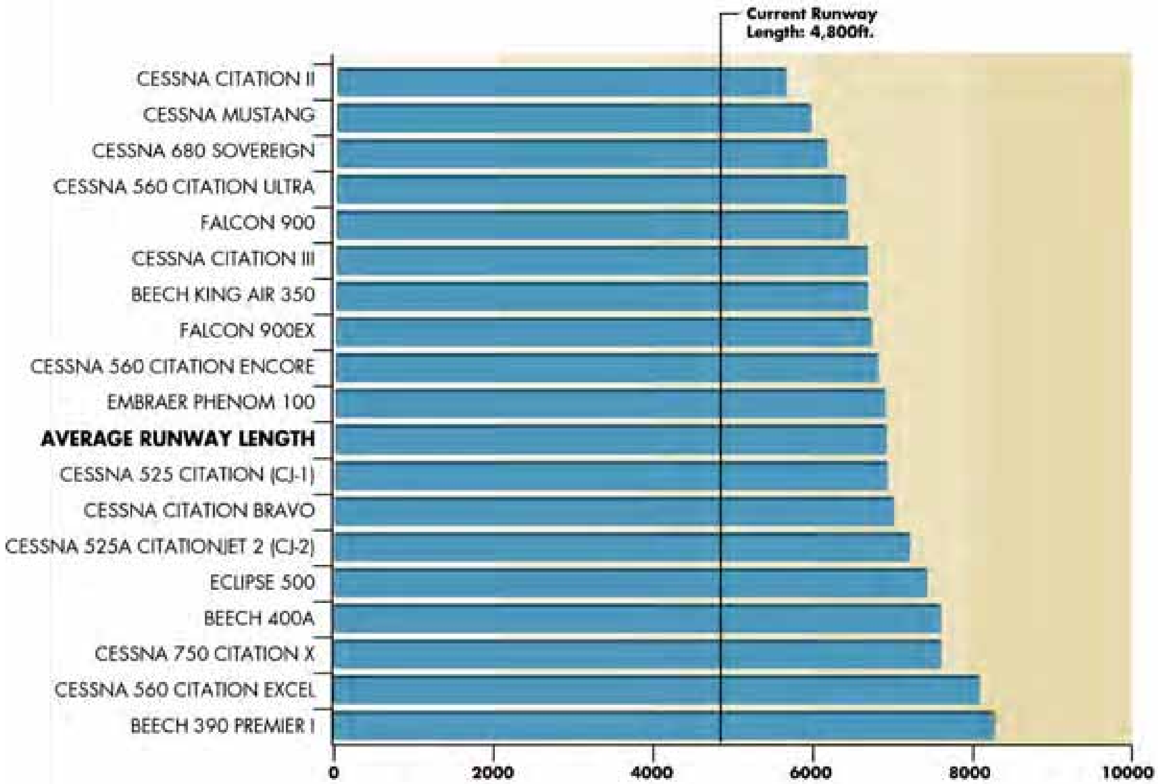
[51] Aviation Research Group, Inc. http://compair.aviationresearch.com/index.aspx?action=aircraft_comparison
[52] FAA Central Region, Airport Planning Division, 2005. *Takeoff Runway Length Adjustment Worksheet*

Furthermore, business aircraft operating under Federal Aviation Regulation (FAR) Part 135 must adhere to strict operating, maintenance, and training requirements. FAR Part 135, *Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons on Board Such Aircraft* is the regulatory guidance for any person or business that provides air transportation of person or property for compensation or hire. Any entity that wishes to conduct operations for compensation or hire are required to hold a certification under FAR Part 135, and must comply with a number of FAA standards. This applies to charter operations into and out of LMO which occur frequently.

In regards to runway length, Part 135 operators must adhere to specific landing distance requirements. Part 135, Section 135.385 states that in accordance with the Airplane Flight Manual, transport or commuter category airplanes may only land at an airport if the airplane is able to complete a full stop landing within 60 percent of the effective runway length, assuming they are 50 feet over the threshold at landing. For LMO, this means that the aircraft must be able to land within 2,880 feet (60% of 4,800 feet) if carrying passengers for hire under a Part 135 certificate. **Graph 4-2** shows the landing distance requirements for the small business aircraft fleet that currently operate at LMO. From this information, all of the business aircraft shown in **Graph 4-2** are unable to land at maximum landing weight (MLW) at LMO per Part 135 requirements without weight penalties. This situation is compounded greatly if wet conditions exist on the runway, in which case virtually all of the aircraft listed in **Graph 4-2** would be unable to land at LMO under Part 135.

In order to accommodate the landing requirements of the average length needs of the aircraft listed in the graph, a runway length of 6,940 feet would be required. ***Runway 11/29's current length is not sufficient to accommodate the landing distance requirements for any of the Part 135 operators that currently fly into LMO without weight penalties***.

GRAPH 4-2 – PART 135 CHARTER AIRCRAFT LANDING DISTANCE REQUIRED AT LMO (DRY CONDITIONS)



*No landing distance information was available for the Beech King Air 200 or Beech King Air 90.
Source: Aviation Research Group, Inc.; FAA Central Region, Airport Planning Division, 2005

4.3.3.1 Runway 11/29 Length Analysis

Runway length analysis shows that Runway 11/29 currently does not accommodate any of the family groupings of small airplanes applicable to LMO. A total length of 6,220 feet would be sufficient to accommodate 95% of small aircraft with less than 10 passenger seats, while a total length of 6,390 feet would accommodate 100%. Moreover, the 95% of small airplanes with fewer than 10 seats family grouping almost exclusively includes aircraft in the B-II family and smaller. This aircraft family is compatible with the current design of Runway 11/29 and the forecasted critical aircraft at LMO. With specific justification, the FAA may accept the length needed to accommodate 100% of family grouping of small airplanes with less than 10 seats or small airplanes with 10 or more seats.

Additionally, as shown in **Graph 4-1** and **Graph 4-2**, LMO's runway length is not sufficient to accommodate the average takeoff runway length requirement for the fully loaded B-II business aircraft fleet that currently operates at the airport, which is 6,196 feet.

Further examination was completed for two specific aircraft types that use LMO frequently: the Beechcraft King Air C90A and the Citation Excel. As previously discussed **Section 2.2** and **Section 3.8**, the design aircraft for runway length for LMO is the Beechcraft King Air 90, which is a popular turboprop aircraft for business travel, as well as an aircraft type used by Mile-Hi Skydiving. The Beechcraft King Air C90A requires a runway length of approximately 5,300 feet.[53] The Citation Excel, a small to mid-sized business jet that has operated at LMO requires a runway length of 6,260 feet at MTOW.[54] Although these aircraft presently operate at LMO, they operate under reduced conditions (i.e. payload and/or fuel) due to the current runway length. An increase in length would allow these aircraft to reach farther destinations, and in Mile Hi Skydiving's case, would allow a greater useful load.

Although a total runway length of 6,390 feet to accommodate 100% of small aircraft (piston fleet) is justifiable at LMO, it may not be practical. **Table 4-6** and **Figure 4-1** shows what additional aircraft types could be accommodated at alternative runway lengths.

TABLE 4-6 - ALTERNATIVE RUNWAY LENGTHS AND AIRCRAFT ACCOMMODATED

Total Runway Length	National Piston Fleet	Business Aircraft
4,800' (Current Length)	77% of Piston Fleet	Eclipse 500 King Air 200
5,300'	84% of Piston Fleet	King Air C90A Citation Ultra Citation Sovereign
5,800'	90% of Piston Fleet	Citation Jet CJ-2 King Air 350
6,000'	92% of Piston Fleet	Citation Excel Citation Bravo
6,220'	95% of Piston Fleet	Average length that accommodates the Business Aircraft that currently operate at LMO
6,390'	100% of Piston Fleet	Citation Jet CJ-1 Citation Encore Embraer Phenom 100
6,800'*	100% of Piston Fleet	75% of large airplanes (<60,000lbs) at 60% useful load

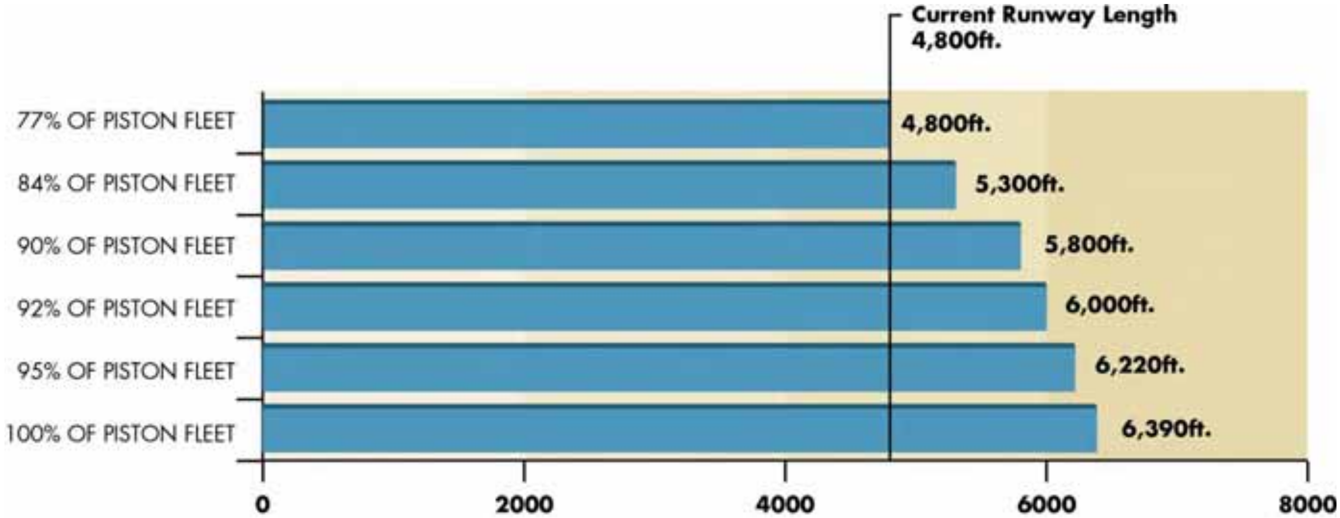
**Large aircraft length requirements are shown for comparison purposes only.*

Source: Jviation, Inc.

53 Model 65-A90 Pilot's Operating Manual, Accelerate and Stop Distance

54 NetJets Runway Length Requirements for the Citation Excel at Maximum Takeoff Weight

FIGURE 4-1 - ALTERNATIVE RUNWAY LENGTHS AND AIRCRAFT ACCOMMODATED



Source: Jviation, Inc.

Chapter 5, Alternatives Analysis will evaluate runway length alternatives for Runway 11/29 to accommodate the piston fleet, ranging from no extension to 1,600 feet (total length of 6,400 feet). Each extension alternative will assess the financial, planning, safety, environmental, and community concerns.

4.3.4 Runway Width

Runway 11/29 is currently 75 feet wide, meeting B-II standards. Runway 11/29 is sufficient for current and projected future runway use at an ARC of B-II. ***The runway width is adequate to meet the facility's current and projected needs; therefore, no widening is required.***

4.3.5 Runway Strength

Runway 11/29 has a weight-bearing capacity of no greater than 30,000 pounds for Single Wheel Gear (SWG) equipped aircraft. The current critical aircraft for weight is Mile High Skydiving's Twin Otter DHC-6, which has a MTOW of 12,500 pounds. ***Runway 11/29's pavement strength is adequate to accommodate all existing and forecasted aircraft; strengthening is not required***.

Several of the Corporate Aircraft Business Surveys received indicated the runway's current pavement strength is a limiting factor, and stronger pavement strength is necessary for the mid-size and larger business jets. Refer to **Appendix E** for more information on airport tenant and corporate user facility requests.

4.3.6 Runway Surface

Runway 11/29 is constructed of Portland Cement Concrete. The runway is in "Excellent" condition according CDOT Aeronautics' 2011 Pavement Evaluation and Pavement Management System. ***Routine maintenance, such as joint and crack sealing, should be performed on a scheduled basis to extend the pavement life. No other surface improvements to the runway are recommended.***

4.3.7 Taxiways

Taxiways should be designed to provide freedom of movement to and from the runways and between developed areas on the airport. LMO has two parallel taxiway systems (Taxiway A and Taxiway B) that include entrance and exit taxiways, taxiway run-up areas, and apron taxilanes. Basic design principles for a taxiway system are outlined by the FAA in AC 150/5300, *Airport Design*, and include the following design principles:

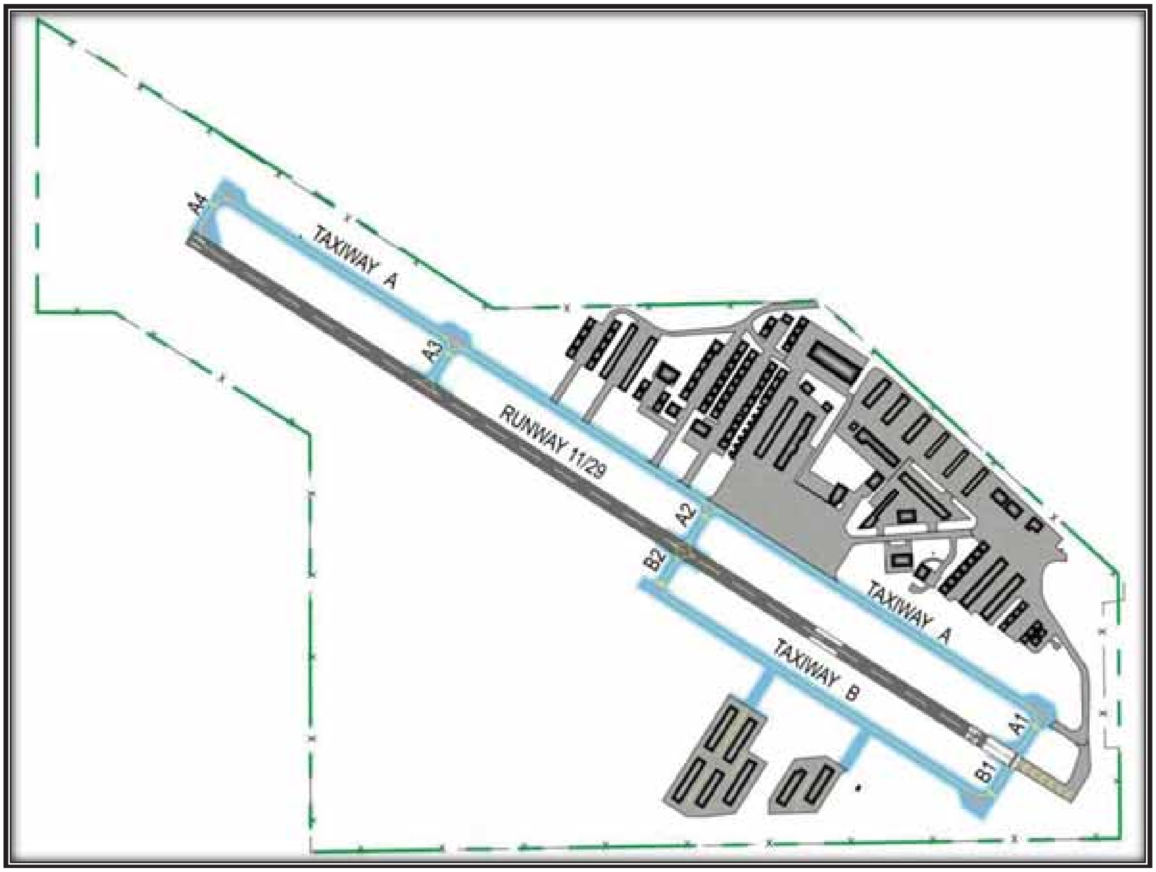
- Construct as many bypass, multiple access, or connector taxiways as possible to each runway and runway end
- Provide taxiway run-up areas for each runway end
- Provide each active runway with a full parallel taxiway
- Build all taxiway routes as direct as possible
- Avoid developed areas, which might create ground traffic congestion

Engineering Brief No. 75, *Incorporation of Runway Incursion Prevention into Taxiway and Apron Design*, provides additional guidance for taxiway and apron design to prevent runway incursions. The FAA has issued a draft update to AC 150/5300-13 incorporating Engineering Brief No. 75. Presently this is draft guidance, but is good practice that should be followed. The guidance states that when new taxiways are planned, runway safety, utility, and efficiency should be considered. The recommended taxiways design standards include:

- Use a right angle for taxiway-runway intersections
- Limit the number of taxiways intersecting in one spot
- Avoid wide expanses of pavement at runway entry

Taxiway A is the full parallel taxiway on the north side of Runway 11/29 and has four connector taxiways: A1, A2, A3, and A4. Taxiway B is a partial parallel taxiway on the south side of Runway 11/29; it has two connector taxiways: B1 and B2. All existing taxiways are equipped with Medium Intensity Taxiway Lighting (MITL) that are in good condition and need no current work. The current taxiway system at LMO is shown in **Figure 4-2**.

FIGURE 4-2 – LMO EXISTING TAXIWAY SYSTEM

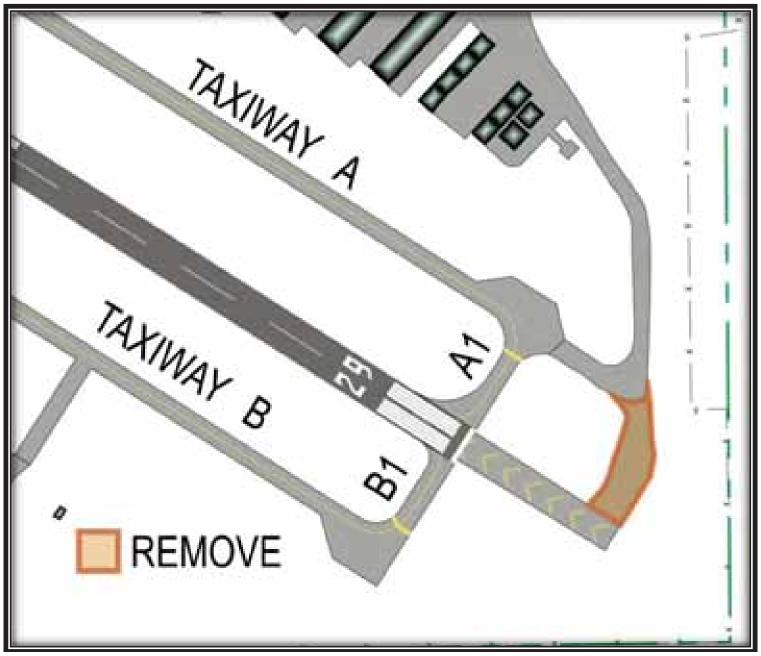


Source: Jviation, Inc.

4.3.7.1 Remove Taxilane Pavement on Runway 29 End

On the east end of Runway 29 is pavement that connects the apron to Taxiway A and to Runway 29. This pavement could be confusing to pilots that are unfamiliar with the airport. ***It is recommended that the pavement on the east of Runway 29 be removed***, as shown in **Figure 4-3**. By removing this pavement, it eliminates the possibility of misidentifying the end of Runway 29, reducing the likelihood of a runway incursion, and increasing situational awareness.

FIGURE 4-3 – REMOVE PAVEMENT ON RUNWAY 29 END

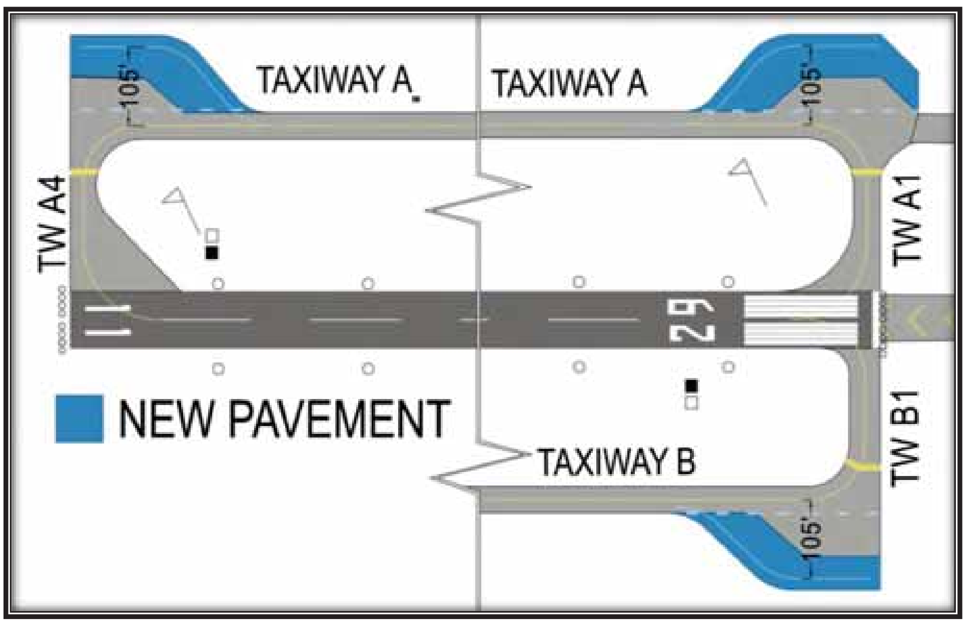


Source: Jviation, Inc.

4.3.7.2 Holding Bays

The current holding bays (also known as run-up areas) on both ends of Taxiway A and east of Taxiway B do not meet current FAA standards. A holding bay provides flexibility in runway use and enhances capacity, as they provide space for aircraft to pull off the main taxiway for run-up procedures until they are ready to depart. Holding bays should be provided when operations exceed 30 per hour according to FAA AC 150/5300-13, *Airport Design*. LMO currently has a peak hour capacity of 30 aircraft and is forecasted to grow to 45 aircraft by year 2030, as discussed in **Section 3.7.4**. The design criteria for the holding bays are based on parallel taxiway to taxiway centerline separation standards of an ADG-II aircraft, which is 105 feet. The current holding bays have a separation of approximately 50 feet on Taxiway A and 60 feet on Taxiway B. ***It is recommended that all of the holding bays at LMO be upgraded to meet the FAA standards for increased separation for safety***, as shown in **Figure 4-4**.

FIGURE 4-4 - HOLDING BAYS

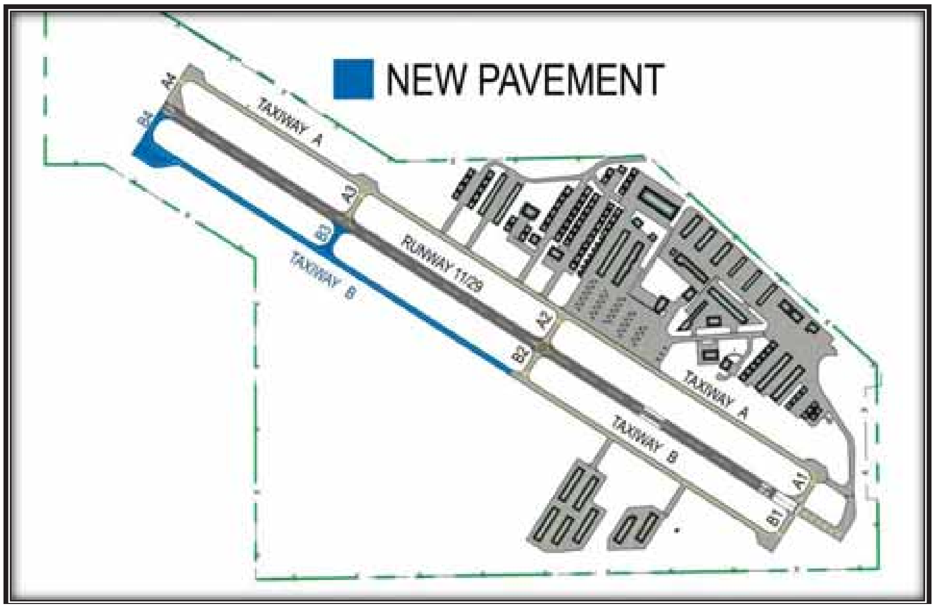


Source: Jviation, Inc.

4.3.7.3 Extend Taxiway B to Full Parallel

The majority of the new development at LMO has recently, and will continue to be on the south side of the airport. The lack of a full parallel taxiway on the south side of Runway 11/29 causes aircraft landing on Runway 29 to execute a mid-field runway crossing to access the hangars on the south side of the airport. Runway crossings at mid-field are less desirable than at runway ends due to the potential for aircraft collisions. ***It is recommended that Taxiway B be extended to a full parallel configuration to improve safety,*** as shown in **Figure 4-5**.

FIGURE 4-5 - FULL PARALLEL TAXIWAY B



Source: Jviation, Inc.

4.3.7.4 Taxiway Pavement Strength

The taxiways have a pavement strength of no greater than 30,000 pounds for SWG aircraft. The majority of the taxiways are in "Excellent" or "Very Good" condition according CDOT Aeronautics' 2011 Pavement Evaluation and Pavement Management System. However, CDOT noted 12 to 15 slabs randomly spaced on Taxiway B that are experiencing heavy cracking. ***The panels will require rehabilitation measures to include removal and replacement of the existing pavement panels that are experiencing heavy cracking is recommended.***

4.3.8 FAA Design Standards

For all airport planning efforts, FAA design standards are the primary consideration. **Table 4-7** shows the FAA design standards from FAA AC 150/5300-13, *Airport Design* (Change 16). LMO is currently a B-II airport and is projected to remain B-II throughout the planning horizon. Runway dimensional design standards define the widths and clearances required to optimize safe operations for landing, take-off, and taxiing.

TABLE 4-7 - FAA DESIGN STANDARDS (AC 150/5300-13, CHANGE 16)

	Existing Runway 11/29	ARC B-II Non-Precision
Runway Width	75'	75'
Taxiway (Parallel) Width	35'	35'
Runway Safety Area		
Width	150'	150'
Length Beyond RW End	300'	300'
Runway Object Free Area		
Width	500'	500'
Length Beyond RW End	300	300'
Taxiway Safety Area Width	79'	79'
Taxiway Object Free Area Width	131'	131'
Taxilane Object Free Area Width	115'	115'
Runway CL to Parallel TW CL		
Taxiway A	255'	240'
Taxiway B	240'	240'
Runway CL to Aircraft Parking	320'	250'
Taxiway CL to Parallel TW CL	N/A	105'
Runway Holdline	200'	200'
Taxiway FOMO* Distance	65.5'	65.5'

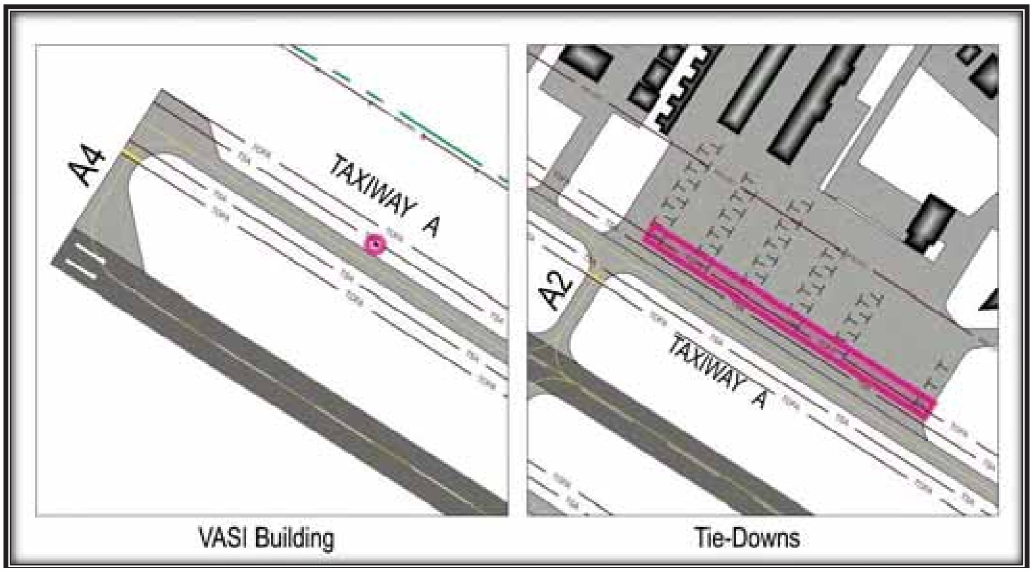
**Distance to Fixed or Movable Object (FOMO) from taxiway centerline*

Source: AC 5300-13, Airport Design; Table: Jviation, Inc.

4.3.8.1 Safety Areas

A safety area is a defined surface surrounding the runway or taxiway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the paved surface. LMO's runway and taxiway safety areas are compliant with FAA design standards; however, the FAA's equipment building to support the Visual Approach Slope Indicator (VASI) penetrates the Taxiway A safety area, as shown in **Figure 4-6**. FAA design standards require the taxiway safety area to be free of non-frangible objects except when fixed by function. ***LMO should request that the FAA relocate the VASI building outside of the Taxiway Safety Area and Taxiway Object Free Area, or replace the VASI with a PAPI system (See Section 4.4). All other portions of the safety areas meet the current standard.***

FIGURE 4-6 - OBJECTS WITHIN THE TSA AND TOFA



Source: Jviation, Inc.

4.3.8.2 Object Free Area (OFA)

An OFA is an area on the ground that is centered on a runway, taxiway, or taxilane centerline, and is provided to enhance the safety of aircraft operations by clearing the area of above-ground objects. Some objects are acceptable in the OFA, including objects that need to be located in that area for air navigation or aircraft ground maneuvering purposes and must be frangible, or objects that are less than three inches tall. All runway and taxiway OFAs are free of objects, with the exception of aircraft parking adjacent Taxiway A, the supplemental windcones, and the VASI equipment building discussed in **Section 4.3.8.1**. Currently, five tie-downs are within the taxiway OFA, shown in **Figure 4-6**. ***The five tie-downs be removed or relocated outside of the Taxiway A OFA.*** Additionally, both supplemental windcones near Taxiway A4 and Taxiway A1 are not frangible. ***The supplemental windcones within the runway OFA must be made frangible. All other portions of the runway and taxiway OFAs are free of objects.***

4.3.8.3 Runway Obstacle Free Zone (OFZ)

The OFZ is a volume of airspace intended to protect aircraft in the early and final stages of flight. It must remain clear of object penetrations, except for frangible NAVAIDs located in the OFZ because of their function. The OFZ is comprised of the Runway OFZ and, where applicable, the Precision OFZ, the Inner-Approach OFZ, and the Inner Transitional OFZ. ***All portions of the OFZ are free of obstacles.***

4.3.8.4 Runway Protection Zone (RPZ)

The RPZ is an area off of each runway end designed to enhance the protection of people and property on the ground. In order to ensure that the RPZ is kept clear of incompatible uses, the land included in the RPZ should be owned by the airport or protected by an avigation easement. Portions of the RPZ are not owned by the City. The areas the Airport owns in fee or avigation easements are shown in **Figure 4-7**. ***The airport should acquire all land within the RPZ except for the road right-of-ways shown in Figure 4-7. A Letter of Agreement should be executed with the jurisdictions of Airport Road and Rogers Road that all development inside of the RPZ should be coordinated with the airport, including traffic signals, street lighting, etc.***

FIGURE 4-7 - AIRPORT RPZ AND BRL OWNERSHIP

Source: Jviation, Inc.

4.3.8.5 Building Restriction Lines (BRLs)

The BRLs are lines that run parallel to the runway and offset at a distance that ensures that new construction is below protected airspace, per 14 CFR Part 77 imaginary surfaces. The BRLs at LMO are calculated based on a 35 foot tall structure, and are 500 feet from the runway centerline outward and include the RPZs off the runway ends. Structures that are taller than 35 feet will require additional analysis to ensure compliance with the Part 77 surfaces. Currently, LMO does not own all of the land required within the BRLs. Nevertheless, since the City of Longmont has a height zoning overlay for the airport, the Airport Influence Zone (AIZ), as previously discussed in **Section 2.11**, the airport does not need to acquire all the land within the BRL as long as AIZ height zoning is enforced. ***There are no BRL issues.***

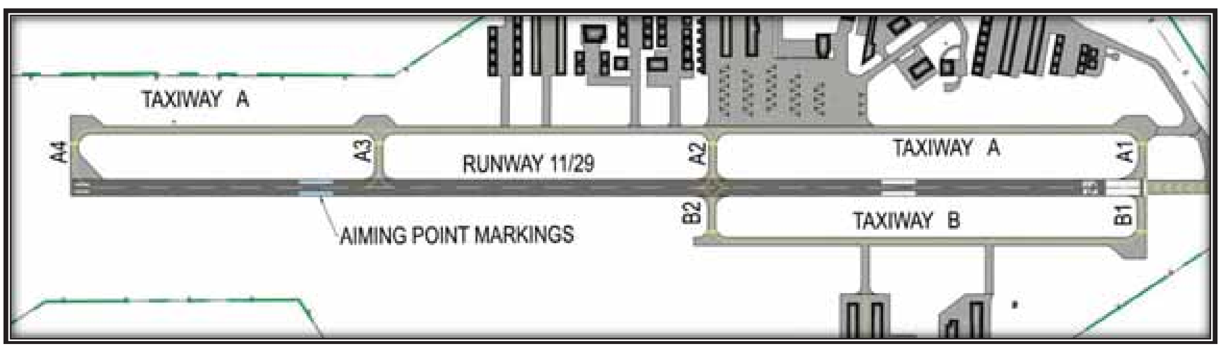
4.3.8.6 Line of Sight

The Line of Sight standard requires that two points five feet above the runway centerline be mutually visible for the entire runway length. However, if there is a parallel taxiway, the two five-foot points are allowed to be visible for only half of the runway length. ***There are no line of sight issues on the airport.***

4.3.9 Airfield Markings and Signage

Runway 29 is marked with non-precision markings, which include the runway designation (29), centerline, threshold, and aiming point markings. Runway 29 also has chevron markings located beyond the runway end on pavement not intended for aircraft operations. Runway 11 is marked with visual markings, which only include the runway designation (11) and the centerline markings. Aiming point markings are required for visual runways only when the runway is 4,200 feet or longer, serving approach categories C and D airplanes. ***It is recommended, not required, that aiming point markings be added to Runway 11,*** as shown in **Figure 4-8.**

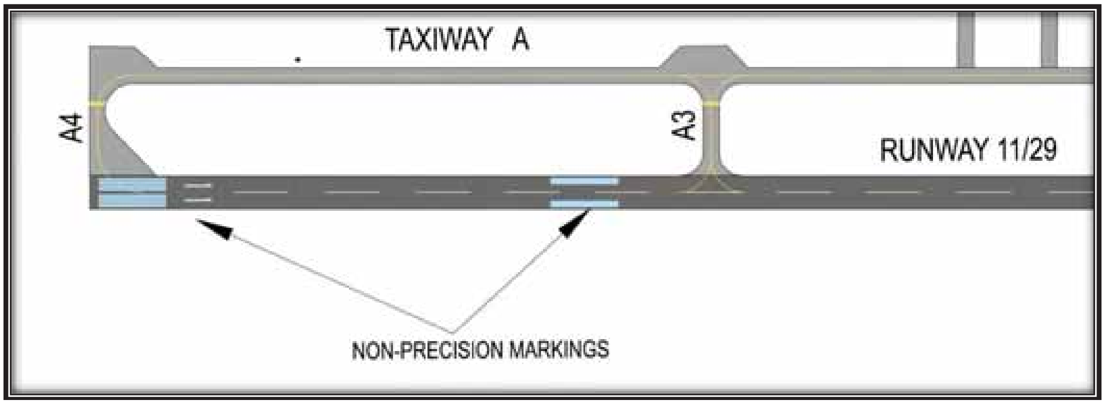
FIGURE 4-8 - RUNWAY 11 AIMING POINT MARKINGS



Source: Jviation, Inc.

If Runway 11 were upgraded to a non-precision runway, threshold and aiming point markings would be required and the runway designation marking (11) would need to be relocated, as shown in **Figure 4-9.**

FIGURE 4-9 – NON-PRECISION RUNWAY MARKINGS FOR RUNWAY 11



Source: Jviation, Inc.

The taxiways are marked with yellow centerline striping. ***The runway and taxiway markings are consistent with current requirements and only need to be repainted as part of scheduled maintenance.***

The entire runway and taxiway signage and lighting system was replaced in 2007. ***The airfield signage meets FAA standards and is in excellent condition.***

As part of LMO voluntary noise abatement procedures (VNAP), ***it is recommended that the City install informational signs for the Voluntary Noise Abatement Procedures (VNAPs) at the GA apron and the holding bays.*** These signs will help promote LMO's VNAPs ("fly friendly" program) in an effort to be a good neighbor to the citizens who live near the airport. The VNAP document is located in **Appendix C.**

4.4 VISUAL NAVIGATIONAL AIDS (NAVAIDS)

The existing NAVAIDs for LMO provide a non-precision approach to Runway 29 and a visual approach to Runway 11. Both Runway 11 and Runway 29 are equipped with 4-box Visual Approach Slope Indicators (VASIs), which provide visual descent guidance. ***While it is currently not a mandatory requirement, it is recommended that LMO replace its VASI system with a Precision Approach Path Indicator (PAPI) system as it may become a requirement in the future.*** PAPI systems are the new standard for visual approach path guidance, whereas VASIs are no longer being installed at airports. Additionally, with the replacement of the VASI systems with a PAPI system, the VASI building in the Taxiway Safety Area does not have to be relocated, but rather it can be removed.

Runway 11/29 is also equipped with Medium Intensity Runway Lighting (MIRL). As stated in **Section 4.1**, the CDOT Aeronautics' 2005 Aviation System Plan recommends that all "Major" airports have Runway End Identifier Lights (REILs) and High Intensity Runway Lights (HIRLs).

REILs are high intensity strobe lights, placed on each side of the runway end to indicate to approaching aircraft where the usable runway begins. The proximity of the approach end of Runway 29, which is the primary arrival runway in instrument flight conditions, to Airport Road could create a hazard to vehicles with the presence of a strobe light. ***It is recommended that REILs be add to both runway ends in a manner that does not create a hazards to ground vehicles.***

A HIRL system is recommended by the FAA only with a precision instrument approach. LMO does not have a precision instrument approach, even though one is recommended by the CDOT, as discussed in the following section. Furthermore, installing and maintaining HIRLs can be very costly. ***For these reasons, a HIRL system is not practicable at LMO and therefore, not recommended.***

The airport has a segmented circle with a wind cone located on the north side of Taxiway A, on the east end of the airfield. There are also lighted supplemental wind cones near the end of each runway threshold. ***The wind cones must be made frangible, and an additional mid-field wind cone is recommended. The segmented circle is in disrepair and should be replaced.***

The airfield also has a standard rotating beacon, which is located on the southeast corner of the airport, nearest to the last hangar to the east, west of Airport Road. ***No improvements to airport beacon are required.***

4.5 Instrument Approach Procedures

There are two types of Instrument Approach Procedures (IAP): traditional ground based and satellite based (Global Positioning Systems). Approach minimums are based upon several factors, including obstacles, navigation equipment, approach lighting, and weather reporting equipment.

There are two primary classifications of ground based navigation systems: those that provide horizontal guidance only (e.g. VOR, NDB, TACAN, etc.), and those that provide both horizontal and vertical guidance (e.g. ILS). In most cases, the lowest possible minimums, with horizontal guidance only is 300-1 (i.e. 300 feet cloud ceiling allowance and one mile visibility). The traditional ground based system providing both horizontal and vertical guidance is an Instrument Landing System (ILS).

Global Positioning Systems (GPS) satellite based instrument approaches follow the same basic guidelines as ground based systems, with the lowest possible minimums for approaches with horizontal only guidance being 300-1. GPS can be enhanced with the addition of vertical guidance through a Wide Area Augmentation System (WAAS) or Local Area Augmentation System (LAAS), the lowest minimums are generally 200-¾. The visibility can be further reduced by a quarter mile with and the installation of an approach lighting system, such as a Medium Intensity Approach Lighting System (MALS).

Table 4-8 gives the current instrument approach procedures and weather minimums for LMO. Currently, the weather minimums of the approaches are limited due to obstacles in the approach course. ***It is recommended that the City request the FAA re-evaluate LMO instrument approaches to determine if there are alternatives to improve approach minimums.***

TABLE 4-8 - LMO INSTRUMENT APPROACH MINIMUMS

Circling Approaches	Weather Minimums		Minimum Descent Altitude
	Visibility	Ceiling (AGL)	
VOR/DME – A	1 mile	700'	648'
RNAV (GPS) – B	1 mile	700'	648'

Runway 29 - Approach	Weather Minimums		Minimum Descent Altitude
	Visibility	Ceiling (AGL)	
RNAV (GPS)	1 mile	700'	636'

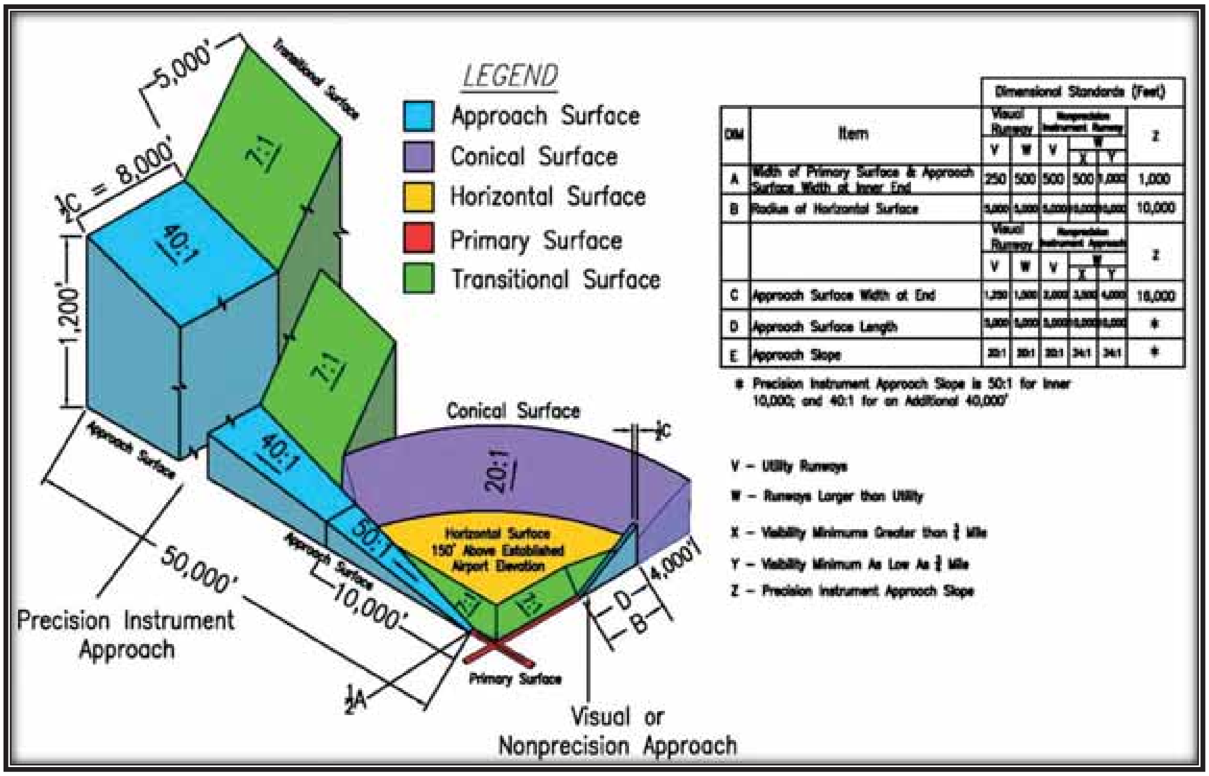
Source: LMO Instrument Approach Charts

Additionally, LMO does not have a Remote Communications Outlet (RCO). A RCO permits radio communication for pilots at non-towered airport with FAA services, such as Flight Service Stations (FSS) and Air Traffic Control (ATC) for instrument clearances. Through the use of an RCO, pilots can file their flight plans and obtain the latest weather information for their route with a VHF radio. Currently, pilots at LMO are only able to contact the FAA via a phone line, which can be extremely difficult while operating an aircraft. Discussions with the airport tenants indicated the need for a RCO. Refer to **Appendix E** for more information on airport tenant and corporate user facility requests. ***It is recommended that an RCO be installed at LMO.***

4.6 OBSTRUCTIONS AND AIRSPACE REQUIREMENTS

14 CFR Part 77 defines and establishes the standards for determining obstructions that affect airspace in the vicinity of an airport. Prior to any airport development, the City must request the FAA to conduct an airspace evaluation to determine the impact to the National Airspace System (NAS) and air safety, regardless of project scale. Part of the airspace evaluation involves the FAA determining the impact of proposed development on the airport's imaginary surfaces. Imaginary surfaces are geometric shapes that are in relation to the airport and each runway, as defined in Part 77. The size and dimensions of these imaginary surfaces are based on the category of each runway for current and future airport operations. The five imaginary surfaces are the Primary, Approach, Horizontal, Conical, and Transitional, as shown in **Figure 4-10**, and are defined below. Any object which penetrates these surfaces is considered an obstruction and affects navigable airspace.

FIGURE 4-10 - PART 77 IMAGINARY SURFACES



DIM	Item	Dimensional Standards (Feet) Visual Runway V	Visual Runway W	Nonprecision Instrument Runway V	Nonprecision Instrument Runway W X	Nonprecision Instrument Runway W Y	Z
A	Width of Primary Surface & Approach Surface Width at Inner End	250	500	500	500	1,000	1,000
B	Radius of Horizontal Surface	5,000	5,000	5,000	10,000	10,000	10,000
		Visual Runway V	Visual Runway W	Nonprecision Instrument Approach V	Nonprecision Instrument Approach W X	Nonprecision Instrument Approach W Y	Z
C	Approach Surface Width at End	1,250	1,500	2,000	3,500	4,000	16,000
D	Approach Surface Length	5,000	5,000	5,000	10,000	10,000	*
E	Approach Slope	20:1	20:1	20:1	34:1	34:1	*

Source: Jviation, Inc.

Primary Surface - The Primary Surface is an imaginary obstruction-limiting surface that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are functions of the types of approaches existing or planned for the runway.

Approach Surface - The Approach Surface is an imaginary obstruction-limiting surface that is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance upon the type of available or planned approach by aircraft to a runway.

Horizontal Surface - The Horizontal Surface is an imagery obstruction-limiting surface that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimension of this surface is a function of the types of approaches existing or planned for the runway.

Conical Surface - The Conical Surface is an imaginary obstruction-limiting surface that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

Transitional Surface - The Transitional Surface is an imaginary obstruction-limiting surface that extends outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface.

With respect to Part 77, Runway 29 is a larger than utility runway with a non-precision instrument approach and visibility minimums greater than three-quarters of a mile. Runway 11 is a utility runway with visual (circling) approaches only. See **Appendix A**, *Aviation Glossary* for runway approach and runway type definitions. Runway 11 should be considered as a non-precision runway in the future because GPS approaches can be developed without the installation of expensive ground base equipment. The installation of a non-precision approach for Runway 11 will better accommodate the users of the airport during low visibility conditions. **It is recommended that the City request the FAA develop a straight in approach to Runway 11 during the 20-year planning period**.

4.6.1 Obstructions

Obstructions are defined as any object of natural growth, terrain, permanent or temporary construction equipment, or permanent or temporary manmade structure that penetrates an imaginary surface. There are high towers in the vicinity of LMO, but none appear to penetrate the imaginary surfaces surrounding the airport. An obstruction survey was not included in this master plan. ***There are no known obstructions per the 2004 Airport Layout Plan, in the FAA's Digital Obstacle File (DOF).***

4.7 Airspace Class and Air Traffic Control

The airspace that surrounds an airport is classified according to the activity level of the facility and the presence of an air traffic control tower. LMO is currently in Class G airspace from the surface to 700 feet above ground level (AGL), where Class E airspace begins from 700 feet AGL to 18,000 above mean sea level (MSL). These are the airspace types which surrounds an airport without an operating control tower. The next highest level of airspace is Class D, which involves an operating control tower. ***The activity levels that are forecasted for LMO do not support the expense of a control tower; therefore, the airspace should remain Class G and Class E.***

All aircraft that are operating on an instrument approach are required to remain in contact with an air traffic facility. Aircraft on approach to LMO remain in contact with a controller at the Denver Air Route Traffic Control Center (Denver Center) in Longmont. Once pilots have visual contact with the airport they can cancel their instrument flight plan and are no longer required to maintain radio contact. ***It is not anticipated that such air traffic control requirements will change during the 20-year planning period.***

4.8 Landside Requirements

Landside facilities support airside operations, such as the facilities necessary for handling aircraft and passengers while on the ground. The landside facilities consist of the Fixed Base Operator (FBO) buildings, access roads, hangars, and other support facilities. The capabilities and capacities of the various landside components are examined in relation to the project demand to help identify future landside facility needs.

4.8.1 Off-Airport Access

The public entrance for LMO is on the east side of the airport, off of Airport Road. Airport Road is a four lane arterial road abutting the airport. It has access to Highway 119, Nelson Road, Rogers Road, and Hover Road. There is also access on the southeast side of the airport, on Rogers Road, and on the northwest via St. Vrain Road. ***The current roads that access the airport are adequate for the current and projected demand at LMO.***

4.8.2 Parking

LMO has free parking, located north and west of each FBO. Additionally, limited parking is included with each hangar unit. Private aircraft owners often park inside of their hangars and are provided access through the vehicle access gate. ***It is recommended that LMO add more parking spaces as more aeronautical activities are developed.***

4.8.3 Vehicle Service Road

The vehicle service road (VSR) that connects the north and south sides of the airfield is currently unpaved. The recycled asphalt surface can cause foreign object debris (FOD) hazards from vehicles tracking the material on the paved airfield surfaces. Moreover, several airport tenants indicated the desired to have the VSR paved. Refer to **Appendix E** for more information airport tenant facility requests. ***It is recommended that the VSR be paved with asphalt to minimize the contamination of FOD on the airfield***.

4.9 GENERAL AVIATION

The number and types of projected General Aviation (GA) operations and based aircraft can be converted into a generalized projection of GA facility needs. GA facilities include the FBO, hangars, and apron, and aircraft tiedown space.

4.9.1 Aircraft Storage Facility Requirements

Most hangars at LMO are privately owned on land leased from the City of Longmont. Only one hangar is currently owned by the City and is used as office space for airport management, and has one tenant, Twin Peaks Aviation. Currently, there are 297 privately owned hangars that comprise approximately 492,865 square feet of hangar space. The hangars are typically at or near full occupancy with 302 based aircraft. This equates to approximately 1,632 square feet of hangar space for each based aircraft (492,865 square feet of hangar space divided by 302 current hangared aircraft).

Hangar requirements are a function of the number of based aircraft and forecasted based aircraft. Specific demand will be based on the actual size of aircraft that ultimately will be based at LMO and will require new hangar construction, as well as how many aircraft will choose to park outside on the apron. However, for planning purposes it is assumed that the current ratio of 1,632 square feet per aircraft will continue, as shown in **Table 4-9**. Moreover, from the returned airport user surveys, the respondents overwhelmingly indicated the need for additional hangar space on the airport. The survey responses also revealed the lowest scored categories of airport facilities/services were hangar space, hangar availability, and hangar lease rates.

TABLE 4-9 - BASED HANGARED AIRCRAFT REQUIREMENTS

Year	Based General Aviation Aircraft	Based General Aircraft Using Tie-Downs	Minimum Hangar Space Required (square feet)	Current Hangar Space (square feet)	Hangar Surplus or Shortfall (square feet)
2015	378	42	548,352	492,864	-55,488
2020	418	47	605,472	492,864	-112,608
2025	462	52	669,120	492,864	-176,256
2030	511	57	740,928	492,864	-248,064

Source: Jviation, Inc.

With aircraft storage nearly at capacity, alternative hangar development options will be investigated in the Chapter 5.

4.9.2 Aircraft Parking Aprons

Apron frontage is a premium airport space and should be strategically utilized with the highest and best use. The planning and design of aprons take into account the location of airport terminal buildings, FBO buildings, and other aviation related access facilities at an airport. Aprons provide parking for based and transient airplanes, access to the terminal facilities, fueling, and surface transportation. FAA AC 150/5300-13, *Airport Design, Appendix 5,* provides guidelines to assist with the determination of the layout and design of airplane parking apron(s) and tie-down area(s) for based and transient aircraft.

4.9.2.1 Transient Aircraft Apron

The FAA has established a method, found in FAA AC 150/5300-13, *Airport Design*, which includes factors that affect the determination of the area needed for transient parking. This method involves the analysis and estimation of the demand for transient airplanes and utilizes forecasting numbers from numerous tables mentioned throughout **Chapter 3**, *Aviation Activity Forecasts*.

Table 3-3 (LMO Operations Forecast) indicates that in 2030 there will be 92,067 operations at LMO. **Table 3-5** (LMO Design Hour Operations Forecast) specifies that in 2030 an estimated 359 operations will occur on the airport's peak day of operation. It is reasonable to assume, with the large amount of pilot training performing touch-and-go operations at LMO, that 6% of the peak day traffic will be transient aircraft that will use the apron. This equates to a peak of approximately 22 transient aircraft using the apron at once on the peak day in 2030. In AC 150/5300-13, the FAA presupposes an area of 360 square yards for each transient aircraft, resulting in roughly 7,920 square yards of desired apron space required for transient aircraft in 2030. This space takes into account Taxilane OFA width criteria (found in FAA AC 150/5300-13, *Airport Design*) and other necessary space for fueling, parking, and other airplane related actions. **Table 4-10** summarizes the current space available, along with the minimum apron space required, using the above calculations for the years 2015, 2020, 2025, and 2030. The minimum apron space required for transient aircraft per the FAA AC 150/5300-13, *Airport Design*, exceeds the current space available. ***It is recommended that additional apron space be added as the current space begins to reach capacity.*** **Chapter 5**, *Alternatives* will evaluate possible future apron expansions.

TABLE 4-10 - TRANSIENT AIRCRAFT APRON REQUIREMENTS

Year	General Aviation Operations	Peak Day Operations	Minimum Apron Space Required (square yards)	Current Apron Space (square yards)*	Apron Surplus or Shortfall (square yards)
2015	67,987	265 – 16 Transient	5,760	5,434	-326
2020	75,239	293 – 18 Transient	6,480	5,434	-1,046
2025	83,247	324 – 19 Transient	6,840	5,434	-1,406
2030	92,067	359 – 22 Transient	7,920	5,434	-2,486

**Current apron space for transient aircraft is based on 17% of the total apron space (31,400 SY) available per the ratio of designated transient tiedowns to based aircraft tiedowns, not based on designated area for transient aircraft.*
Source: Jviation, Inc.

Currently, Air West Flight Center offers roughly eight tiedowns for transient aircraft in the summer months and around 10 tiedowns throughout the remaining months. Twin Peaks Aviation offers one tiedown for transient aircraft. During busy periods, the lack of transient tiedown spaces is a concern. ***Additional apron space is recommended for transient aircraft. Additional transient aircraft parking will be explored in Chapter 5, Alternatives Analysis.***

4.9.2.2 Based Aircraft Parking Aprons

Apron space utilized for based airplanes should be separate from that of transient airplanes. Moreover, the area needed for parking based airplanes typically is a smaller space per airplane than that for transient aircraft. The smaller required space results in knowledge of the specific type of based airplanes at the airport in addition to closer clearance allowed between airplanes. Currently, according to Airport Management, Air West Flight Center manages 35 tie-downs, of which about 25 are occupied full-time and 30 are occupied full-time in the summer months. Twin Peaks Aviation manages 17 tie-downs, 16 of which are occupied full-time. At the Airports' busiest time of the year, roughly 38 based aircraft out of 340 are tied down on the apron versus housed inside of a hangar.

The FAA has established a method for determining apron needs for based aircraft, which uses the previously discussed forecasting numbers found in **Chapter 3**, *Aviation Activity Forecasts*. This method assumes that 300 square yards of apron space is necessary for each based aircraft. This area should be adequate for all single engine and light twin engine airplanes, such as the Cessna 310, which has a wingspan of 37 feet and a length of 27 feet. This space also takes into account Taxilane OFA width criteria and any other necessary space for fueling, parking, and other airplane related actions. Assuming the same ratio of based aircraft that are tied down today will continue into the future, estimated based aircraft apron requirements have been developed. **Table 4-11** summarizes the projected LMO based aircraft that will require apron tie-downs and apron space for the years 2015, 2020, 2025, and 2030.

TABLE 4-11 - BASED AIRCRAFT APRON REQUIREMENTS

Year	Projected Tied Down Based Aircraft	Minimum Apron Space Required (square yards)	Current Apron Space (square yards)*	Apron Surplus or Shortfall (square yards)
2015	41	12,300	25,966	13,666
2020	45	13,500	25,966	12,466
2025	48	14,400	25,966	11,566
2030	52	15,600	25,966	10,366

**Total apron space less the transient apron space (31,400sy – 5,434sy).*

Source: Jviation, Inc.

The apron needs for the based aircraft meets the current and project demands at LMO, no additional apron space it recommended. However, there is insufficient lighting in the GA apron area. ***Installation of basic lighting in the GA apron area is recommended.***

4.9.3 FBO Facility Needs

LMO has two FBOs located on the airfield: Twin Peak Aviation and Air West Flight Center. Twin Peak Aviation is a limited service FBO that offers self service fueling for 100LL, aircraft parking on the ramp or tie-downs, hangar rental, aircraft maintenance, Internet access, and flight instruction. Air West Flight Center is the only full-service FBO and offers 100LL, Jet A, and motor vehicle gasoline. Air West Flight Center also offers flight instruction, aircraft rental, aircraft maintenance, pilot supplies, vending machines, internet access, pilot lounge, hangar rental, catering service, and maintains a fleet of 13 aircraft.

From the returned user surveys, respondents stated they would like to see the FBO's and the pilots lounges improved. Additionally, corporate user surveys indicated that one of the reasons they choose to land at other airports is due to lack of complete services provided by the FBOs. However, since the FBOs are privately owned they are not eligible for FAA airport grants for any improvements to the facilities. Refer to **Appendix E** for more information on airport tenant and corporate user facility requests.

4.9.3.1 FBO/Flight Center

The airport could better serve the current users and corporate businesses by building an executive flight/business center building. This flight center could house a year-round restaurant, pilot lounge, meeting/conference room, and offices for airport management. Through surveys and communications with the airport tenants showed the need for flight/business center to house a restaurant, pilot lounge, FBO, and flight planning. Refer to **Appendix E** for more information on airport tenant and corporate user facility requests. ***Land use planning for LMO should include an executive flight center building.***

4.10 AIRPORT SECURITY

The Transportation Security Administration (TSA) does not regulate most GA airports. Only three GA airports are regulated, due to their location within the Flight Restriction Zone around Washington DC. Further, the State of Colorado does not presently require GA airports to have a security program, or take any actions related to security, beyond the TSA recommendations. Funding for security measures at GA airports is not available from the State of Colorado, or the FAA AIP program. Some grant money is available through the TSA for limited pilot programs. Occasionally, the FAA may fund a security related project for a GA airport, provided there is a safety benefit.

Regardless, there exists considerable data to both evaluate the security of GA airports and to provide recommendations for improvement. This section provides a limited evaluation of the security of the airport, but does not constitute a complete security assessment.

The standard security assessment process in the United States for a GA airport is the Airport Characteristics Measurement Tool (ACMT), published in the TSA Information Publication IP-001. TSA intends this document to be used to provide effective and reasonable security enhancements at GA facilities across the Nation; to the extent the procedures and recommendations are consistent with the airport's circumstances. It is not the intent of IP-001 to recommend that GA landing facilities meet the same security requirements as commercial service airports; however, some terminology is common to both commercial service airport security and GA airport security.

TSA has not taken a position that GA airports and aircraft are a threat. However, as vulnerabilities within other areas of aviation have been reduced, GA may be perceived as a more attractive target and consequently more vulnerable to misuse by terrorists. The scope and breadth of GA landing facilities precludes any one document from capturing all characteristics relevant to all GA airports; therefore, other considerations will be taken into account as related to security recommendations for LMO.

The ACMT provides a numerical scale tying attributes such as runway length, number of based aircraft, number of annual operations, and whether an airport hosts flight training to recommended security systems, measures and procedures.

The attributes are based on indicators established by the TSA that may determine whether an airport requires higher levels of security. For example, the attribute addressing aircraft size is related to the potential kinetic energy of an airplane, combined with its fuel capacity, to determine its effectiveness (and potential) as a weapon of mass destruction (WMD). The TSA currently has established greater than 12,500 pounds Mean Gross Takeoff Weight (MGTW) as the threshold for aircraft that should be of concern with regard to its use as a WMD.

However, the greater than 12,500 pound weight is highly controversial within the industry as it was selected based on a pre-existing threshold the FAA uses to determine whether a pilot requires specialized training to operate larger aircraft, not on whether an aircraft that is greater than 12,500 pounds represents a true "missile" threat to a ground structure. Additional studies and legislative review have demonstrated that aircraft above 28,000 pounds, and even up to 90,000 pounds in MGTW, still do not represent a significant "9/11" style threat. It is anticipated that the TSA's revised GA security recommendations will reflect a revised minimum weight. LMO has only a few based aircraft above the 12,500 pound threshold.

Whether an airport hosts flight training is directly related to the fact that the 9/11 hijackers were trained at U.S. flight schools and the subsequent higher level of scrutiny that such operations received post 9/11. This does not mean that an airport that hosts flight training activity is a threat, just that additional security considerations should be included as part of its overall operation.

The ACMT separates GA airports into four categories: 0 to 14 points, 15 to 24 points, 25 to 44 points, and greater than 45 points. Based on the ACMT, LMO scores a 38, which puts the airport near the upper range of the third tier for security recommendations. The score was determined based on the following criteria:

TABLE 4-12 - SECURITY CHARACTERISTICS

Criteria	Points
The airport is within 30 nautical miles of a mass population area (Denver)	5
The airport is within 30 nautical miles of sensitive sites (the former St. Vrain nuclear power plant, and active U.S. Air Force missile silos located throughout north central Colorado)	4
Greater than 101 based aircraft (LMO has 340 based aircraft)	3
Based aircraft over 12,500 pounds	3
Runway length between 2001-5,000 feet	4
Concrete runway	1
Over 50,000 annual aircraft operations	4
Part 135 (charter) operations	3
Flight training	3
Flight training in aircraft over 12,500 pounds	4
Rental aircraft	4
TOTAL POINTS	38

Source: Leading Edge Strategies

The following systems, measures and procedures are recommended for airport within the 25 to 44 points range:

TABLE 4-13 - SUGGEST AIRPORT SECURITY ENHANCEMENTS

Requirement	Description	LMO
Contact List	List all appropriate emergency contact numbers. Include point of contact names and office hours of operation as appropriate.	Completed
Community Watch Procedures	Post signs promoting the program, warning that the airport is watched. Include appropriate emergency phone numbers on the sign (Airport Watch Program).	In effect
All Aircraft Secured	All aircraft secured when not in use (throttle locks, prop locks).	Not the direct responsibility of an airport operator - general compliance may be determined through a security assessment
Positive Passenger / Cargo / Baggage ID	Pilot-in-Command positively identifies each passenger and material carried on board their aircraft.	Not the direct responsibility of an airport operator - general compliance may be determined through a security assessment
Documented Security Procedures	Written security program.	None
Signs	Signs warning against unauthorized entry.	Some signage
Transient Pilot Sign-in/Out Procedures	Pilots of transient aircraft required by the Fixed-Base Operator to sign-in and sign out their aircraft.	Not the direct responsibility of an airport operator - general compliance may be determined through a security assessment
Security Committee	Airport Security Committee composed of airport tenants and users drawn from all segments of the airport community. Involve airport stakeholders in developing effective and reasonable security measures and disseminating timely security information.	None, however the Airport Advisory Board addresses security issues as brought to their attention by the airport manager.
Law Enforcement Officer (LEO) Support	More than just law enforcement officer (LEO) response to incidents, this section includes educating LEO's about airport challenge and credential procedures, access and airfield patrol.	Response only
Challenge Procedures	A challenge system involves airport employees and users confronting unknown personnel on the airport to determine whether or not they have a valid reason for being on airport property. Such a system may include stopping and questioning or even simply greeting the unknown individual and engaging in conversation to determine their purpose for being in a restricted area.	No formal system or training for tenants
Vehicle ID System	These systems should be used to indicate access authorization where appropriate, such as by numbering or color-coding.	None
Personnel ID System	Some form of airfield identification card - capabilities of each system varies from airport to airport.	None
Lighting System	Lighting of airfield boundaries, aircraft and fuel truck parking areas and pedestrian and vehicle approach paths.	Limited airfield lighting due to neighbor concerns about light pollution. Not adequate for **any** security purposes.
Access Controls	Gates and doors, locked either electronically, or mechanically, and some form of access issuance/approval.	Four (4) electronic access gates requiring a PIN code available to tenants only.

Source: Leading Edge Strategies

The fact that LMO has not previously accomplished many of the security recommendations is characteristic of other GA airports throughout the United States. As previously mentioned, GA airports are not usually given funding for security improvements through AIP or other programs. Some States, such as New York, Florida and Virginia, have included GA airport security regulations within their Statues and provided funding for security improvements. Additionally, there remains considerable debate throughout the industry whether GA aircraft represent a threat to the United States.

Some of the aforementioned recommendations must include additional measures, in order to be effective. For example, access controls and gates to the airfield are of little to no use without fencing.

Some of the recommendations in the previous list are beyond the control of the airport operator. Transient pilot sign-in/sign-out procedures are processes controlled locally by the FBOs, not by the airport. Pilots knowing the identities of personnel they are flying, and positively identifying any material they are carrying on board is the purview of the individual aircraft operator. While the airport can include some of these security requirements within their Minimum Standards, and Rules and Regulations, it is difficult to enforce.

Aircraft operators conducting charter or commercial operations in aircraft above 12,500 pounds are required to have TSA approved security programs. Please note that the airport itself is not required to have a security program, but certain aircraft operations are, regardless of whether they fly into a GA airport or a commercial service airport. Again, aircraft operator security programs could be addressed in Minimum Standards or Rules and Regulations, but enforcement of such programs remains with the TSA.

Although GA airports are not regulated, TSA Transportation Security Inspectors do conduct outreach programs and make recommendations about security processes at GA airports. The TSA has visited LMO frequently over the past several years and has not noted a threat to or from the airport's operations. Recently, the airport received a letter of appreciation for security awareness during the Democratic National Convention.

4.10.1 Criminal Activity

Besides terrorism, criminal activity is a concern at GA airports. While GA airports are known to be used as places for drug smuggling, most common crimes at a GA airport include aircraft or avionics theft, criminal mischief, vandalism, and vehicle break ins. LMO has not experienced any significant levels of criminal activity.

4.10.2 Surroundings

The airport is largely surrounded by agriculture to the west and north, an industrial park to the south and open fields and residential development to the east. There are no sensitive sites bordering the airport, no commercial operations or schools, which may lend themselves as launch points for trespassing onto airport property.

4.10.3 Security Recommendations

LMO should incorporate formalized security procedures along with certain facility enhancements to protect the airfield from unlawful and inadvertent intrusions by individuals. Recommendation: at a minimum, wildlife fencing should be installed on the airport perimeter along with appropriate access gates. LMO has had a long-standing wildlife issue, which perimeter fencing has been shown to help; fencing provides several of the fundamental elements of security, including a visible barrier, deterrence of inadvertent entry and delay of individuals attempting to access the aircraft movement or ramp areas. Neither TSA or the FAA generally funds security fencing at General Aviation airports, however, wildlife fencing is eligible for AIP funds and the FAA has traditionally supported the installation of such fencing at airports with wildlife hazards. The security and public protection benefits of wildlife fencing provide justification to support the project.

Fuel truck and aircraft parking areas, along with access points, should be well lit. Existing lighting is inadequate for security purposes, however, there are alternate lighting systems that reduce light pollution to the surrounding community but still provide adequate illumination. As host to several corporate aircraft and businesses, LMO should install adequate security lighting.

An access control system is recommended to the extent that fencing and access gates can be installed. The access control system should restrict and control vehicle access, but not pedestrian access (at this time). A baseline vehicle access control system, using a cipher lock entry system (vs. airport identification badging) is affordable and provides a foundation for increased access control and personnel badging requirements at General Aviation airports, which will likely be a TSA requirement in the foreseeable future.

It is recommended that LMO conduct a security assessment and develop an airport security program, and implement recommendations as called for in the ACMT to bring the airport to a baseline standard (if access controls and gates are included, fencing should be added). Since the airport is forecasted to have increased operations that will alter the results of the ACMT, additional recommended security measures are a personnel and vehicle ID system, challenge procedures, and fencing. Depending on the results of the security assessment, CCTV and potentially an intrusion detection system could be included, according to the TSA's GA airport security guidance. ***It is strongly recommended that LMO, at a minimum, install a six foot chain link fence around the entire property border of the airport for safety, security, access control, and wildlife protection. The existing 3-strand wire fence is not sufficient for any type of control and opens the City to liability and trespass issues.***

4.11 Airport Equipment

The airport has one vehicle for airport manager use, and it is the property of the City of Longmont, Department of Public Works and Natural Resources. The airport has no other equipment. The snow removal equipment and mowing equipment is contracted from various service providers. Additionally, responses from the Corporate Aircraft Businesses and Business Tenant surveys indicated the need for dedicated snow removal at the airport to assure year-round access to the airport. ***It is recommended that LMO acquire one snow plow to help ensure timely snow removal off the airfield in the winter months. It is also recommended that LMO acquire one sweeper so the airport is able to quickly and easily remove foreign object debris (FOD) off the airfield pavements for safer operations at the airport.***

4.12 Support Facilities

There are no support facilities for maintenance on the airport. ***It is recommended that LMO construct an SRE/Maintenance Building to house the snow plow and sweeper, as well as an office for airport management.***

Additionally, it is recommended that LMO add an Aircraft/Equipment Wash Pad on the airport property to ensure long-term maintenance of the airport, as well as an additional revenue stream for tenants that use the pad to wash their aircraft.

4.13 Fuel Storage requirements

All of the fuel storage at LMO is owned and operated by private companies. It is assumed that this arrangement will continue in the future and the additional fuel storage will be added by the private sector when necessary to meet the demand levels.

40 Code of Federal Regulations (CFR) 112 identifies the regulatory requirements to prevent oil from entering any natural surface water ("navigable waters") in the U.S. 40 CFR 112 requires any business that maintains an aggregate aboveground oil storage capacity of greater than 1,320 gallons, or total capacity greater than 42,000 gallons in completely buried containers to develop a Spill Prevention Control and Countermeasures (SPCC) Plan. Oil for this regulatory requirement includes a variety of substances that are petroleum and non-petroleum based, and includes all jet and aviation fuel (e.g. Jet A and AvGas). The SPCC Plan must detail the equipment, workforce, procedures, and steps required to prevent, control, and provide adequate countermeasures to discharged oil. In addition, any fuel tanks between 660 gallons and 33,990 gallons must be registered with State of Colorado's Department of Labor and Employment, Division of Oil and Public Safety and must be inspected annually.

Both FBOs at LMO, Air West Flight Center and Twin Peaks Aviation, are required to have an SPCC Plan since their businesses have an aggregate fuel storage capacity of greater than 1,320 gallons. Additionally, Air West Flight Center, Twin Peaks Aviation, and Mile-Hi Skydiving are required to have their fuel tanks registered with Colorado State's Division of Oil and Public Safety and their fuel tanks inspected annually.

Twin Peaks Aviation has a SPCC Plan, and its fuel tanks are registered with the State's Division of Oil and Public Safety. Currently, Air West Flight Center and Mile-Hi Skydiving do not have an SPCC Plan and are not registered with the State. Mile-Hi Skydiving is not required to have an SPCC Plan since its total fuel capacity is less than 1,320 gallons. ***It is recommended that Air West Flight Center develop a SPCC Plan, and both Air West Flight Center and Mile-Hi Skydiving register their fuel tanks with the State.***

Additionally, since the only Jet A fuel storage at LMO is the 2,200 gallon tank owned by Air West Flight Center***, the installation of a 10,000 gallon tank for Jet A is recommended to better accommodate the fuel needs of the corporate aircraft that operate at LMO***.

4.14 DEICING FACILITIES

Currently, LMO does not have deicing capabilities. Deicing is the removal of frost, ice, slush, or snow through the application of heated water and propylene or ethylene glycol to ensure safe operations of aircraft. Deicing can be a substantial cost, and therefore is often not in demand at GA airports. Many of the Corporate Aircraft Business surveys indicated the need for a deicing facility to assure year-round operational capabilities at the airport. Refer to **Appendix E** for more information on airport tenant and corporate user facility requests.

The EPA is in the process of defining new regulations for deicing activities. However, these regulations, entitled Effluent Limitation Guidelines, would not apply to LMO because of the low amount of fluid usage that would be required. For this reason, ***no specific deicing containment facilities are required for LMO***. If an FBO or private operator decides to deice aircraft in the future, they should coordinate that activity through airport management to ensure best practices are followed in the location of those activities and that they do not cause environmental concerns.

4.15 UTILITIES

Utilities provide the airport with potable water, sanitary sewer, fiber optics and phone, electric, storm water, and natural gas. Currently, the electric, gas, fiber optics and phone utilities are adequate to meet existing and forecasted demand for the airport. However, the airport currently does not have adequate water and sewer utilities. There is only one water line on the north side of the airport and it has extremely low water pressure, and the sewer services on the airport are limited to commercial buildings only. There is also only one water line on the south side and it is for fire protection services only. Essentially, there are currently no water or sewer services on the south side of airport property. The nearest water and sewer lines on the south side are located under Airport Road, approximately 1,500 feet away from the property line. The City does not provide the water and sewer infrastructure for the tenants, making it cost prohibitive for future tenants to build on airport property. Furthermore, the utilities on the airport need to be reassessed to accommodate the requirements of any future development at the airport (i.e. hangar development, apron expansions, new facility, facility expansion, etc.). Additionally, many airport tenants indicated the need for water and sewer utilities for their hangars and/or business. Refer to **Appendix E** for more information on tenant and corporate user facility requests. ***It is recommended that the water and sewer utilities are***

extended from Airport Road to the south side of the airport to accommodate the utility demands of future development on the airport.

4.16 Summary

A summary of the recommended improvements are provided in **Table 4-14**. Detailed discussions of sixteen recommendations and four requirements were explained throughout the chapter.

TABLE 4-14 - LMO FACILITY REQUIREMENTS SUMMARY

Section	Facility	Improvements Needed
4.3.1	Runway Capacity	No Improvement Needed
4.3.2	Runway Orientation	No Improvement Needed
4.3.3	Runway Length	**Extend Runway** (Recommended)
4.3.4	Runway Width	No Improvement Needed
4.3.5	Runway Pavement Strength	No Improvement Needed
4.3.6	Runway Surface	No Improvement Needed
4.3.7	Taxiways	**Extend Taxiway B to a Full Parallel** (Recommended) **Rehabilitate Panels on Taxiway B** (Recommended) **Increase the Size of the Taxiway Holding Bays at the Runway Ends** (Required)
4.3.8	Runway Protection Zones	**Acquire or Lease All Land within the RPZ** (Required)
4.3.8	Runway Visibility Zone	No Improvement Needed
4.3.8	Safety Areas	**Relocate the VASI Building Outside of the TSA & TOFA** (Required)
4.3.8	Object Free Areas	**Relocate Five Tiedowns Outside of the TOFA** (Required)
4.3.9	Airfield Markings	**Add Aiming Point Markings to Runway 11** (Recommended)
4.4	Navigational Aids	**Replace VASI System with PAPI System** (Recommended)
4.5	Instrument Approaches	**Approach Study for Improved Approaches** (Recommended) **Remote Communications Outlet** (Recommended)
4.6	Obstructions	No Improvement Needed
4.7	Airspace Class and Air Traffic Control	No Improvement Needed
4.8	Landside Requirements	No Improvement Needed
4.9.1	Hangar Facilities	**Additional Hangar Sites** (Recommended)
4.9.2	Apron Space/Tiedowns	**Additional Apron Space and Tiedowns** (Recommended)
4.10	Airport Security	**Conduct a Security Assessment and Develop an Airport Security Program** (Recommended) **Install Perimeter Fence** (Recommended)
4.11	Airport Equipment	**Acquire One Sweeper and One Snow Plow** (Recommended)
4.9.3.1 4.12	Support Facilities	**Upgrade Airport Administration Office/Flight Center** (Recommended) **Construct an SRE/Maintenance Building** (Recommended) **Add an Aircraft/Equipment Wash Bay** (Recommended)
4.13	Fuel Storage Requirements	**Installation of a 10,000 gallon Jet A Fuel Tank** (Recommended)
4.14	Deicing Facilities	No Improvement Needed
4.15	Utilities	**Extend Water and Sewer Utilities to South Side** (Recommended)

Source: Jviation, Inc.