

Forecasts of Aviation Activity

Introduction

Forecasting is a key element in the master planning process. The forecasts are essential for analyzing existing airport facilities and identifying future needs and requirements of the facilities. Forecasting, by its very nature, is not exact, but it does establish some general estimates for future aviation activity levels and provides a defined rationale for various changes at the Airport as demands increase or decrease. The amount and kind of aviation activity occurring at an airport is dependent upon many factors, but is usually reflective of the services available to aircraft operators, the meteorological conditions under which the airport operates (daily and seasonally), the businesses located on the airport or within the community the airport serves, the general economic conditions prevalent within the surrounding area and the location of the airport relative to the service area population.

Aviation activity forecasting generally commences by utilizing the present time as an initial point, supplemented with historical trends obtained from previous years' activity and recorded information. This data has evolved from a comprehensive examination of historical airport records from airport personnel, *Colorado Statwide Airport Inventory and Implementation Plan*, FAA Form 5010-1 data, *FAA Terminal Area Forecasts (TAF)*, *FAA Aerospace Aviation Forecasts Fiscal Year 2003-2014* and the *1992 Boulder Municipal Airport Master Plan Update (approved in 1994)*. These documents were assembled in different years, making the base year data quite variable, and emphasizing the need for establishing a well-defined and well-documented set of base information from which to project future aviation activity trends.

Prior to an examination of current and future activity levels at the airport, there are several conditions and assumptions that should be noted that form the basis or foundation for the development of the forecasts contained here. These variables represent a variety of physical, operational and socioeconomic considerations, and to varying degrees relate to and affect aviation activity at Boulder Municipal Airport.

Weather Conditions

The most current and complete set of weather data available for Boulder Municipal Airport was obtained for the area (i.e., JeffCo Airport located in Broomfield, CO) and analyzed. With the exception of very few days annually, the airport is not adversely affected by poor weather conditions. Visual Flight Rules (VFR) meteorological conditions are experienced, on average, approximately 92% of the time annually. Therefore, aircraft can operate at the airport on a regular basis throughout the year, with limited interruption due to weather. The potential negative impact of poor weather conditions on the operational capability of the airport will be further analyzed in the following chapter (*FACILITIES REQUIREMENTS*) of this document.

Socioeconomic Conditions

Historically, the socioeconomic conditions of a particular region impact aviation activity within that region. The most often analyzed indicators are population, employment, and income.

Population. Boulder County and all of the communities that lie within the county limits experienced significant population growth during the latter half of the 20th century. The City of Boulder had tremendous growth between 1950 and 1970. According to the US Census Bureau, the City of Boulder had a population increase of almost 89 percent between 1950 and 1960, and 77 percent during the following decade. As a result, the City adopted measures to slow growth by limiting residential development within the City limits. While the city's population has continued to rise, population growth is at a considerably slower rate than previous decades. It is important to note that the communities surrounding Boulder, such as Louisville, Lafayette, Broomfield, Longmont, Superior, and Erie have experienced significant growth over the past 10 years, and are projected to continue to grow.

The following table, entitled *POPULATION PROJECTIONS 2000 to 2025*, provides a summary of the population information for the City and County of Boulder, State of Colorado, and the Denver metropolitan region.

Table B1
POPULATION PROJECTIONS, 2000 to 2025
Boulder Municipal Airport Master Plan Update

	2000	2025	Total growth over 25 years	Average Annual Growth Rate
City of Boulder ¹	113,917 ²	134,550	20,633 ³	0.2%
Boulder County ⁴	271,051	362,643	91,592	1.16%
Colorado ⁴	4,335,540	6,652,082	2,316,542	1.72%
Denver Metro ⁵	2,429,208	3,525,987	1,096,779	1.45%

Source: BARNARD DUNKELBERG & COMPANY.

1. City of Boulder Service Area (Areas 1 and 2)
2. 2002 Population estimate
3. Total growth over 24 years
4. Colorado Department of Local Affairs Demography Section
5. Colorado Department of Local Affairs Demography Section – Region 3: includes the following counties surrounding the Denver metropolitan area: Adams, Arapahoe, Broomfield, Boulder, Clear Creek, Gilpin, Denver, Douglas, Jefferson County

As the above table highlights, the City of Boulder and its service area have a population of 113,917 people in 2002, and is projected to increase by 20,633 people by the year 2025 (to a total population of 134,550 people). According to data compiled by the Colorado Department of Local Affairs Demography Section, Boulder County had approximately 271,051 people in 2000 and is forecast to have 362,643 people in 2025 (an increase of 91,592 people).

Employment. According to the City of Boulder Planning and Development Services, total employment (all full and part-time jobs) for the City of Boulder was 104,030 in 2001. In 2025, approximately 147,460 jobs are forecast, an increase of approximately 1,808 jobs per year (43,400 jobs over the 24 year forecast period).

Income. Data from the 2000 US Census indicates that the per capita income for the City of Boulder was \$27,262. The per capita income for Boulder County, State of Colorado and the United States was \$28,976, 24,049 and \$21,776 respectively. The median family income for the City of Boulder was \$55,883 in 2000 and \$70,572 in Boulder County.

Community/Airport Location and Potential

Boulder and the surrounding area, with its numerous educational and recreational opportunities, tourist activities, and affluent population base, provide a strong and definable market area for continued business and recreational flying opportunities, as well as glider activity. The Airport is in a position to continue to support the economic vitality

of the community and the City is committed to ensuring its use is a positive benefit to the community.

While the City of Boulder is focused on managing population growth, the area surrounding Boulder is growing substantially. Therefore, many of the residents of these surrounding communities, in addition to Boulder residents, have convenient access to the existing corporate and recreational aviation opportunities at the Airport.

Recreational flying opportunities are well served at the Airport due to the fact that several of the other airports in the area are better suited to cater to more business-related aviation activity that is typically conducted by larger and higher performance general aviation aircraft. The following table, entitled *AIRPORTS WITHIN 30-MILE RADIUS* provides comparative facility, based aircraft, and operational data on surrounding airports in the vicinity of Boulder. It should be noted that the aircraft representing the “higher end” of the general aviation sector are not entirely restricted from operating at Boulder; however, existing site development considerations, such as runway length, pavement strength, and airfield design standards combine to limit their operational capability at the Airport.

Table B2
AIRPORTS WITHIN 30-MILE RADIUS
Boulder Municipal Airport Master Plan Update

Airport Name	City	Distance to Boulder	Airport Identifier	Aircraft Storage	Total Based Aircraft	SE	ME	Jet	Helicopter	GL	UL	Average Operations per Day	Airport Use	Airport Ownership	ATCT	Instrument Approach
Boulder Municipal Airport ¹	Boulder	---	BDU	Tiedowns	190	125	20	0	0	45	0	165	Public	City of Boulder	No	No
Denver International Airport	Denver	28 NMs ESE	DEN	Hangars	5	0	2	3	0	0	0	1,509	Public	City & County of Denver	Yes	Yes
Erie Municipal Airport	Erie	8 NMs ESE	48V	Hangars & Tiedowns	204	194	5	0	1	0	4	197	Public	Town of Erie	No	Yes
Fort Collins-Loveland Municipal Airport	Fort Collins	26 NMs NNE	FNL	Hangars & Tiedowns	245	211	6	8	4	2	14	331	Public	City of Fort Collins & Loveland	No	Yes
JeffCo Airport	Denver	9 NMs SSE	BJC	Hangars & Tiedowns	460	352	70	30	8	0	0	514	Public	Jefferson County	Yes	Yes
Platte Valley Airpark	Hudson	24 NMs E	18V	Hangars & Tiedowns	26	25	1	0	0	0	0	79	Private	Platte Valley Airpark Limited	No	No
Vance Brand Airport	Longmont	8 NMs NNE	2V2	Tiedowns	339	274	42	0	7	0	16	274	Public	City of Longmont	No	Yes

Source: Website: www.airnav.com
1. The based aircraft counts and operational data reflect actual counts from year 2005.
SE: Single Engine
ME: Multi-Engine
Jet: Business Jet
GL: Glider
UL: Ultralight
ATCT: Air Traffic Control Tower

Economic Impact

Boulder Municipal Airport is recognized as a vital community asset that contributes to the stability and future of the area's economy. The Airport has been self-sufficient from a financial standpoint for many years, requiring no additional funding from the city of Boulder.

The Colorado Aeronautics Division conducted a study in 2003 that measured the Economic Impact of Airports in Colorado. According to that study, the Boulder Municipal Airport created 675 jobs (full and part time combined), and generated \$24,033,000 in wages (the full payroll expended for employees, including all taxes and benefits). These economic benefits include both direct and indirect jobs, wages and revenues. Additionally, the Airport generated \$56,986,000 in economic activity. The Airport is supported by numerous aviation-related facilities, including commercial glider operators, recreational glider clubs, aircraft maintenance, flight training, business/corporate activity, and recreational flying. In addition to the recreational and sport-use flying activity, the Airport is conveniently located to serve a variety of business and executive flying purposes.

Negative or Neutral Factors

As a general comment, the airport has very few negative factors and is in an enviable position due to its many positive features and conditions. However, there are some factors that can and do have a negative impact on the airport and the aviation industry, and these must be considered in the planning process.

The first issue is associated with the continued industry-wide aviation recovery efforts following the September 11, 2001 terrorist attacks. With the focus of the attacks directly involving the aviation industry, their impact rippled throughout the economy on the heels of the economic recession that began in early 2000. One of the beneficiaries of "Post 9/11" impacts on commercial air travel has been the business/corporate sector of the general aviation industry. Fractional and corporate aircraft ownership of business-use aircraft continues to expand due to increased travel times and inconvenience associated with commercial air travel that has resulted from the increased security requirements.

The second issue is the overall condition of the general aviation industry in the United States. Beginning in 1978, the general aviation industry experienced a significant recession, and the FAA has identified several factors that contributed to this prolonged downturn. These included three (3) economic recessions, two (2) fuel crises, the enactment of the Airline Deregulation Act of 1978, the repeal of the GI Bill, and the repeal of the investment tax credit.

More recently, the impacts to general aviation include the expense of owning and operating an aircraft (i.e., costs of insurance, fuel, and maintenance), competition from commuter airlines in the more open aviation market since airline deregulation, changes in disposable discretionary income, increases in air space restrictions affecting fair-weather flying, reductions in personal leisure time, and shifts in personal preference as to how leisure time is spent. These factors have significantly influenced the single-engine light aircraft segment of the industry in particular. In response, the general aviation industry has been focusing more on the business aircraft operator and less on the recreational operator.

There are also a number of bright spots having a positive impact in certain segments of the general aviation industry. They include the passage of the General Aviation Revitalization Act of 1994 that provides an eighteen (18) year limit on product liability lawsuits against general aviation aircraft and component manufacturers. This legislation has caused renewed interest and optimism among U.S. aircraft manufacturers, who are either, reentering the single engine aircraft market after several years' absence, or is increasing future production schedules to meet expected renewed demand. The growth in the amateur-built aircraft market, and the strength of the used aircraft market, indicate that demand for inexpensive personal aircraft is still relatively strong. Additionally, operations at non-towered U.S. airports has increased, supporting the belief held by many that much of the smaller general aviation sector has been forced out of towered airports because of the increased business and corporate general aviation activity and/or commercial air carrier activity that is typically associated with towered facilities.

The FAA's efforts to aid general aviation revitalization include streamlining the certification process for new entry-level aircraft and implementing measures to provide regulatory relief and reduce user costs (i.e., reduced rules, improving the delivery of FAA services by decreasing excess layers of management, and the elimination of unneeded programs and processes). Groups such as the Aircraft Owners & Pilots Association (AOPA) and the National Aeronautics and Space Administration (NASA) are sponsoring programs that aggressively promote the benefits of general aviation and learning to fly.

Historical and Existing Aviation Activity

A tabulation of the Boulder Municipal Airport's historical aviation activity since 1990 is presented in Table B3, entitled *HISTORICAL AVIATION ACTIVITY, 1990-2003*. This table presents a summary of historic aviation activity at the Airport, which includes four categories of aircraft operations, as well as total operations.

Table B3
HISTORICAL AVIATION ACTIVITY, 1990-2003
Boulder Municipal Airport Master Plan Update

Year	Air Taxi Operations	Itinerant GA Operations	Local GA Operations	Military Operations	Total Operations
1990	771	27,327	74,203	28	102,330
1991	696	24,681	67,017	25	92,419
1992	809	28,552	77,528	29	106,915
1993	811	28,742	78,046	29	107,629
1994	759	26,910	73,070	28	100,767
1995	770	26,408	71,710	20	98,908
1996	619	21,926	59,536	22	82,103
1997	673	22,391	60,857	20	83,941
1998	696	24,681	67,019	25	92,422
1999	654	23,164	62,898	24	86,739
2000	509	18,051	49,014	19	67,592
2001	528	18,727	50,851	19	70,126
2002	550	19,491	52,925	20	72,986
2003	535	18,224	49,483	20	68,262

Source: Boulder Municipal Airport Personnel with data collected from FAA Airport Master Record Form 5010, and glider tow plane records.

As the table indicates, total aircraft operations (an operation is defined as either a takeoff or a landing) at Boulder Municipal Airport in 2003 was 68,262 total operations¹. As the table indicates, aircraft operations have generally decreased since the early 1990's, but have stabilized over the past few years. Overall, aircraft activity remains well below the operational highs that were recorded in the early 1990's.

General Aviation Operations. General aviation operations are more typically tied to economic conditions than commercial passenger operations, and this trend is often

¹ Subsequent to the preparation of these forecasts in the summer of 2004, which have been approved by the FAA, the Airport has recorded 47,432 and 59,379 operations respectively for the years 2004 and 2005.

reflected in the historical operations data for a particular airport. In addition, within metropolitan areas such as Denver that have several general aviation airports, changes at one airport (i.e., airside or landside development projects, aviation business or airport closures, etc.) can have a profound impact on the operations and aircraft basing characteristics of the remaining airports of the system. Therefore, as economic conditions in the region continue to change and evolve, some fluctuation in the number of general aviation operations at the Airport will continue, although a trend toward moderate increases in operational activity is expected over the long-term. The general aviation operations mix is discussed below.

Air Taxi Operations. During the past decade the number of air taxi (i.e., air charter) operations has fluctuated significantly between 1990 and 2003 with a high of approximately 811 annual operations in 1993 and a low of approximately 509 in 2000. An Air Taxi operation is a small aircraft (ranging from 2 seats to a high of 60 seats) that makes short local flights, often to areas that are not serviced by regular airlines. These operations are typically for passenger or air freight service. The Boulder Municipal Airport has very little Air Taxi service. For purposes of this study, air taxi operations will be included in the general aviation operations category.

Military Operations. Historically, military aircraft have utilized Boulder Municipal Airport on a sporadic and infrequent basis. This limited use of the Airport by military aircraft is likely dictated by the limited runway length, limited pavement strength, lack of instrument approach capability, and surrounding availability of more suitable public-use and military aviation facilities. Military activity is expected to remain an insignificant component of the total operations for Boulder Municipal Airport.

Local and Itinerant Operations. Aircraft operations are placed into two categories, local and itinerant, and local operations generally reflect training operations. The *Air Traffic Control Handbook* defines a local operation as any operation performed by an aircraft operating in the local traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from flight in local practice areas, or aircraft executing practice approaches at the airport. For the most part, local operations are touch-and-go operations.

Itinerant operations are all other aircraft operations and are often associated with business aircraft activity. The historic data presented in the previous table indicate that local operations in 2003 accounted for approximately 72.5% of the total operations at the Airport. This is higher than what is typically true for most general aviation airports, but is reflective of a facility that accommodates a significant amount of recreational activity, consisting primarily of glider operations, and flight training.

Existing Operations by Aircraft Type

The current level of aviation activity by aircraft type is summarized in the following table, entitled *EXISTING OPERATIONS BY AIRCRAFT TYPE, 2003*. This summary indicates that of the estimated total 68,262 aircraft operations at the Airport in 2003, less than one percent (0.78%) were attributed to air taxi operations. With little military activity and no commuter/passenger airline activity, general aviation aircraft accounted for 99.19% of the airport's aviation activity.

As can be seen, Boulder Municipal Airport currently experiences a large number of single-engine general aviation operations when compared with multi-engine operations. Of the general aviation aircraft operations, it is estimated that single engine aircraft represented approximately 58% of such operations. Less than seven percent (6.59%) of general aviation activity was attributed to multi-engine aircraft, and approximately 28.28% was attributable to glider operations. In addition, there were an estimated 650 jet operations (i.e., approximately 0.95% of the annual activity) recorded at the Airport in 2003.

Table B4
EXISTING OPERATIONS BY AIRCRAFT TYPE, 2003
Boulder Municipal Airport Master Plan Update

Aircraft Type	Operations	Traffic Percentage
<i>Air Taxi</i> ¹	535	(0.78%)
<i>General Aviation</i>	67,707	---
Single Engine	39,803	(58.31%)
Multi-Engine	4,500	(6.59%)
Turboprop	3,000	(4.39%)
Glider	19,304	(28.28%)
Business Jet	650	(0.95%)
Helicopter	450	(0.66%)
<i>Military</i>	20	(0.03%)
TOTAL	68,262	(100.0%)

Source: Boulder Municipal Airport Personnel with data collected from FAA Airport Master Record Form 5010, and glider tow plane records.

1. *As presented in previous sections, the Airport has a limited amount of Air Taxi service and these operations will be included in the general aviation operations category.*

Based Aircraft

According to the Airport Manager, there are currently 234 aircraft based at Boulder Municipal Airport. Of this total, it is estimated that there are approximately 171 single engine aircraft, 23 multi-engine aircraft, 3 business jets, 2 helicopters, and 35 gliders². A historical summary of based aircraft is provided in the following table, entitled *SUMMARY OF BASED AIRCRAFT, 1990-2003*. The data was compiled from a combination of FAA and Airport Management records which did not differentiate between multi engine and turboprop aircraft.

Table B5
SUMMARY OF BASED AIRCRAFT, 1990-2003
Boulder Municipal Airport Master Plan Update

Year	Single Engine	Multi Engine	Business Jet	Helicopter	Glider	Total
1990	187	28	1	5	36	257
1991	187	28	1	3	34	253
1992 ¹	---	---	---	---	---	253
1993	171	24	3	6	44	248
1994 ¹	---	---	---	---	---	248
1995 ¹	---	---	---	---	---	244
1996	183	26	3	2	44	258
1997 ¹	---	---	---	---	---	272
1998	169	30	3	8	44	254
1999	169	30	3	8	44	254
2000	169	30	3	8	44	254
2001 ¹	---	---	---	---	---	254
2002	173	30	3	4	44	254
2003 ²	171	23	3	2	51	250

Source: FAA Airport Master Record Form 5010

--- Data not available

1. Terminal Area Forecasts obtained 3/25/2004 from the Federal Aviation Administration

2. Total based aircraft counts estimated by Airport Manager, with percentage breakdown extrapolated from Airport Master Record Form 5010 data.

² According to based aircraft estimates for 2005, there were a total of 190 based aircraft at the Airport. The breakdown of aircraft by type is as follows: 125 single engine, 20 multi-engine, 0 jets, 0 helicopters, and 45 gliders.

Aviation Activity Forecasts

General Aviation Activity Forecasts

As discussed earlier, recessions and growth periods in the country's economic cycle have historically affected aviation operations overall, and this trend is reflected in the historical operations data for the Airport. This operational trend is further defined at Boulder by the relatively high percentage of recreational flying that is conducted at the Airport. Due to the close relationship between recreational flying and disposable discretionary income, economic factors which influence aircraft ownership and operational costs will continue to impact future operational activity levels at Boulder.

Fluctuations in aviation fuel prices do have some impact on the hours flown by recreational pilots; however, the fixed costs associated with aircraft ownership (i.e., purchase price of new and used aircraft, insurance, including annual storage and maintenance costs) are typically the more critical factors influencing recreational flying activity. Regarding the issue of aircraft ownership costs, it's anticipated that the upcoming finalization of the FAA's new Sport Pilot and Light-Sport Aircraft certificates will provide both flying enthusiasts and would-be pilots with a safe, less complicated, and more cost effective option to own and fly aircraft. Light sport aircraft are simple, low performance aircraft that require as little as 20 hours of flight instruction to complete the specified certification requirements. Representative aircraft within this category include airplanes, weight-shift-control aircraft, powered parachutes, gyroplanes, gliders, balloons, and airships. Boulder Municipal Airport is particularly well-suited to accommodate the anticipated operational increases within this general aviation sector, and could benefit from the Airport's currently defined niche for recreational flying within the Denver Metropolitan Area. According to data from the current FAA Aerospace Forecasts document, the amateur-built and glider aircraft fleets nationally increased 7.4 percent and 2.4 percent respectively during the 2002 calendar year.

One additional factor that will influence future operational activity at Boulder is the availability of new aircraft storage facilities. Many general aviation aircraft are too valuable to store unprotected on apron tiedowns. The Airport Manager maintains a hangar wait list for aircraft owners who desire some type of hangar storage at the Airport, and the Airport's existing Recommended Improvement Plan, as defined by the existing Airport Layout Plan (ALP) identifies approved locations for additional aircraft storage facilities. Unfortunately, the high development costs associated with hangar construction coupled with the City of Boulder's planning and permitting costs have combined to limit the financial feasibility of such aviation development projects. However, increasing demand for aviation storage facilities at the Airport, in conjunction with new Federal grant funding

options³ for hangar development by airport sponsors that are administered through FAA's Airport Improvement Program, have the potential to help facilitate the construction of additional hangars at the Airport. In addition, the Federal share of airport improvement grants has been increased from 90% to 95%, and this funding level would be available for qualifying hangar development projects. Each of these factors, combined with the previously mentioned legislative action limiting general aviation aircraft and parts manufacturer's liability, could contribute to a future positive impact on general aviation activity at Boulder.

In developing the general aviation activity forecasts, several general aviation forecasts and national trends were reviewed, along with airport-specific historical data and trends that were identified within the northwest region of the Denver Metropolitan Area. Included in this assessment, and presented in the following table entitled *GENERAL AVIATION OPERATIONS FORECAST SCENARIOS, 2003-2023*, are several general aviation operational forecasts, including the forecast contained in the 1992 Boulder Municipal Airport Master Plan Update (MPU), the FAA Terminal Area Forecast Detail Report, and four (4) forecast scenarios developed for this study.

- **TAF:** FAA's Terminal Area Forecast Detail Report obtained 3/25/2004.
- **MPU:** The *1992 Airport Master Plan Update* completed in 1994 projected forecasts for the following years (as relevant to this forecast): 2006 and 2011. Analysis indicates that the MPU forecasted an approximate one and a half percent (1.42%) average annual growth rate through the year 2016 (using 94,559 operations as the base year).
- **Scenario One:** Projects an annual average growth rate of 0.7%, which is equal to the forecast contained in the *FAA Terminal Area Forecast* for overall general aviation activity.
- **Scenario Two:** This scenario utilizes the annual growth rate forecast in the FAA Aerospace Forecasts Fiscal Year 2004-2015 for general aviation aircraft operations (1.69 %) as a basis. However, the application of the recommended growth rate would be delayed for the first 5-years of the planning period to allow further recovery time of the national and regional economy. In addition, the rationale that it will likely be several years before new hangar facilities are constructed will also influence operational activity at the Airport. This forecast scenario is based on the assumption that general aviation operations at Boulder Municipal Airport will remain relatively unchanged during the initial years of the planning period, then grow at the same rate as that which is forecast nationally for general aviation

³ According to the funding provisions of the new Airport Improvement Program (AIP), entitled Vision 100-Century of Aviation Reauthorization Act, Subtitle C/Section 149: "At the Secretary's discretion, support facilities, including fuel farms and hangars, are allowable for an airport development project at non-primary airports provided the airport has made adequate provisions for financing airside development needs."

operations (i.e., maintain its present national market share). It should also be noted that this projected growth rate corresponds very closely with the forecasted population growth rate of 1.72% for the State of Colorado, and is only slightly higher than the projected 1.45% that is forecast for the Denver Metropolitan Area. Therefore, Scenario Two is the consultant recommended forecast scenario for this study⁴.

- **Scenario Three:** This scenario utilizes the annual growth rate forecast in the *FAA Aerospace Forecasts Fiscal Year 2004-2015* (recently published/current edition) for general aviation aircraft operations (1.69%) as a basis. This forecast scenario is based on the assumption that general aviation operations at Boulder Municipal Airport will begin to recover right away, in response to current economic trends, and grow at the same rate as that which is forecast nationally for general aviation operations (i.e., maintain its present national market share). As can be noted, this most recent FAA publication reflects a slightly more optimistic growth rate for general aviation activity nation wide.
- **Scenario Four:** This scenario reflects the positive influence of additional aircraft operations that would occur if additional hangar space would be constructed at the Airport in the short-term (5 year) planning period. Currently there is a waiting list for aircraft storage hangars. As with Scenario Three, this forecast scenario projects an increase of 1.69 percent per year (the average annual growth rate for general aviation contained in the *FAA Aerospace Aviation Forecasts Fiscal Year 2004-2015*). However, an additional 3,000 operations were added during the first 5 years as a result of accommodating the increased demand that the Airport currently has for additional hangar facilities.

⁴ For comparative purposes, see Appendix Seven for presentation of a Forecast Addendum table that reflects the use of the 2005 base year total operational counts of 59,379.

Table B6
GENERAL AVIATION OPERATIONS FORECAST SCENARIOS, 2003-2023
Boulder Municipal Airport Master Plan Update

Year	TAF ¹	1992 MPU ²	Scenario One 0.7%	Scenario Two ³ 1.69%/ (delayed)	Scenario Three 1.69%	Scenario Four 1.69%/ (accelerated)
2003	102,510	---	68,242	68,242	68,242	68,242
2006	---	118,363	---	---	---	---
2008	102,510	---	70,664	68,250	74,207	89,985
2011	---	124,304	---	---	---	---
2013	102,510	---	73,173	74,215	80,693	95,751
2018	102,510	---	75,770	80,701	87,746	101,887
2023	102,510	---	78,459	87,754	95,415	108,417

Source: BARNARD DUNKELBERG & COMPANY.

1. Terminal Area Forecasts obtained 3/25/2004 from the Federal Aviation Administration indicate no change through the 20 year planning period of this study.
2. Forecast obtained from the Boulder Municipal Airport Master Plan Update dated October 1992. It is important to note that the forecasts contained in this document did not break out total operations by category.
3. Recommended Selected Forecast.

Operations Forecast by Aircraft Type

A further assessment of the forecasts involves the individual and collective use of the airport by various types of aircraft. The types of aircraft expected to use the airport assists in determining the amount and type of facilities needed to meet the aviation demand.

The following table, entitled *SUMMARY OF OPERATIONS FORECAST BY AIRCRAFT TYPE, 2003-2023*, depicts the approximate level of use by aircraft types that are projected to use Boulder Municipal Airport⁵. This table reflects the slight growing percentage of turbine and multi engine powered aircraft anticipated to operate at the Airport, and the decreasing percentage of single engine powered aircraft. It is anticipated that this change in operational distribution will be due in part to the projected influx of micro jets into the general aviation fleet. Additionally, glider activity will continue to remain strong at the Airport, increasing slightly as well. This is indicative of the type of facility the Airport is, and the prevailing local economic conditions. As mentioned previously, there is no expected growth in military operations from the base year (2003).

⁵ Ibid., pg. 14

Table B7
SUMMARY OF OPERATIONS FORECAST BY AIRCRAFT TYPE, 2003-2023
Boulder Municipal Airport Master Plan Update

Operations by Type	2003	2008	2013	2018	2023
<i>General Aviation</i>	68,242	68,250	74,215	80,701	87,754
Air Taxi	535	546	594	646	702
Single Engine	39,803	39,653	42,559	46,282	50,327
Multi-Engine	4,500	4,505	4,898	5,326	5,792
Turboprop	3,000	3,003	3,265	3,551	3,861
Glider	19,304	19,451	21,522	23,403	25,449
Business Jet	650	683	891	1,009	1,097
Helicopter	450	410	445	484	527
<i>Military</i>	20	20	20	20	20
TOTAL	68,262	68,270	74,235	80,721	87,774

Source: BARNARD DUNKELBERG & COMPANY.

Local and Itinerant Operations Forecast

Forecasts of operations have also been categorized accordingly into local and itinerant operations, which were defined in a previous section of this chapter. The number of local operations will likely continue to be the dominant aircraft activity at the airport. Local operations account for 72.5% of all airport operations and this percentage is projected to decrease only slightly throughout the planning period. Based on this consideration, forecasts of local and itinerant operations are shown on the following table, entitled *SUMMARY OF LOCAL AND ITINERANT OPERATIONS, 2003-2023*.

Table B8
SUMMARY OF LOCAL AND ITINERANT OPERATIONS, 2003-2023
Boulder Municipal Airport Master Plan Update

Year	Local	Itinerant	Total
2003	49,483	18,779	68,262
2008	49,154	19,116	68,270
2013	53,078	21,157	74,235
2018	57,312	23,409	80,721
2023	61,442	26,332	87,774

Source: BARNARD DUNKELBERG & COMPANY.

Peak Period Forecast

An additional element in assessing airport use and determining various capacity and demand considerations is to ascertain peak period activities. In lieu of air traffic records or other reliable sources of information, FAA statistics and assumptions from airports with similar activity and operational characteristics have been applied to Boulder Municipal Airport. These include: ten percent (10%) of annual operations occur in the peak month, a 31-day peak month is assumed, and the peak hour operations that occur on the average day of the peak month occur approximately 10% of the time⁶.

⁶ During the course of this Master Plan Update, airport management began to collect a more detailed level of aviation data that can be utilized for statistical analysis in future airport planning documents.

Table B9
PEAK PERIOD AIRCRAFT OPERATIONS, 2003-2023
Boulder Municipal Airport Master Plan Update

Year	Annual	Peak Month	Average Day of Peak Month	Peak Hour/ Average Day Ratio	Peak Hour
2003	68,262	6,826	220	10.0%	22
2008	68,270	6,827	220	10.0%	23
2013	74,235	7,424	239	10.0%	24
2018	80,721	8,072	260	10.0%	26
2023	87,774	8,777	283	10.0%	28

Source: BARNARD DUNKELBERG & COMPANY from methodology contained in FAA AC 150/5070-6A *Airport Master Plans* and FAA AC 150/5060-5 *Airport Capacity and Delay*.

Based Aircraft Forecast

The number of general aviation aircraft, which can be expected to base at an airport facility, is dependent on several factors, such as airport radio communications, available facilities, airport operator services, airport proximity and access, aircraft basing capacity available at adjacent airports and similar considerations. General aviation operators are particularly sensitive to both the quality and location of their basing facilities, with proximity of home and work often being identified as the primary consideration in the selection of an aircraft basing location. According to Airport Management personnel, there is strong demand for additional aircraft storage facilities, and between 25 and 50 individuals are on a hangar wait list. Currently, the Airport has 190 based aircraft with approximately 85% of those stored in hangars or in trailers for the gliders.

Regarding the issue of available aircraft basing capacity at adjacent airports, it should be noted that there are currently over 1,000 based aircraft distributed among three (3) airports within a 10-mile radius surrounding Boulder (i.e., Vance Brand Airport, Erie Municipal Airport, and JeffCo Airport). According to current FAA Terminal Area Forecast projections, approximately 145 additional based aircraft are projected to be located at JeffCo Airport by the year 2020. Information on existing based aircraft at other area airports, which was previously presented in Table B2, also provides insight into the specific aircraft basing characteristics for each airport, relative to aircraft types (based aircraft breakdown), operational activity (daily operations), and key support facilities (ATCT and instrument approach capability).

It is important to note that generally there is a relationship between aviation activity and based aircraft, stated in terms of operations per based aircraft (OPBA). Sometimes a

trend can be established from historical information of operations and based aircraft. The national trend has been changing with more aircraft being used for business purposes and less for pleasure flying. This impacts the OPBA in that business aircraft are usually flown more often than pleasure aircraft. In 2003, the OPBA at Boulder Municipal Airport was approximately 292, below the average OPBA of 325 over the past 14 years. It is expected that the number of operations per based aircraft will increase at the airport as more aircraft based there are used for business and recreational purposes. The following table, entitled *GENERAL AVIATION BASED AIRCRAFT, 2003-2024* presents the forecasts for the twenty-year planning period.

Table B10
BASED AIRCRAFT FORECAST, 2003-2023
Boulder Municipal Airport Master Plan Update

Year	TAF ¹	1992 MP ²	Selected Forecast
2003	---	---	234 ³
2006	---	259	---
2008	306	---	251
2011	---	272	---
2013	306	---	266
2018	306	---	282
2023	306	---	298

Source: BARNARD DUNKELBERG & COMPANY.

1. Terminal Area Forecasts obtained 3/25/2004 from the Federal Aviation Administration indicate no change through the 20 year planning period of this study.
2. Forecast obtained from the Boulder Municipal Airport Master Plan Update dated October 1992. It is important to note that the forecasts contained in this document did not break out total aircraft by category.
3. Actual.

The mix of based aircraft for incremental periods is shown in the following table, entitled *BASED AIRCRAFT FORECAST BY TYPE, 2003-2023*. The percentage of multi engine turbine-powered aircraft has the potential to increase as a part of the total based aircraft population at the Airport. This is primarily related to overall national trends in general aviation, but it can be equally indicative of a growing local and regional economy. For the purposes of this Master Plan Update, aggregate growth (not to be confused with aircraft type growth on a percentage basis) is primarily forecast in the single-engine and glider aircraft types.

Table B11
BASED AIRCRAFT FORECAST BY TYPE, 2003-2023
Boulder Municipal Airport Master Plan Update

Aircraft Type	2003	2008	2013	2018	2023
Single Engine	171	182	192	202	213
Multi Engine	23	25	27	29	31
Business Jet	3	3	3	4	4
Helicopter	2	3	3	3	3
Glider	35	38	41	44	47
TOTAL	234	251	266	282	298

Source: BARNARD DUNKELBERG & COMPANY.

Summary

A summary of the aviation forecasts prepared for this study are presented in the following table, entitled *SUMMARY OF AVIATION ACTIVITY FORECASTS, 2003-2023*⁷. As can be noted from the table, the selected operational forecasts for the Airport reflect a flat growth rate for the first 5-years of the planning period, followed by a conservative average annual growth rate of just under 1.7%. According to *Aerospace Forecasts Fiscal Year 2006-2017* general aviation operations are forecast to increase at 1.9% annually. In addition, it is projected that the airport's existing aircraft basing patterns are likely to be continued in the future, with single engine and glider aircraft remaining as the dominant based aircraft categories throughout the planning period. This information will be used in the following chapters to analyze the capacity of the airport, develop facility requirements, and to determine future noise impacts and exposure. In other words, the aviation activity forecasts are the foundation from which future plans will be developed and implementation decisions will be made.

⁷ For comparative purposes, see Appendix Seven for presentation of a Forecast Addendum table that reflects the use of the 2005 base year total operational counts of 59,379.

Table B12
SUMMARY OF AVIATION ACTIVITY FORECASTS, 2003-2023
Boulder Municipal Airport Master Plan Update

Operations	2003	2008	2013	2018	2023
<i>General Aviation</i>	68,242	68,250	74,215	80,701	87,754
Air Taxi	535	546	594	646	702
Single Engine	39,803	39,653	42,599	46,282	50,327
Multi Engine	4,500	4,505	4,898	5,326	5,792
Turbo Prop	3,000	3,003	3,265	6,551	3,861
Business Jet	650	683	891	1,009	1,097
Helicopter	450	410	445	484	527
Glider	19,304	19,451	21,522	23,403	25,449
<i>Military</i>	20	20	20	20	20
Total Operations	68,262	68,270	74,235	80,721	87,774
Local Operations	49,483	49,154	53,078	57,312	61,442
Itinerant Operations	18,779	19,116	21,157	23,409	26,332
<i>Based Aircraft by Type</i>					
Single Engine	171	182	192	202	213
Multi-Engine	23	25	27	29	31
Business Jet	3	3	3	4	4
Helicopter	2	3	3	3	3
Glider	35	38	41	44	47
Total Based Aircraft	234	251	266	282	298

Source: BARNARD DUNKELBERG & COMPANY.

1. For comparative purposes, see Appendix Seven for presentation of a Forecast Addendum table that reflects the use of the 2005 base year total operational counts of 59,379.

Airport Reference Code (ARC)/Critical Aircraft Analysis

The types of aircraft presently utilizing an airport and those projected to utilize the facility in the future are important considerations for planning airport facilities. An airport should be designed in accordance with the Airport Reference Code (ARC) standards that are described in *AC 150/5300-13 Airport Design*. The ARC is a coding system used to relate and compare airport design criteria to the operational and physical characteristics of the aircraft intended to operate at the airport. The ARC has two components that relate to the airport's "Design Aircraft". The first component, depicted by a letter (i.e., A, B, C, D, or E), is the aircraft approach category and relates to aircraft approach speed based upon operational characteristics. The second component, depicted by a roman numeral (i.e., I, II, III, IV, or V), is the aircraft design group and

relates to aircraft wingspan (physical characteristic). Generally speaking, aircraft approach speed applies to runways and runway-related facilities, while aircraft wingspan is primarily related to separation criteria associated with taxiways and taxi lanes.

At Boulder Municipal Airport, it is projected that the most critical aircraft that will regularly utilize Runway 08/26 is the Beech Super King Air B200. This aircraft has a wingspan of 54.5 feet and an approach speed of 103 knots, which indicates that Runway 08/26 should continue to be designed in accordance with ARC B-II dimensional criteria (the next chapter will present a more detailed discussion on the topic of design standards). It is expected that the Beech Super King Air B200 will continue to be the critical aircraft using the Airport through the end of 20-year planning period of this master plan update. It should also be noted that the current Airport Layout Plan does not specify a critical aircraft or ARC designation for the glider runway (Runway 8G/26G); however, it is assumed that ARC B-I design criteria could be used as the applicable standard.

Table B13
SUMMARY OF OPERATIONS BY AIRPORT REFERENCE CODE, 2003-2023
Boulder Municipal Airport Master Plan Update

Operations by ARC	2003	2008	2013	2018	2023
A-I through B-I	46,832	46,689	50,301	54,669	59,447
B-II ⁽¹⁾	20,974	21,142	23,476	25,669	27,812
A-III ⁽²⁾ & C-II ⁽²⁾	436	420	437	460	495
TOTAL	68,242	68,250	74,215	80,701	87,754

Source: Operational estimates generated by BARNARD DUNKELBERG & COMPANY.

1. Operation count is represented by a combination of multi-engine turboprops, small business jets, and glider aircraft.
2. Operation Count is represented by a combination of large glider aircraft (i.e. ARC A-III) and small business jets (i.e. ARC C-II).