

Aircraft Activity Forecasts

Introduction

The forecasting of future aviation activity in terms of general aviation, air taxi operations and military aircraft operations at Centennial Airport serves as a significant basis for analyzing existing aircraft noise levels and identifying future noise levels. There are no scheduled commercial service operations at the airport. Forecasting, by its very nature, is not exact; however, it does establish some general parameters for aircraft operations and, when soundly established, provides a defined rationale for various noise mitigation scenarios.

Forecasting generally commences by utilizing the present time as an initial point, supplemented with historical trends obtained from previous year's activity and recorded information. This data has evolved from a comprehensive examination of historical airport records and recent planning documents relative to the airport. The intent of this section is to review the forecasts presented in the recent airport master plan; i.e., the 1996 *Centennial Airport Master Plan Update*, and update those forecasts as necessary for the short-term, five-year, planning horizon of this FAR Part 150 Study. It must be remembered that an airport master plan utilizes a twenty-year planning period but an FAR Part 150 Study, by regulation, utilizes a five-year planning period for determining future noise exposure. Therefore, the forecast period for this study will be five years after the date of submittal of the document, which translates into the year 2005 operations.

The 1996 *Centennial Airport Master Plan Update* utilized 1995 base data to forecast aviation activity at the airport. Fluctuations in both the nation and region's economy since that time have influenced aircraft activity since that document was produced, resulting in a need to update those forecasts. Several forecasting elements are pertinent to the aircraft noise and land use planning efforts at Centennial Airport. These forecasting categories include air charter operations, military aircraft operations and general aviation operations by aircraft type.

In developing the forecasts, the 1996 *Centennial Airport Master Plan Update* made several assumptions to help formulate the forecasts. These are presented below:

- With the closure of Stapleton International Airport and the opening of Denver International Airport, a greater portion of general aviation users will want to use Centennial Airport.
- Air charter operations were two percent (2%) of total operations in 1995 and will increase to three percent (3%) of total activity by 2015.
- Military operations are mostly US Air Force Academy cadets performing touch-and-go operations, with those operations remaining at 6,000 per year.
- General aviation operations will continue to account for approximately ninety-five percent (95%) of the total operations.
- Local operations are expected to level off at 205,000 through out the planning period, with itinerant activity increasing so that local operations account for forty-five percent (45%) of total operations by 2015.

These assumptions may or may not hold true for this forecast evaluation process. A determination concerning the assumptions will be made as more information from the noise monitoring sequence becomes available.

Historical Airport Activity

A tabulation of Centennial Airport's historical aviation activity since 1992, with average operations for 1987-1991, is presented in Table B1, entitled *HISTORICAL AVIATION ACTIVITY, 1992-1999*.

Table B1
SUMMARY OF HISTORICAL OPERATIONS, 1992-1999
Centennial Airport FAR Part 150 Study

Year	Operations
1987-91 Average	364,999
1992	376,417
1993	415,453
1994	422,463
1995	402,325
1996	359,704
1997	408,602
1998	466,267
1999	436,081

Source: Airport Activity Reports

As can be seen, operations for 1999 are less than 1998 levels but greater than other years shown.

Operations Forecast

In evaluating the 1996 *Airport Master Plan Update* forecasts, a comparison of forecasted operations with comparable actual operations would be informative. This would determine past or current realization of forecasted operations which would aid in any adjustments to forecasted activity levels. However, the time period has been very short since the Master Plan was completed and the Master Plan forecasts were presented in five year increments, starting in 2000. Therefore, there is no data to compare forecasted levels with actual levels of operations. In this instance, a comparison of forecast activity levels for extended years with actual levels that have occurred since 1995 is a helpful starting point. In 1998 there were 466,267 operations at the airport. The Master Plan only forecast 461,000 by the year 2015, thus the airport has already exceeded the twenty year forecast presented in the Master Plan.

However, in 1996 operations were less than in 1995 and in 1997 they were only slightly greater than in 1995. This is very common at general aviation airports where operations vary greatly between years. In these instances it is the overall trend in operations that is important. The operations forecasts presented in the 1996 *Airport Master Plan Update* are presented in the following table, Table B2, entitled *COMPARISON OF MASTER PLAN FORECASTS AND OTHER FORECASTS*, along with the actual number of such operations that occurred for comparable years and the adjusted forecast. The adjusted forecast reflects the *averaged* difference in actual and forecasted operations for 1995 through 1998 carried forward to 2015. In addition, the table also presents two "trend projections" and the Federal Aviation Administration's *Terminal Area Forecasts*. The trend projections assume that whatever occurred in the past will occur in the future. Trend 1 is utilizes historical operations since 1991 to determine the straight line trend. Trend 2 utilizes historical operations since 1995 to determine the straight line trend. The *Terminal Area Forecasts* (TAF) are updated yearly by the FAA and represent the official forecasts used by the FAA for planning purposes. As can be seen, each trend line results in a significantly different number of operations when carried out to 2015, which is obviously dependent upon which year is picked as the starting point.

For the FAR Part 150 forecasting purposes, the fifth year after submittal of the document is the end of the planning horizon. Thus, the 2005 forecasts will be used for this FAR Part 150 Study. In evaluating the various forecasts presented below, several factors need to be considered. The first is that operations are always fluctuating at a general aviation airport due to many contributing factors. These

include the price of fuel, the ability to finance pilot training activities, economic growth specific to the area, congested facilities at other airports, congestion at this airport, navigational aids and airport services, and landside operating cost. It is also unreasonable to assume that whatever conditions occurred in the past will continue to occur in the future. In other words, the airport experienced a significant increase in operations in 1998 (approximately fourteen percent increase), with similar increases not expected to occur every year. In addition, the theoretical annual capacity of the airport is approximately 525,000 operations. Once this number of operations is achieved, delay becomes such that aircraft will normally use another airport in the vicinity, with all things being equal. Therefore, the number of operations indicated by Trend 2 is considered to be unreasonable for the short-term planning period. It is recommended that the TFA be used as the forecasts for this Study. The TAF is a reasonable projection, very similar to Trend 1, which reflects fluctuations in actual operations but represents a growing trend in overall operations. This projection is significantly higher than the Master Plan forecast and higher than the Adjusted Forecast, but is lower than the trend projection based on historical operations since 1995.

Table B2
COMPARISON OF MASTER PLAN FORECASTS AND OTHER FORECASTS
Centennial Airport FAR Part 150 Study

Year	Master Plan	Actual	Adjusted ^b	TAF	Trend 1	Trend 2
1995	402,325	402,325				
1996 ^a	405,140	359,704				
1997 ^a	407,955	408,602		406,704		
1998 ^a	410,770	466,267		422,937		
1999 ^a	413,585	436,081	424,293	429,942	432,126	469,406
2000	416,400		427,108	436,947	438,655	493,478
2001 ^a	419,320		430,028	443,954	445,184	517,550
2002 ^a	422,240		432,948	450,959	451,713	541,623
2003 ^a	425,160		435,868	457,966	458,243	565,695
2004 ^a	428,080		438,788	464,971	464,772	589,768
2005	431,000		441,708	471,977	471,301	613,840
2010	446,000		456,708	507,006	503,984	734,202
2015	461,000		471,708	542,037	536,594	854,564

^a BD&C Extrapolation

^b These are adjusted based on the average difference between actual and forecast, 1995-1998.

Trend One Trend projection from 1991

Trend Two Trend projection from 1995

As can be noted by the TAF, total annual operations are anticipated to increase moderately through the five-year planning period. Overall, total annual operations are expected to increase moderately (approximately one percent) by the year 2005 over 1998 figures. This also represents an increase of approximately sixteen (16) percent over 1997 figures and an increase in approximately eight (8) percent over 1999 figures, again illustrating the dramatic increase in operations that occurred in 1998.

Operations Forecast By Aircraft Type

Although total annual operations are very important in generating noise contours, of equal if not greater importance, is the aircraft mix that is represented in the forecast. The aircraft mix refers to the *type* of aircraft that make up the annual forecast; for example, 150,000 single engine piston aircraft operations generate a much different noise contour than 150,000 business jet operations. There are no records of aircraft operations by type of aircraft, other than category, such as air charter/taxi, military and general aviation. The 1996 *Airport Master Plan Update* did make an attempt to generate a fleet mix, by aircraft type, for both the existing and future operations. This information is presented in the following table, Table B3, *SUMMARY OF AIRCRAFT OPERATIONS BY AIRCRAFT TYPE, 1995-2015, AIRPORT MASTER PLAN, 1996*. In addition, the 1996 *Noise and Land Use Study* also presented similar, but different, information. That Study contains a breakdown of both existing and future aircraft operations by specific aircraft types, which are presented in Table B5, along with the percentage of the total operations for each type.

As can be seen, both documents contain a different fleet mix, by percentage, for both the existing and future forecast conditions. Even though they are different, this is useful information and can be used as a starting point for additional refinement. During the noise monitoring program, additional and more detailed information concerning aircraft types will be collected. Subsequent to the noise monitoring, an updated aircraft fleet mix will be presented for consideration.

Table B3
**SUMMARY OF OPERATIONS BY AIRCRAFT TYPE, BY PERCENT, 1995-2015
 AS PRESENTED IN THE AIRPORT MASTER PLAN, 1996**
Centennial Airport FAR Part 150 Study

Operations By Type	1995^a	2000	2005	2010	2015
Business Jets	8.5	11.9	13.3	14.5	16.6
Turboprop	4.0	4.9	5.0	5.2	5.5
Piston	84.5	80.8	79.2	77.8	75.5
Helicopter	2.0	2.4	2.5	2.5	2.4

^a Actual Source: Table IV.1, Centennial Airport Master Plan Update (Revised 11/7/96)

Table B4
SUMMARY OF OPERATIONS BY AIRCRAFT TYPE, 1995-2000
AS PRESENTED IN THE NOISE AND LAND USE STUDY, 1996
Centennial Airport FAR Part 150 Study

Operations By Type	1995^a		2000	
Business Jets <i>Stage 3</i>	16,093	4%	24,948	6%
Business Jets <i>Stage 2</i>	8,047	2%	8,328	2%
Turboprop	20,116	5%	29,148	7%
Piston	354,046	88%	349,776	84%
Helicopter	4,023	1%	4,164	1%
TOTAL OPERATIONS	402,325		416,400	

^a Actual

Table B5 shows the actual aircraft operations that occurred at the airport in 1999. The breakdown of aircraft types is based on tower counts, observations during the noise monitoring sequence and several months worth of radar tracking of aircraft. This information will be used to generate the existing noise contour.

Table B5

SUMMARY OF OPERATIONS, EXISTING 1999
Centennial Airport FAR Part 150 Study

Category Type	Annual Operations	Daily Operations	Percent Nighttime
<i>Business Jets</i>			
Stage 3	27,406	75.1	25%
<i>Business Jets</i>			
Stage 2	5,594	15.3	19%
<i>General Aviation</i>			
Single Engine Piston	330,081	904.6	5%
Multi-Engine Piston	37,000	101.4	5%
Turboprop	24,000	65.7	5%
Helicopter	12,000	32.9	5%
Total Operations	436,081	1,195	

Revised Forecasts Scenarios

Based on discussions with the Advisory Committee, the Federal Aviation Administration and Airport staff, it seems reasonable that the FAA Terminal Area Forecasts be used for the five-year future operation forecasts. However, the mix of aircraft contained in this forecast, especially the allocation of Stage 2 and Stage 3 business jets, can result in potentially significant differences in overall noise levels. Therefore, prior to identifying one forecast of aircraft operations for noise contour modeling, several Stage 2/Stage 3 business jet allocations will be examined and modeled. The first scenario will be based on the Stage 2/Stage 3 business jet percentages remaining at the same level as occurred in 1999, 17 percent Stage 2

and 83 percent Stage 3. The second scenario will increase the Stage 3 business jet percentage to 87 percent of the business jet fleet, which is industry estimate for the national business jet fleet in the near future. The third scenario assumes the same number of Stage 2 operations as in 1999 with Stage 3 business jets experiencing the increase. In each scenario, the Terminal Area Forecasts showing a total of 471,977 operations will be used, with the growth in operations over 1999 levels will all be a result of the business jet aircraft. The other general aviation aircraft operations are forecasted to remain the same. This will result in the most aggressive forecast and most significant aircraft noise levels. The business jet operations dominate the noise contours, the other general aviation aircraft operations could almost double and they would not impact the size of the contours. The results of this analysis is presented in the Noise Analysis Chapter.