

CHAPTER 4

DEMAND/CAPACITY ANALYSIS

INTRODUCTION

The demand/capacity analysis examines the capability of the airfield system at Blue Grass Airport (LEX) to address existing levels of activity as well as determine the capability of the airfield to meet the projected future levels of demand without incurring adverse levels of aircraft delay stemming from an airfield deficiency. This assessment will be conducted by comparing the results of several different methodologies. The following chapter, “Facility Requirements”, will provide the specific recommendations intended to address any deficiencies identified in this analysis.

While elements of the traditional Federal Aviation Administration’s (FAA) methodology for assessing airfield capacity have been conducted, the focus of this analysis does not depend solely on the definition of Annual Service Volume (ASV) as a measure of airfield capacity. The determination of ASV at LEX was undertaken to provide the basis for estimating the levels of delay that would result as the Airport reached various operational levels over, and even beyond, the planning horizon. In the past, the emphasis on ASV as an absolute capacity value has tended to oversimplify the more complex considerations that drive decisions relative to undertaking a major airfield development program including incurred hourly and annual delay and the cost of this delay to users. The FAA has developed a very detailed Benefit Cost Analysis process for the purpose of comparing the cost of a proposed capacity enhancement against the cost to airport users of not mitigating an identified capacity need, but often the development of this detailed analysis occurs after a master plan recommendation has been developed. It is the intent of this analysis to provide the Lexington Fayette Urban County Airport Board (LFUCAB) and the community an assessment of not only ASV, but also of the potential future cost of delay to users. This information will be used as a basis of discussion and as a tool for decision makers in determining the need and possible timing of future potential airfield improvements.

As a starting point, the LFUCAB has employed the same methodology that has been used in the past to assess the adequacy of the airfield to meet demand at LEX. The intent of this analysis was to define the hourly aircraft operational capacities of the runway system during periods of both visual flight conditions and instrument flight conditions. Additionally, the current FAA methodology for assessing airfield capacity for long range planning as expressed by the ASV level was also used to define the extent to which aircraft operations will incur operational delay as activity at LEX increases. The results of these analytical efforts were then compared to the previous master planning study to identify changes that have occurred since the last master plan relative to aircraft fleet mix, operational procedures or other changes in data input to the analysis that would influence the need for and timing of potential runway and taxiway improvements. Consideration is also given to airfield capacity enhancement beyond the 20-year planning horizon.

As alluded to above, the ASV value will be used to define the anticipated minutes of delay per aircraft operation and total annual delay figures. Additionally, this chapter will examine the specific hourly operational costs of the fleet of aircraft operating into and out of LEX. These costs, referred to as block hour costs of operations, when multiplied by the minutes or hours of delay per aircraft operation, provides a general idea of the annual cost of delay to the specific airport users at varying levels of forecasted aircraft activity. This cost of delay will ultimately need to be compared against the development alternatives cost to derive an estimate on the return of such a capacity enhancing development. In short, if airport users are incurring \$300,000 of annual delay costs, but mitigating these impacts costs \$60 million, the return on the proposed investment may not be warranted by the

financial benefits that are achieved. Typically, the ASV assessment has been used to provide an approximate time that future capacity enhancements would likely be necessary without consideration of the potential cost versus benefit considerations. While it is possible that the ASV values may suggest that capacity enhancements need to be considered, it is also possible that the cost of doing so may outweigh the benefits to be achieved rendering potential improvements of questionable viability.

FEDERAL AVIATION ADMINISTRATION METHODOLOGY

The FAA’s standard method for determining airport capacity and delay for long-range planning purposes can be found in Advisory Circular (AC) 150/5060-5, Change 2, entitled “Airport Capacity and Delay”. For this portion of the analysis, generalized qualitative airfield capacity was calculated in terms of the hourly capacity of the runways, annual service volume, and average aircraft delay, using the FAA’s methodology. This approach utilizes the projections of annual operations by the specified fleet mix as projected in the Aviation Activity Forecasts while considering a variety of other factors that are described in the following sections.

Airfield Characteristics

In addition to the updated aviation activity forecasts, a number of an airport’s airfield characteristics and operational conditions are required in order to properly conduct the FAA capacity analyses. The elements that affect airfield capacity are:

- Runway Configuration;
- Aircraft Mix Index;
- Taxiway Configuration;
- Operational Characteristics; and,
- Meteorological Conditions.

When analyzed collectively, the above elements provide the basis for establishing the generalized operational capacity of an airport as expressed by Annual Service Volume. The following sections will evaluate each of these capacity characteristics with respect to LEX.

Runway Configuration

The airfield configuration for LEX includes two paved runways. The primary runway, Runway 4-22, has a northeast to southwest orientation, while Runway 8-26, the crosswind runway, has more of an east to west alignment. The intersection of the two runways occurs approximately 1,295 feet from the Runway 22 threshold and 1,074 feet from the Runway 26 threshold.

Aircraft Mix Index

Knowing the mix of the aircraft fleet operating into and out of the Airport as was identified in the forecast analysis, it is possible to establish an aircraft fleet mix index as required in the FAA methodology, as one element needed to compute the airfield’s capacity. The aircraft mix index is calculated based on the gross weight of the specific aircraft expected to serve an airfield.

Exhibit 4A provides examples of typical aircraft for each of the FAA's four aircraft size/gross weight classifications. The aircraft indexes are based on the following gross weight characteristics:

- Class A and B: Under 12,500 pounds;
- Class C: 12,500 pounds to 300,000 pounds; and,
- Class D: Over 300,000 pounds.

The formula as expressed in FAA guidance for calculating the mix index is the $\%(C + 3D)$ where C refers to the percentage of aircraft over 12,500 pounds up to 300,000 pounds and D refers to aircraft over 300,000 pounds. Aircraft under 12,500 pounds do not count towards the calculation of mix index. As can be seen by the typical aircraft types by Class illustrated by **Exhibit 4A**, the aircraft types in Classes A and B consist primarily of single-engine and small twin-engine aircraft, while the vast majority of the corporate business jet fleet is contained within Class C. At LEX, the current and future operational fleet mixes include aircraft from all four aircraft classes. However, because the number of aircraft in the D classification is so limited and the projections for these heavy aircraft remain minimal, the inclusion of D aircraft was not considered a realistic assumption for capacity calculation purposes.

Using the FAA formula, the aircraft mix index for LEX ranges from a 2001 index of 66 to a 2022 index of 71. As the mix index rises, the overall airfield capacity diminishes slightly. This is primarily because air traffic control must provide greater separation between the C and D aircraft and other aircraft types due to the dangers of the wake turbulence associated with larger aircraft.

Taxiway Configuration

As mentioned in the Inventory, Runway 4-22 has a full-length parallel taxiway, which is designated as Taxiway A. Taxiway A is separated from the runway centerline of Runway 4-22 by 300 feet, which does not comply with current FAA design requirements. Because of the 300-foot separation distance, an aircraft holding position, which is used when LEX is under instrument flight rules (IFR) conditions, has been established on Taxiway A at a point roughly 4,000 feet from the threshold of Runway 4. This situation reduces airfield capacity when aircraft arriving and departing Runway 4 are operating under actual instrument meteorological conditions (IMC). This operational configuration, with arrivals and departures on Runway 4, is employed an estimated 20 percent of the time, which tends to mitigate the adverse impact of the inadequate separation between the runway and the taxiway.

Not counting the intersection of Runway 4-22 and 8-26, there are eight connector taxiways linking Runway 4-22 with Taxiway A. Based on the FAA's criteria for appropriately located taxiway exits, the taxiway exit factor is maximized when a runway has four exit taxiways within a range determined by the aircraft using that runway. For a mix index of 66 or 71, this range is between 3,500 feet to 6,500 feet from the landing threshold, with exits spaced at least 750 feet from each other. Using the FAA criteria, arrivals to Runway 4 are considered to have three exits while arrivals to Runway 22 have two exits in the range. Because the exit factor is only considered for arriving aircraft, the Runway 4-22 to Taxiway A non-compliant separation distance described above cannot be fully accounted for in the FAA's methodology. This problem primarily impacts departures and as such is limited by the percentage of time the runway is operating in a Runway 4 flow.

Application of the exit range to Runway 8-26 would result in no available exits despite the fact this runway is served by Taxiways A, C, and F. The reason is because this runway is only published as 3,500 feet long. However, according to interviews with air traffic control tower (ATCT) staff, Runway 8-26 is

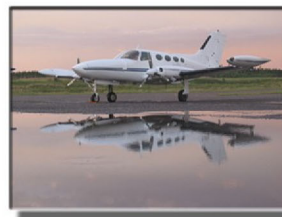
CLASS A:

Small single-engine aircraft, gross weight
12,500 lbs or less



CLASS B:

Small multi-engine aircraft, gross weight
12,500 lbs or less



CLASS C:

Large aircraft, gross weight
12,500 to 300,000 lbs



CLASS D:

Heavy aircraft, gross weight
more than 300,000 lbs



not used very often due to its condition, the prohibition of land and hold short operations (LAHSO), and that there is no aviation-related development in close proximity to the runway.

Operational Characteristics

Significant operational characteristics that can affect an airfield's overall capacity include the percentage of aircraft arrivals and the percentage of touch-and-go or local training operations.

Percentage of Aircraft Arrivals

The percentage of aircraft arrivals is the ratio of landing operations to the total operations at an airport. This percentage is considered due to the fact that aircraft approaching an airport for landing require more runway occupancy time than an aircraft departing the airfield. The FAA methodology used herein provides for computing airfield capacity with a 40, 50, or 60 percent of arrivals figure. The 40 and 60 percent figures result in an average annual service volume variance of ± 11 percent when compared to the 50 percent level, with the lower percentage (40) having the highest capacity.

After a review of the air traffic control tower data and the airline schedules, there are no significant peak periods when the Airport is considered to have more arrivals than departures. In fact, due to the operational requirements of the airlines serving LEX and limited ramp space, most of the commercial passenger flights serving LEX do not have significant dwell times. All of these flights are considered either origin or destination flights and as such, the various carriers try to hit the respective banks at the hubs they fly into or from. This mode of operation is not expected to change significantly throughout the planning period. Therefore, for the purposes of this analysis, the 50 percent of arrivals value was utilized as an average or neutral effect to determine the overall capacity at LEX.

Percentage of Touch-and-go Operations

The percentage of touch-and-go operations plays a key role in the determination of airport capacity. Touch-and-go operations are counted as one landing and one takeoff (i.e., two operations) and are normally associated with flight training activities. Based on interviews with airport management and airport tenants, the level of touch-and-go operations at LEX have decreased significantly over the past 10 years. Much of this activity has shifted to a variety of other general aviation airports in the area such as the ones in Georgetown or Richmond. While there are still some general aviation and even commercial airline and military training touch-and-go operations conducted at LEX, these operations represent less than ten percent of the total operations. With the exception of the no touch-and-go category, this places LEX in the lowest range (1 to 10 percent) in the FAA's methodology. It is projected that the Airport will stay in this range throughout the entire planning period.

Meteorological Conditions

Meteorological conditions influence the decision as to which runway end a pilot will choose to make an approach from based on wind and other weather related conditions. Thus, these conditions can have an affect on the overall capacity for the airfield. Runway utilization is normally determined by wind conditions while the cloud ceiling and visibility dictates spacing requirements.

Based on the review of wind data from the National Climatic Data Center (NCDC), coordination and discussions with FAA Air Traffic Control Tower (ATCT) staff, Runway 4 experiences approximately 20 percent of the Airport's total annual operations (aircraft takeoffs and landings), and Runway 22 is utilized

approximately 80 percent of the time. Much of this is due to the fact that for most of the year, the prevailing winds come out of the west and southwest. While the wind will come out of the north on occasion, this typically only occurs during the winter months and even then on a limited basis. While Runway 22 is the primary end utilized for aircraft operations, Runway 4 does have better descent and visibility minimums as outlined in the Inventory chapter.

Although operations do occur on Runway 8-26, they are very infrequent as indicated previously. Based on ATCT input banner, towing operations are probably the most frequent use of Runway 8-26. For the purposes of the FAA methodology, Runway 4-22 is of primary concern as it is the only runway that can accommodate larger aircraft in the C and D capacity classifications, which as described earlier, drive the mix index for the capacity calculations.

There are three measures of cloud ceiling and visibility conditions recognized by the FAA in calculating the capacity of an airport. These include:

- Visual Flight Rules (VFR) – Cloud ceiling is greater than 1,000 feet above ground level (AGL) and the visibility is at least three statute miles.
- Instrument Flight Rules (IFR) – Cloud ceiling is at least 500 feet AGL but less than 1,000 feet AGL and/or the visibility is at least one statute mile but less than three statute miles.
- Poor Visibility and Ceiling (PVC) – Cloud ceiling is less than 500 feet AGL and/or the visibility is less than one statute mile.

LEX experiences VFR conditions 85.5 percent of the time, IFR conditions 14 percent of the time, and poor visibility and ceiling conditions 0.5 percent of the time. These percentages are approximations based on the historic data collected by the National Weather Service during the period when they had an operating weather reporting station at the Airport.

Airfield Capacity Analysis

The preceding airfield characteristics were used in conjunction with the methodology developed by the FAA to determine airfield capacity. As mentioned previously, this FAA methodology generates the hourly capacity of runways and the annual service volume for measuring airfield capacity.

Hourly Capacity of Runways

Hourly capacity of the runways measures the maximum number of aircraft operations that can be accommodated by an airport's runway configuration in one hour. Based on the FAA methodology, hourly capacity for runways is calculated by analyzing the appropriate VFR and IFR figures for an airport's runway configuration. From these figures, the aircraft mix index and percent of aircraft arrivals are utilized to calculate the hourly capacity base. A touch-and-go factor is also determined based on the percentage of touch-and-go operations combined with the aircraft mix index. These figures also consider the taxiway exit factor.

For both VFR and IFR conditions, the hourly capacity for runways is calculated by multiplying the hourly capacity base, touch-and-go factor, and exit factor. This equation is:

$$\text{Hourly Capacity} = C^* \times T \times E$$

where: C* = hourly capacity base
 T = touch-and-go factor
 E = exit factor

An airport’s mix index can substantially change the value of the hourly capacity base in the FAA capacity tables. The slight change in the hourly capacities shown in **Table 4-1** below is due to the change in the mix index between 2001 and 2022. While this had some effect on both the VFR and IFR capacities, it resulted in very little change. The weighted hourly capacities shown were calculated using the percentages that these conditions occurred at LEX.

Year	VFR Operations/Hour	IFR Operations/Hour	Weighted Hourly Capacity (Cw)
Base Year			
2001	76	57	73
Forecast			
2022	75	57	72

Source: LPA GROUP INCORPORATED, 2002.

ANNUAL SERVICE VOLUME

Under the FAA methodology, the most important value that must be computed in order to evaluate the capacity at an airport is the annual service volume (ASV). ASV represents a measure of the approximate number of total operations that an airport can support annually. In other words, the theoretical limit of operations that an airport can safely accommodate is represented by the ASV. Using the FAA’s methodology to estimate ASV, first the ratio of annual operations to average daily operations, during the peak month, is calculated along with the ratio of average daily operations to average peak hour operations, during the peak month. These values are then multiplied together and the resulting product is multiplied by the weighted hourly capacity.

Thus, the equation used to calculate the ASV is given below:

$$\text{Annual Service Volume} = Cw \times D \times H$$

where: Cw = weighted hourly capacity
 D = ratio of annual operations to average daily operations during the peak month
 H = ratio of average daily operations to average peak hour operations during the peak month

For the equation, the weighted hourly capacities shown in **Table 4-1** were utilized with the values calculated for the variables D and H. The following sections describe how these values were calculated for D and H.



The official Airport Traffic Records were obtained from the Airport to evaluate the characteristics of peak month, day, and hourly operations. Over the past five years, these records showed that October was the busiest month for four of the years. In the fifth year it was June; however, October was the second closest month with very little difference in the number of operations. Over the past five years, the busiest month has fluctuated from a low of 9.1 percent in 1999 to a high of 10.5 percent of the annual operations in 1998. This results in an average of 9.8 percent for the past five years. It is worth mentioning that even after September 11th, October 2001 not only represented the busiest month for the year, but also was just under the five-year average at 9.6 percent of the 2001 annual operations.

The average daily operations during the peak month was derived by taking the number of operations calculated for the peak month and dividing that figure by the number of days in the peak month, which for October is 31 days. For 2022, the average daily operations during the peak month was derived by taking 10 percent of the forecast operations for that year and then dividing by 31. It is assumed that as operations increase, the level conducted during the busiest month would experience a slight increase. The slight increase from 9.6 to 10 percent is based on to the expected increase in commercial service frequency addressed in the forecasts for passenger airline service. The above information was used to calculate the ratio of annual operations to average daily operations during the peak month (D) for the ASV calculation. The results are reflected in **Table 4-2**.

The hourly data for October 2001 was analyzed to determine the average peak hour operations that occurred during that peak month. Over the 31 days, the peak hour ranged from a low of 17 to a high of 49 operations. This resulted in an average of 32. This represents 11.4 percent of the average daily operations occurring that month. As with the average daily operations, the average peak hour for 2022 is expected to increase slightly. Therefore, by applying the same percentage to the already adjusted average daily operations (of the peak month) figure for 2022, the average peak hour (of the peak month) for 2022 was calculated. Since the same hourly percentage was used, the hourly demand ratio (H) for both 2001 and 2022 are the same. The results, reflected in **Table 4-2**, were then used in the calculation for ASV.

TABLE 4-2 CALCULATION OF DEMAND RATIOS		
Element	2001	2022
Annual Operations	90,422	125,387
Average Daily Operations – Peak Month	280	404
Daily Demand Ratio (D)	323	310
Average Daily Operations – Peak Month	280	404
Average Peak Hour – Peak Month	32	46
Hourly Demand Ratio (H)	9	9

Source: LPA GROUP INCORPORATED, 2002.

The final ASV calculations are reflected in **Table 4-3**. This value was then compared to the existing and forecast level of annual operations for LEX. According to the FAA methodology, a demand that exceeds the ASV will result in significant delays on the airfield. However, no matter how substantial an airport’s capacity may appear, it should be realized that delays can occur even before an airport reaches its stated capacity. In fact, a number of projects that would increase the capacity at an airport are eligible for funding from the FAA. According to FAA Order 5090.3B, “Field Formulation of the National Plan of Integrated Airport Systems (NPIAS),” this eligibility is achieved once the airfield has reached 60 percent of its current capacity. This allows improvements to be made before demand levels exceed the capacity of the facility in order to avoid lengthy delays. Future capacity levels



for LEX have been calculated based on the forecasted annual operations and the calculated ASV for the Airport. These levels are depicted in **Table 4-3** and are shown graphically in **Exhibit 4B**.

TABLE 4-3 ANNUAL SERVICE VOLUME			
Year	Annual Operations	Annual Service Volume	Capacity Level
Base Year			
2001	90,422	212,211	43%
Forecast			
2022	125,387	200,880	62%

Source: LPA GROUP INCORPORATED, 2002.

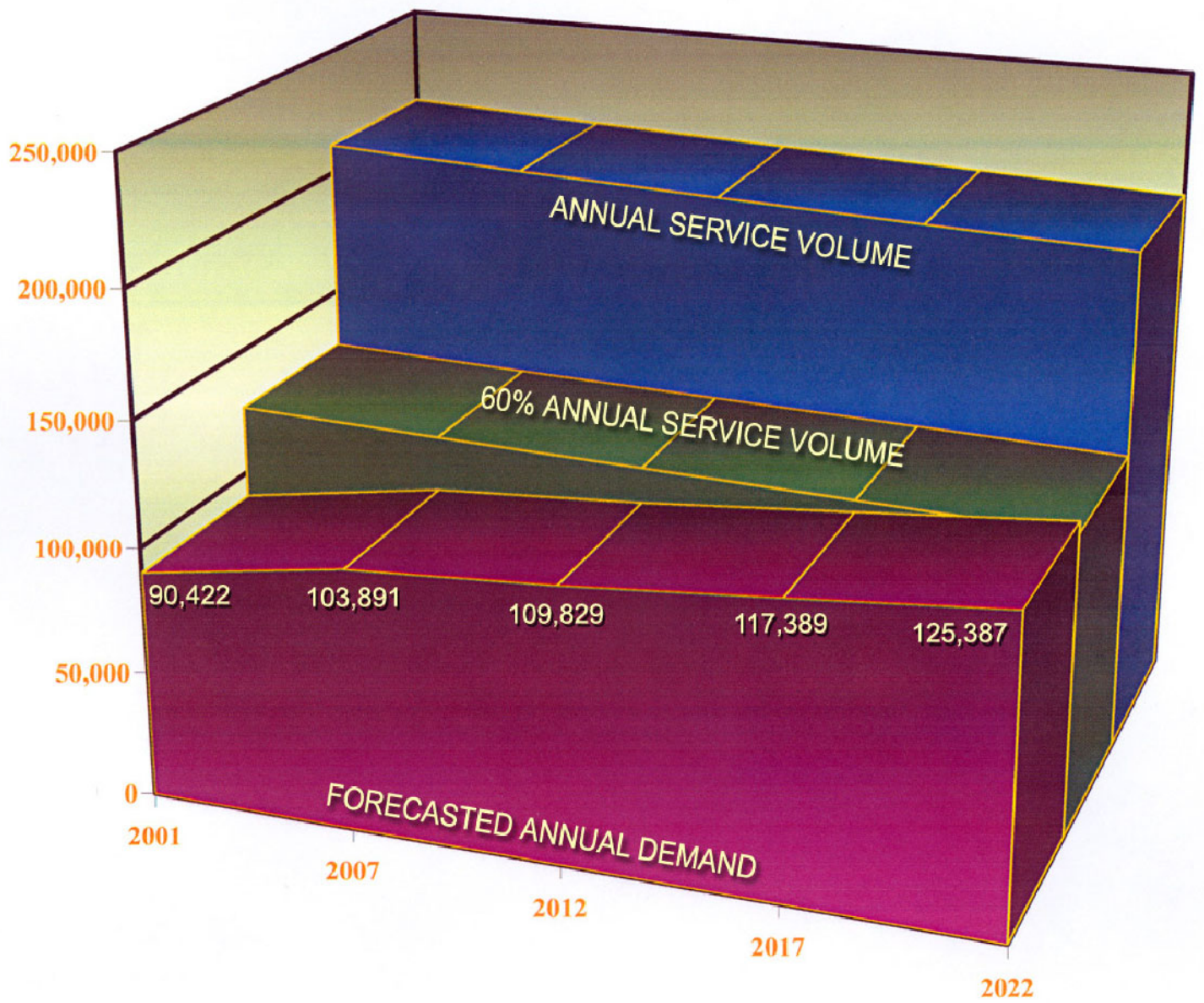
Table 4-3 and **Exhibit 4B** both show that the current airfield capacity will accommodate all of the aircraft operations forecasted through 2022. As shown, the airfield will just reach the 60 percent capacity threshold at the end of the planning period. Therefore, based on the FAA methodology, LEX would not need to explore plans to enhance the capacity of the airfield until 2022.

ANNUAL AIRCRAFT DELAY

As an airport’s level of annual operations increase, so do the times when the airfield experiences periods of delay. Calculating the average delay for each aircraft allows a total to be estimated for all of the delay incurred at an airport over a year. FAA AC 150/5060-5, Change 2, provides a method by which the annual delay can be quantified. This estimate includes arriving and departing aircraft operations under both VFR and IFR conditions. Essentially the ratio of annual demand to ASV is utilized in FAA charts to determine the average delay per aircraft. This value is then applied to the actual or forecasted annual demand to calculate the total hours of annual delay for an airport. The results of these calculations for LEX are included in **Table 4-4**.

TABLE 4-4 ANNUAL AIRCRAFT DELAY				
Year	Average Delay per Aircraft (Minutes)		Total Annual Delay (Hours)	
	Low	High	Low	High
Base Year				
2001	0.15	0.4	226	603
Forecast				
2022	0.25	0.8	522	1,672

Source: LPA GROUP INCORPORATED, 2002.



COSTS ASSOCIATED WITH DELAY

The FAA's methodology uses the ASV calculation as the primary means to identify when certain capacity thresholds will be reached. Under this concept, the funding and planning of capacity enhancing projects should begin when the level of operations reach 60 percent of the airfield's limit. However, associating an actual dollar figure to the delay calculations can provide a more realistic picture of how these delays affect the efficiency of operations. By associating a cost to the level of aircraft delay, it is possible to generate an alternative method for determining when capacity enhancing projects are needed or justified. An estimate of the financial impacts created by delay is derived by applying block hour operating costs to the hourly delay incurred by each aircraft. Block hour cost data has been collected for the existing fleet of aircraft that use LEX.

For the commercial service aircraft, this data was collected from Airline Transport World (ATW), a leading industry magazine. The figures documented in ATW are derived for each commercial passenger aircraft by analyzing costs associated with each aircraft type and is based on average stage length for the respective aircraft. The costs incorporated include those for the crew; fuel and oil; direct maintenance labor and materials; outside and overhead maintenance; possession and insurance; and other miscellaneous costs. For the larger general aviation fleet, an attempt to obtain operating cost information from various manufacturers, flight departments, and corporate operators was made; unfortunately, the information varied significantly. For example, hourly operational costs ranged from a low around \$700 to a high of \$2,300 per hour for the same aircraft. The reason for such variation was that one operator had his own fueling facilities and in-house maintenance while the other did not. Therefore, estimates were made to represent the costs per hour for four different classes of corporate and air taxi type aircraft. For the smaller general aviation fleet, block hour costs were related to the typical cost to rent an aircraft. A summary of the block hour costs is included in **Table 4-5** (shown on the next page).

Using the projected commercial and general aviation fleet mix from the aviation activity forecasts, an average cost per hour of delay equal to approximately \$841.50 was calculated. Multiplying this average cost by the calculated average annual delay (1,097 hours) results in a projected annual delay cost of approximately \$922,977. This calculated annual delay cost can then be compared against the projected costs for various alternatives for addressing airfield capacity to define that point in time when the costs of airfield capacity improvements are justified by the savings to airports users as expressed in reduction of delay costs over a reasonable period of time. For this analysis that reasonable period of time has been assumed to be approximately 20 years. If the delay cost were considerably lower than the development costs to relieve the delay over this timeframe, a capacity-enhancing project, such as the construction of a parallel runway, would not likely pass the required cost-benefit analysis for such a project in 2022.

TABLE 4-5 AIRCRAFT BLOCK HOUR OPERATING COSTS	
Aircraft Type	Block Hour Cost
Commercial Passenger Service	
Airbus 319	\$1,960
Airbus 320	\$2,448
ATR 72	\$1,401
Beach 1900	\$676
Boeing 727-200	\$2,887
Boeing 737-100/200	\$2,596
Boeing 737-300/700	\$2,378
Boeing 737-500	\$2,271
Boeing 737-800	\$2,201
Boeing 757-200	\$3,091
British Aerospace 146	\$2,776
Canadair CRJ-145	\$1,072
Canadair CRJ-200	\$864
Dehavilland Dash 8	\$970
Embraer 120 Brasilia	\$861
Embraer ERJ-145	\$996
Fokker 100	\$2,406
Jetstream 31/32	\$544
Jetstream 41	\$759
McDonnell Douglas 9-30 (DC 9-30)	\$2,280
McDonnell Douglas 80 (MD-80)	\$2,630
McDonnell Douglas 87 (MD-87)	\$2,300
General Aviation - Corporate and Air Taxi	
Small Business Jet	\$500
Mid-sized Business Jet	\$750
Large Business Jet	\$1,000
General Aviation – Private	
Single-Engine Piston	\$100
Multi-Engine Piston	\$200
Multi-Engine Turboprop	\$300
Rotorcraft	\$250

Source: ATW, various issues, 2001.
FBO rental rates, 2002.

LONG-RANGE DELAY IMPACTS

A central issue in the Lexington community and one that is fundamental to the planning efforts of this Master Plan is whether there is the need for a parallel runway or a new airport site to address airport-related capacity issues that have been raised in previous planning studies, or whether the current airport is adequate to meet the anticipated level of demand. Given the projected delay costs it is reasonable to assume that neither of these potential development actions could occur until the cost of delays made such a development beneficial from a

cost-benefit perspective. To address this issue, capacity and delay calculations were performed out to 2050, with the intent being to identify when beyond the 20-year period the Airport would likely experience such significant and costly delays to make either a parallel runway or new airport site viable.

The results of these calculations are presented in **Table 4-6**, which shows the projected enplanements, operations, and ASVs through 2050. The forecasts out to 2050 were prepared using the same methodology as the selected forecasts presented in the last chapter. The assumptions presented in this chapter for the ASV calculations were assumed to remain the same through 2050. Using the FAA guidance and assuming that activity levels followed the projections beyond the initial 20-year timeframe, capacity-related enhancements would be justifiable from a cost perspective at LEX sometime between 2032 and 2037.

TABLE 4-6 LONG-RANGE AVIATION ACTIVITY							
	2022	2027	2032	2037	2042	2047	2050
Enplanements	858,061	977,204	1,109,136	1,254,094	1,411,873	1,581,637	1,688,581
Operations							
Air Carrier/Regional	37,822	40,499	44,161	47,616	50,049	52,527	56,632
Air Taxi	14,772	15,914	17,144	18,469	19,896	21,434	22,413
Air Cargo	300	329	360	394	432	473	500
General Aviation							
Local	6,949	7,486	8,065	8,688	9,360	10,083	10,544
Itinerant	62,544	67,378	72,584	78,194	84,237	90,748	94,893
Military	3,000	3,132	3,270	3,413	3,563	3,720	3,817
Total Operations	125,387	134,737	145,584	156,774	167,537	178,985	188,799
Demand-Capacity Assessment							
Calculated ASV	200,800	198,175	195,584	193,027	190,503	188,013	186,534
Percent ASV	62%	68%	74%	81%	88%	95%	101%

Source: THE LPA GROUP INCORPORATED, 2002.

Knowing from experience that the cost of delays to airport users is the key component for justifying development to relieve capacity problems, long-range delay estimates were developed using the FAA methodology and the associated delay costs as expressed in year 2002 dollars were determined through 2050. These estimates are shown in **Table 4-7**.

TABLE 4-7 LONG-RANGE DELAY COSTS				
Year	Total Annual Delay (Hours)		Annual Delay Costs	
	Low	High	Low	High
2022	522	1,672	\$439,358	\$1,406,595
2027	561	2,246	\$472,184	\$1,889,480
2032	789	2,912	\$664,087	\$2,449,763
2037	1,017	3,560	\$879,558	\$3,296,916
2042	1,675	5,585	\$1,409,817	\$4,698,463
2050	3,461	11,485	\$2,913,061	\$9,661,925

Source: THE LPA GROUP INCORPORATED, 2002.

These calculations assume an hourly delay cost of \$842 for the projected low delay scenario and \$841 for the projected high delay scenario. The high and low delay values are tied to the fleet mix at an airport with the high delay values being typical of an airport having almost entirely commercial airline operations, while the low delay values are typical of airports that have exclusively general aviation operational activity. Given the mix of operations by both commercial and general aviation aircraft at LEX an average of the two values represents a reasonable estimate of delay and the associated delay costs. User costs related to delay at LEX are projected to reach between 1.5 to 2 million dollars a year between 2032 and 2037. This reinforces the potential need for capacity-related developments during that timeframe. This information will be utilized in conjunction with development costs for potential development actions developed as a part of the Alternatives Analysis to evaluate potential long-range actions to address capacity and the need for airfield improvements.

SUMMARY

This demand/capacity analysis has shown that the need to undertake a major capacity-related airfield improvement at LEX is not anticipated to be necessary during the 20-year planning horizon of the typical airport master plan. Based on the anticipated delay costs such an improvement is not deemed likely to be required until well beyond the 2022 horizon. During the 20-year planning period, the only capacity enhancement required at LEX will be to increase and correct the centerline spacing between Runway 4-22 and Taxiway A. This and other airport facility requirements are addressed in the following chapter.