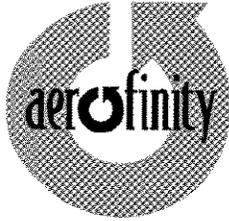

Appendix M – Runway Justification Report



APPENDIX D

FACILITY REQUIREMENTS

CORRESPONDENCE AND DOCUMENTATION



51 S. New Jersey St., 2nd Floor
Indianapolis, IN 46204
317.955.8395 317.955.8479 FAX

BRIEFING MEMO

TO Kathy Kane, C&S Engineers
FROM Susan J.H. Zellers, P.E.
DATE June 1, 2005
RE Operations Fleet Mix at Cuyahoga County Airport

Introduction

To identify the future runway length needs at Cuyahoga County Airport, operating data were gathered for based business jets. In addition to activity by these based business jets, there is also significant transient business jet activity at the airport. An estimate of the operations for the most demanding business jets was prepared.

Annual Operations by Type

As a part of the inventory process, from September 7, 2003 to September 13, 2003 hourly traffic count information was obtained from the Cuyahoga County Tower. This data showed that 72 percent of those operations were by single engine aircraft and 21 percent were by business jets. The balance was comprised of multi-engine and turbo prop operations as shown in **Exhibit 1**. These percentages were used to estimate the annual operations by each type of aircraft from the 2003 total operations (includes operations not recorded by the tower based on historic airport records.) The 2003 total operations are the basis of the aviation forecasts accepted by the FAA on August 4, 2004.

Exhibit 1	
2003 Operations at Cuyahoga County Airport	
Type of Aircraft	Operations
Single Engine	50,069
Multi Engine	3,477
Turbo Prop	1,391
Jet	14,603
Total Operations	69,540

Source: Percent by type from September 7-13, 2003 Tower Hourly Flight Records, Total Operations from Cuyahoga County Airport Aviation Forecasts, July 2004.

Annual Business Jet Operations

Business jet operations are typically conducted under instrument flight rules (IFR). To divide the total business jet operations shown on Exhibit 1 into annual operations by the various types of business jets, the most recent 12 months of IFR flight plans filed to Cuyahoga County Airport were used. The IFR flight plan data were analyzed to estimate the percentage of operations by each type of business jet. Business jet types conducting less than 100 annual operations were grouped together as "other business jets." The percentage of business jet operations by each type were then applied to the 2003 business jet operations to estimate the operations by each common type of business jet operating at Cuyahoga County Airport. Annual operations levels by the various types of business jets are shown in **Exhibit 2**.

Exhibit 2 2003 Business Jet Operations at Cuyahoga County Airport		
Aircraft Type	Percent	Operations
Hawker 400	18.2	2,658
Citation 560/56X	15.5	2,263
HS125	13.0	1,898
Learjet 45	10.0	1,460
Falcon 50	7.1	1,037
Citation 550/551	6.2	905
Challenger 600	5.1	745
Citation 650	3.3	482
Citation 525/526	2.9	423
Learjet 60	2.9	423
Learjet 31	2.6	380
Falcon 2000	2.2	321
Citation 750	1.6	234
Learjet 55	1.5	219
Learjet 35	1.4	204
Gulfstream IV	0.9	131
Other business jets	5.6	820
Total		14,603
Other business jets include: Citation 500/501, Challenger 300, Falcon 10, Falcon 20, Falcon 90, Falcon 900, Embraer 135, Global Express, Gulfstream II, Gulfstream V, Legacy, Learjet 24, Learjet 25, Sabreliner, and Westwind		

Source: May 2004 to April 2005 IFR Flight Plans to Cuyahoga County Airport, www.fboweb.com.

355 Richmond Road
Suite 1
Richmond Heights, Ohio 44143
Ph: 216-289-6566
Fax: 216-289-6577

Acme Operating Corp.

June 1, 2005

Corporate Wings
Attn: Ed McDonald
355 Richmond Road
Richmond Heights, Ohio 44143

Mr. McDonald:

Per your request, I am submitting this letter as evidence of the overall benefit our department would achieve by extending the main runway at Cuyahoga County Airport (CGF) to 6,000 feet, with my professional opinion and encouragement to further pursue such endeavor.

ACME Operating Co. operates a Global Express BBD-700. The Global has the range capability of 6500 nautical miles. We are currently limited operationally with the 5100ft runway. We are restricted to land at or below 60,000# due to its weight bearing capacity, and cannot utilize the full range capability of this aircraft due to the runway length. On a standard day, departing CGF, we can only carry enough fuel to fly 4500 nautical miles. With the runway extended to 6,000ft, we could increase our range to 5800 nautical miles. That amounts in a difference of 18% in fuel quantity alone and is considering the cost savings in general for us not having to reposition to airport with a longer runway, as in Cleveland Hopkins (CLE) or Burke Lakefront (BKL) in order to regain this loss in range. This also amounts in to loss of revenue for both the City of Richmond Heights, and Corporate Wings in at least the same amount.

This runway extension would significantly improve safety as well, guarding further against potential runway overruns when the runway is contaminated, and also provide a bigger traffic relief alternative for the presently overloaded Cleveland Hopkins (CLE) airport and ARTCC systems. With the speculation of Burke Lakefront airport being closed, Cuyahoga County airport would then become the only real alternative for corporate and private general aviation to operate. CGF should be capable of handling the added capacity with a 6,000ft runway.

To fully gain the value of this runway improvement, we also must provide the staffing of US Customs and Immigration services at the field. It is not in the interest of "best practice" to offer a world class airport facility and not provide customers services that they are willing to pay for, adds convenience, and positively impacts the aforementioned public entities listed above as well.

I appreciate the opportunity to add my input for this project. Please contact me should you require additional information.

Sincerely,


Glen Keen
Chief Pilot

Background

Following the guidance in FAA Advisory Circular 150/5070-6B, *Airport Master Plans*, master planning analysis “should determine what, if any, additional facilities will be required to accommodate forecast aviation activity.” As part of this task the ability of existing facilities to meet current and future demand is assessed. The facility requirements chapter of the Cuyahoga County Airport Draft Final Master Plan Update, December 2006 (2006 Draft Final Master Plan) identified that the airport’s most important airside facility needs are to: upgrade the airfield to meet current Federal Aviation Administration (FAA) standards, preserve the existing pavements, and explore the potential to accommodate at least a 6,000-foot runway to better serve existing users. Runway length requirements at mean maximum daily temperature, one of the most demanding operating conditions, and at maximum takeoff and landing weights for frequent operators at Cuyahoga County Airport were identified in the master plan facility requirements. In response to public comments, additional data have been compiled to provide supplemental information on the runway length needs of the users at Cuyahoga County Airport, as not all operations require use of maximum takeoff or landing weight.

Analysis Process and Summary of Findings

The purpose of this recommended runway length analysis is to identify the appropriate runway length to accommodate the users’ needs and to provide a high margin of safety while recognizing the developed environment around the airport. The five steps outlined in FAA Advisory Circular (AC) 150/5325-4B, *Runway Length Requirements for Airport Design*, are used in this analysis to expand upon the runway length facility requirements in the master plan.

Step one is to identify critical aircraft at Cuyahoga County Airport, which are the more than 10,000 annual operations by business jets. Step two is to identify the critical airplane group at Cuyahoga County Airport that requires the longest runway length, which is the large business jet airplanes of 60,000 pounds or less. Step three uses the tables in FAA AC 150/5325-4B, to determine the appropriate design guidance. Step four uses FAA Airport Design Program Version 4.2D with the Cuyahoga County Airport characteristics of airport elevation, mean maximum temperature of hottest month, and maximum difference in runway centerline elevation, which results in a recommendation of 5,500 feet to 8,010 feet to serve the group of business jets currently and forecast to operate at Cuyahoga County Airport. The FAA Design Program recommended runway length is compiled from a grouping of aircraft. With a range of recommended runway lengths, step five is to consider adjustments for local conditions by analyzing airplane

performance data provided by Cuyahoga County Airport users (Exhibits 3 and 4). Since weather impacts aircraft operating characteristics the local weather is also considered as a part of this step.

Through the five steps overviewed above and described in detail in this document, at Cuyahoga County Airport there is a need for more than the minimum FAA recommended length of 5,500 feet, but a length of at least 6,000 feet should provide good utility for the users. Thus, the recommended future runway length at Cuyahoga County Airport is at least 6,000 feet to meet the needs of the existing business jet operators both based at the airport and using the airport on a transient basis.

FAA Guidance

FAA Advisory Circular (AC) 150/5325-4B, Runway Length Requirements for Airport Design, issued July 1, 2005, outlines the process to identify the runway length requirements. This Advisory Circular includes five steps to determine the recommended runway length:

- Step 1 - Identify the critical aircraft that make regular use of the runway for an established planning period of at least five years. Regular use is substantial use defined by the FAA as at least 500 or more annual itinerant operations (landings and takeoffs are considered as separate operations) for an individual airplane or group of airplanes with similar characteristics.
- Step 2 – Identify the airplane group (class of airplane with similar operating characteristics) that requires the longest runway lengths. The FAA groups the airplanes based on maximum takeoff weight (MTOW). Except for regional jets, when the MTOW of listed airplanes is 60,000 pounds or less, the recommended runway length guidance uses combined data from a group of airplanes with similar performance characteristics and operating weights.
- Step 3 – Use the weight category for the group of airplanes identified in Step 2 with the tables in *FAA Advisory Circular 150/5325-4B* to determine the appropriate design guidance.
- Step 4 – Identify the recommended runway length. The FAA design program *FAA Airport Design for Microcomputers Design Program Version 4.2D* is used to implement the guidance from *FAA Advisory Circular 150/5325-4B*.
- Step 5 – Apply necessary adjustments to consider local conditions.

Critical Users

The business jets operated at Cuyahoga County Airport are the critical users. The business jet operations can be grouped into two types of operations:

- “traditional” owned by a company and operated by its corporate flight department for the purpose of transporting people and goods in support of the business and
- “fractional ownership” owned by the operating company and operated as an unscheduled airline for those entities (Owners) that purchase a share (number of hours) in the aircraft.

Five of the active traditional corporate operators responded to the May 2007 survey request for additional operating information. These five traditional operators currently operate 12 business jets including two Citation 550s, a Citation 560, two Falcon 50s, two Challenger CL60s, and five Learjet 45s for a combined 2,993 operations in 2006, almost 30 percent of the 2006 business jet operations.

Flight Options is a fractional ownership operator based at Cuyahoga County Airport. Flight Options currently has four types of aircraft: Hawker 400 (Beechjet), Hawker 800XP, Citation X and Embraer Legacy in its fleet of 126 aircraft. Due to the limited runway length, the Hawker 400, Hawker 800XP and Citation X are the primary aircraft Flight Options operates at Cuyahoga County Airport. The Flight Options fleet while registered at Cuyahoga County Airport, moves around the nation as needed to meet the demand of the Owners. In 2006, Flight Options conducted 2,532 operations at Cuyahoga County Airport, approximately 24 percent of the 2006 business jet operations.

As discussed in the Critical Aircraft section, in 2006 there were more than 10,000 business jet operations at Cuyahoga County Airport. With a high level of use by transient operations, the based business jets conducted approximately half the business jet operations in 2006 and the transient business conducted the other half.

NetJets, another fractional ownership company, frequently uses Cuyahoga County Airport on a transient basis to serve their Owners (owners of fractional shares in the aircraft). The Owners choose Cuyahoga County Airport based upon its location. NetJets conducts a performance analysis of each of the chosen airports to ensure that basic performance and safety needs of the individual fleet aircraft are met prior to determining a go/no go decision on the day of the flight. The NetJets aircraft that have historically been active at the airport include the Citation 560 and 560XL, the Citation X, the Hawker 800XP, and most recently the Hawker 400XP. In 2006, NetJets conducted 1,140 operations at the airport, about 10 percent of the 2006 business jet operations.

The destination of the traditional business jet flights varied with the operators. One operator conducts organ transplant flights. The destination for these flights can be as close as Toledo, Cincinnati and Columbus, Ohio, or as far as San Jose, CA. Another operator has flights to New York, NY; Chicago, IL; St. Louis, OH; Fort Pierce, FL; Louisville, KY; Palm Beach, FL; and Cincinnati, OH approximately two to three times each week. However, they also conduct a number of west coast trips and a few international trips each year. One operator conducts flights throughout the entire United States (except Hawaii), Canada and Mexico, but with the planned addition of a Challenger 300 aircraft by 2009, this operator will also add flights to Europe and South America. Another operator conducts flight to the west coast and Europe. The origin and destination of the fractional ownership business jets is driven by the Owners needs and varies including destinations around the United States and abroad.

Applying FAA Guidance to Cuyahoga County Airport

Identify Critical Aircraft

Cuyahoga County Airport serves business and general aviation. The more than 10,000 annual business jet operations are the most demanding. As described in the 2006 Draft Final Master Plan, the FAA uses a system of Airport Reference Codes to determine the appropriate design standards for an airport. This system combines the most demanding approach speed (landing speed) with the most demanding wingspan to determine the airport reference code for an airport. The 2006 Draft Final Master Plan concluded that Cuyahoga County Airport should be planned to ARC D-II standards (approach speed 141 knots but not more than 166 knots, wing span 49 feet up to but not including 79 feet or tail height from 20 feet up to but not including 30 feet).

To update the data in the 2006 Draft Final Master Plan, the FAA Enhanced Traffic Management System Counts (ETMSC) of business jet operations at Cuyahoga County Airport for 2005 and 2006 are shown on **Exhibit 1**. The ETMSC information documents continued high level of business jet use.

The top five types of business jets using the airport account for over 50 percent of the annual business jet operations. The high level of activity is in part reflective of the fact that these types of business jets are based at Cuyahoga County Airport.

Identify the Airplane Group that Require the Longest Runway Length

Examining the operations data, the second step in the *FAA AC 150/5325-4B* is to identify the critical aircraft that will require the longest runway length. MTOW is used to define the airplane group for the runway length analysis. The business jets at Cuyahoga County Airport are over 12,500 pounds MTOW with the majority less than 60,000

EXHIBIT 1
Business Jet Operations at Cuyahoga County Airport

Airplane	2005	2006
BE40 - Raytheon/Beech Beechjet 400/T-1	1,912	1,912
H25B - BAe HS 125/700-800/Hawker 800	1,224	1,327
LJ45 - Bombardier Learjet 45	988	1,137
C56X - Cessna Excel/XLS	792	854
C560 - Cessna Citation V/Ultra/Encore	1,081	811
C550 - Cessna Citation II/Bravo	736	706
FA50 - Dassault Falcon/Mystère 50	852	701
CL60 - Bombardier Challenger 600/601/604	456	443
C525 - Cessna CitationJet/CJ1	464	275
LJ31 - Bombardier Learjet 31/A/B	247	266
LJ60 - Bombardier Learjet 60	283	254
C750 - Cessna Citation X	180	208
F2TH - Dassault Falcon 2000	282	205
WW24 - IAI 1124 Westwind	121	167
CL30 - Bombardier (Canadair) Challenger 300	25	164
C650 - Cessna III/VI/VII	278	146
LJ55 - Bombardier Learjet 55	171	142
LJ35 - Bombardier Learjet 35/36	136	123
GLF4 - Gulfstream IV/G400	91	76
GLEX - Bombardier BD-700 Global Express	69	72
C680 - Cessna Citation Sovereign	8	63
LJ25 - Bombardier Learjet 25	81	50
GALX - IAI 1126 Galaxy/Gulfstream G200	42	35
C25B - Cessna Citation CJ3	3	33
F900 - Dassault Falcon 900	46	32
GLF5 - Gulfstream V/G500	41	32
C25A - Cessna Citation CJ2	19	27
C526 - Cessna 526 CitationJet	24	23
H25C - BAe/Raytheon HS 125-1000/Hawker 1000	42	20
SBR1 - North American Rockwell Sabre 40/60	17	18
GLF3 - Gulfstream III/G300	23	17
FA10 - Dassault Falcon/Mystère 10	32	16
FA20 - Dassault Falcon/Mystère 20	36	16
GLF2 - Gulfstream II/G200	28	15
H25A - BAe HS 125-1/2/3/400/600	16	15
PRM1 - Raytheon Premier 1/390 Premier 1	12	14
C501 - Cessna I/SP	8	9
ASTR - IAI Astra 1125	30	8
LJ24 - Bombardier Learjet 24	4	6
C500 - Cessna 500/Citation I	13	4
GL5T - Bombardier BD-700 Global 5000	0	3
G150 - Gulfstream G150	0	2
WW25 - IAI 1125 Westwind	0	2
C551 - Cessna Citation II/SP	1	0
DA10 - Dassault Falcon/Mystère 10	5	0
DA90 - Dassault Falcon 900	0	0
SBR2 - North American Rockwell Sabre 75	17	0
Total	10,936	10,449

Source: FAA ETMSC 2005 and 2006.

pounds MTOW. This group of airplanes has been identified as needing the longest runway length.

Determine Appropriate Design Guidance

Table 1-1 of *FAA AC 150/5325-4B* identifies business jets to be large airplanes weighing 60,000 pounds or less. For this group of airplanes, Chapter 3 of *FAA AC 150/5325-4B* provides the guidance to determine the recommended runway lengths.

Identify Recommended Runway Length

Runway length is a function of several aircraft and airport site specific factors including airport elevation above sea level, temperature, wind velocity, airplane operating weights, takeoff and landing flap settings, runway surface condition (dry or wet), effective runway gradient (change in elevation along the length of the runway), and presence of obstructions in the vicinity of the airport. While the tables in Chapter 3 are based on the assumption of no obstructions, zero wind, dry runway surfaces, and zero effective gradient, *FAA Airport Design for Microcomputers Design Program Version 4.2D* implements the guidance in *FAA Advisory Circular 150/5325-4B* including variables for runway surface condition and runway gradient.

Both the *FAA Advisory Circular 150/5325-4B* and *Microcomputer Design Program* classify aircraft based on weight: small aircraft are those below 12,500 pounds, large aircraft are those above 12,500 pounds up to 60,000 pounds, and the largest aircraft are over 60,000 pounds. For business jets at Cuyahoga County Airport the design program uses the following site specific information:

- Airport elevation above mean sea level (879 feet MSL)
- Mean daily temperature of the hottest month at the airport (81.4°F)
- Maximum difference in centerline elevation (6 feet)

For airplanes weighing 12,500 pounds MTOW to 60,000 pounds MTOW, **Exhibit 2** provides runway lengths sufficient to satisfy the operation requirements of a certain percentage of the aircraft fleet at a certain percentage of the useful load. Useful load is the representative measure of trip length and is defined as the difference between maximum gross takeoff weight and the empty weight of the airplane excluding fuel. The longer the trip, the more fuel is needed and the higher percent of useful load the airplane will be on takeoff. Exhibit 2 shows the FAA recommended runway length guidance for large aircraft of 60,000 pounds or less. The FAA has divided the turbojet powered fleet (business jets) into two classes (also shown in Exhibit 2), airplanes that make up 75 percent of fleet and airplanes that make up 100 percent of fleet. The FAA groups the business jets according to performance capability as contained in the FAA-approved

airplane manuals under an assumed loading condition. The groupings are published on Table 3-1 and 3-2 in *FAA AC 150/5325-4B* and are included as an Attachment A.

EXHIBIT 2		
FAA Runway Length Guidance		
Airport and Runway Data		
Airport Elevation		879 feet MSL
Mean daily maximum temperature of the hottest month		81.4 F
Maximum difference in runway centerline elevation		6 feet
Runway Length Recommended for Airport Design		
	Dry Runway	Wet Runway
Large airplanes of 60,000 pounds or less		
75 % of these large airplanes at 60% useful load	4,780	5,420
75% of these large airplanes at 90% useful load	6,280	7,000
100 % of these large airplanes at 60% useful load	5,410	5,500
100 % of these large airplanes at 90% useful load	8,010	8,010
<i>Source: Airport Design Program, Version 4.2D with Cuyahoga County Data, October 2004</i>		

The five airplanes with the most annual operations at Cuyahoga County Airport in 2006 are large aircraft weighing between 12,500 pounds MTOW to 60,000 pounds MTOW. Examining these aircraft, the Raytheon/Beech 400 (Hawker 400), Learjet 45, and Cessna Citations 560/560X are within the 75 percent of fleet and the Hawker 800 is within the 100 percent of fleet. Thus, both classes of business jet aircraft need to be considered, with the 100 percent of fleet typically having the more demanding requirements. In addition to using the FAA design guidance, it is important to also consider specific airplane requirements to best meet the existing users' needs, as discussed in the next section.

Per the FAA guidance in *FAA AC 150/4325-4B*, useful load is the difference between the maximum allowable structural gross weight and operating empty weight. The useful load consists of passengers, cargo, and usable fuel. The FAA design guidance provides only two useful load percentages, 60 percent and 90 percent. A curve for 100 percent useful load was not developed by the FAA because many of the airplanes used to develop the curves were operationally limited in the second segment of climb.

The runway condition, whether dry or wet or contaminated with snow or ice impacts performance. By regulation, as discussed in *FAA AC 150/4325-4B*, the runway length for jet powered airplanes obtained from the 60 percent useful load curves are increased by 15 percent or up to 5,500 feet, whichever is less, and the 90 percent useful load curves are also increased 15 percent or up to 7,000 feet, whichever is less. No adjustment is necessary by regulation for turboprop airplanes. This adjustment is reflected in the wet runway length column in Exhibit 2.

The airplane operators based at Cuyahoga County Airport have different missions and destinations in support of their businesses. These missions range from personnel transport to fractional ownership flights with various destinations. Thus, the trip length and resulting useful load vary. For business jets within the 100 percent of fleet operating on a regular basis (more than 500 annual operations), the recommended runway length ranges from 5,500 feet at 60 percent useful load to 8,010 feet at 90 percent useful load for Cuyahoga County Airport following the FAA guidance.

Apply Necessary Adjustments to Consider Local Conditions

The FAA recommended runway length guidance is compiled from a grouping of aircraft. With a range of recommended runway lengths significantly influenced by useful load and recognition that Cuyahoga County Airport is located in a developed environment, specific user data has been sought. To identify a final length, all of the owners of the based business jets were contacted via a survey form, requesting airport specific user data. Some of the owners responded to the survey; some of the owners have declined to respond considering the data proprietary.

The business aircraft based at the airport currently, in many cases, have been selected by their operators to maximize their utility within the constraints of the existing airport. One manner to operate within the constrained environment is by adjusting useful load, which may necessitate an additional fuel stop. While an extra fuel stop may make certain operations feasible, it increases the time and cost of the operations and it does not provide the highest level of customer service. Based upon information from the user surveys, a fuel stop increases the trip time by an estimated 30 minutes. It also adds up to \$2,500 per stop in additional operating cost and increased fuel expense compared to using in-house fuel.

To identify a final recommended runway length, two factors were considered: runway length requirements based on operating specifications and available range for various runway lengths. Weather greatly affects air density, which in turn impacts the performance of an aircraft; the higher the elevation of the airport, the lower the air density. Another density factor is air temperature, which varies throughout the year. The warmer the temperature, the less dense the air, and the poorer the resulting performance of the airplane. Performance is also impacted by a contaminated runway condition: wet, snow or ice. Aside from weather, useful load is the primary driving factor in runway length needs. Therefore, data regarding operations under various conditions at Cuyahoga County Airport were requested.

Several Cuyahoga County Airport based aircraft operators provided airplane specific data. While a common survey form was provided to all of the key users, the responses varied in format. **Exhibit 3** identifies the various runway lengths for operations. However, even these are a snapshot for a set of given conditions. While the weather create different needs for each operation, even for the same type of aircraft different companies may use different operating standards. Aircraft manufacturers provide performance curves in airplane operating manuals. With the complexity and variability of the calculations, operators may also purchase software to assist in the flight planning.

The temperatures in the airplane operating manuals usually use the worldwide (other than United States) standard of Celsius (C). For perspective, 20 degrees C is approximately 68 degrees Fahrenheit (F), 15 degrees C is approximately 59 degrees F (standard temperature), and 0 degrees C is 32 degrees F.

As described in the 2006 Draft Final Master Plan, business jet operators at Cuyahoga County Airport operate under two different sets of regulations depending on the type of operations.

- Federal Aviation Regulations (FAR) Part 91 – General Operating and Flight Rules
- FAR Part 135 – Operating Requirements: Commuter and On-Demand Operations

EXHIBIT 3
Key User Airplane Performance Data for Various Conditions

Airplane Type		Takeoff Operations			Landing Operations		
		Maximum Weight	Common Weight	Restricted Weight	Maximum Weight	Common Weight	Restricted Weight
Hawker 400XP (Beechjet 400) (1,912 annual ops)	Weight (lbs)	16,300			15,700		
	Length (ft)	4,634			<i>6,094/4,570**</i>		
	Conditions	20 C/Dry			20 C/Dry		
	Length (ft)	5,329			5,256		
Hawker 800XP (1,327 annual ops)	Weight (lbs)	28,000			23,350		
	Length (ft)	5,418			<i>4,505/3,381**</i>		
	Conditions	20 C/Dry			20 C/Dry		
	Length (ft)	6,231			3,888		
Lear 45 (1,137 annual ops)	Weight (lbs)	21,500	19,500	21,500	19,200	17,000	19,200
	Percent of Ops	50					
	Length (ft)	5,100					
	Conditions	60 F/Dry					
Citation 560XL (854 annual ops)	Weight (lbs)	20,000			18,700		
	Length (ft)	3,969/4,593	Std/Alt Flap		<i>5,610/4,208**</i>		
	Conditions	21 C/Dry			21 C/Dry		
	Length (ft)	3,969/4,593	Std/Alt Flap		<i>6,452/5,340**</i>		
Citation 560 (811 annual ops)	Weight (lbs)	16,830					
	Percent of Ops	50	50		10	90	
	Length (ft)	3,830	2,700		4,883*	3,883*	
	Conditions	20 C/Dry	20 C/Dry		20 C/Dry	20 C/Dry	
Citation 550 (706 annual ops)	Weight (lbs)	14,800					
	Percent of Ops	10	90	0	0	100	--
	Length (ft)	4,390	3,950	--	--	3,530*	--
	Conditions	20 C/Dry	20 C/Dry	--	--	20 C/Dry	--
Falcon 50 (701 annual ops)	Weight (lbs)	38,800					
	Percent of Ops	5	80	15	5	75	20
	Length (ft)	5,000	3,900	5,500	4,000	3,600	5,500
	Conditions	Dry	Dry	Wet or Snow	Dry	Dry	Wet or Snow
Challenger 60 (443 annual ops)	Weight (lbs)						
	Percent of Ops	0		100	0		100
	Length (ft)	> 5,100		5,100	>5,100		<5,100
	Conditions	Never Possible		Restricted	Wet, Slush, Snow, Ice		Dry
Citation X (208 annual ops)	Weight (lbs)	36,100					
	Length (ft)	5,599			<i>6,003/4,502**</i>		
	Conditions	20 C/Dry			20 C/Dry		
	Length (ft)	6,408			5,069		
Global Express BBD-700 (72 annual ops)	Weight (lbs)	98,000			78,600		
	Percent of Ops	20	70	10	10	60	30
	Length (ft)	6,557	4,587	5,100	4,457	3,721	5,100
	Conditions	15 C/Dry	15 C/Dry	15 C/Dry	15 C/Dry	15 C/Dry	0 C/Dry

Source: Hawker 400, 800 and Citation X from Flight Options data, Citation 560XL from NetJets data, other aircraft from traditional operators data; compiled by Aerofinity, Inc., June 2007.

*Part 135

**60 Percent/80 Percent of Runway under Part 135/91K Requirements

Annual operations are total by type from FAA ETMSC 2006 data

Italics indicates more than existing 5,100 foot runway. Also, available landing length beyond glide slope is only 3,983 feet.

Part 91 are the regulations used to govern private (not-for-hire) operations, although some of the private operators voluntarily apply Part 135 standards to increase the margin of safety of their operations. Fractional ownership operations are conducted under either a special subsection of Part 91 (Subpart K) or Part 135. Charter operations are conducted under Part 135. One of the primary differences between the two regulations is the required runway length for landing. Under Part 135, an aircraft must be fully stopped within 60% of the available runway length or 80% of the available runway length if the airport is an approved Destination Airport in that operator's manual. Where Part 135/91K standards apply they have been noted by the operator and included on the above table.

When considering landing length, it is important to recognize that the current usable landing length beyond the glide slope (provides vertical guidance to a landing airplane) of the Instrument Landing System (ILS) is only 3,953 feet at Cuyahoga County Airport. Business jets usually operate under instrument flight rules (IFR) and use of the ILS is necessary in poor weather which commonly occurs with wet or snow conditions.

As shown previously, the FAA recommended runway length guidance identifies the need for at least 5,500 feet to accommodate 100 percent of business jets at 60 percent useful load and up to 8,010 feet at 90 percent useful load. Specific data for Cuyahoga County Airport shown on Exhibit 3 demonstrates there are a number of conditions that would need more than the existing 5,100 feet and more than the FAA baseline of 5,500 feet. They most commonly occur with higher useful loads, regulatory required increased landing distances, and wet conditions. While useful loads can be adjusted by an operator with the potential penalty of a fuel stop, regulatory required increased landing distances, and wet conditions cannot be controlled by the operator. One operator noted in the survey response that their fleet is heavily restricted by any form of contaminated runway conditions. This is demonstrated by a seasonal analysis by Flight Options indicating an increased usage of Cuyahoga County Airport in the "summer" (May 1 to November 1) and an increased usage of Cleveland Hopkins International operations in the "winter" (November 2 to April 30).

With needs beyond the minimum FAA recommended runway length, the range of the airplanes operating at Cuyahoga County Airport was used to help define the appropriate runway length. To operate within a constrained environment, the operator must reduce the takeoff weight resulting in a lower useful load and reduced nonstop range. **Exhibit 4** summarizes maximum range of various airplanes with the existing 5,100-foot runway, a 5,500-foot runway, and a 6,000-foot runway.

**EXHIBIT 4
Airplane Range in Nautical Miles**

Runway Length		5,100 Feet Runway Condition			5,500 Feet Runway Condition			6,000 Feet Runway Condition		
Aircraft	Max Range	Dry	Wet	Ice/Snow	Dry	Wet	Ice/Snow	Dry	Wet	Ice/Snow
Range in Nautical Miles										
Beechjet 400	1,400	1,400	<i>1,200</i>	0	1,400	1,400	0	1,400	1,400	0
w/2 PAX	1,200	1,200	<i>1,000</i>	0	1,200	1,200	0	1,200	1,200	0
w/4 PAX	1,100	1,100	<i>900</i>	0	1,100	1,100	0	1,100	1,100	0
w/6 PAX	900	900	<i>700</i>	0	900	900	0	900	900	0
Hawker 800XP	2,400	<i>2,000</i>	<i>1,700</i>	0	2,400	2,400	0	2,400	2,400	0
w/2 PAX		<i>1,900</i>	<i>1,600</i>	0			0			0
w/4 PAX		<i>1,800</i>	<i>1,500</i>	0			0			0
w/6 PAX		<i>1,800</i>	<i>1,400</i>	0			0			0
Citation X	3,120	<i>2,200</i>	<i>1,600</i>	0	<i>2,670</i>	<i>1,860</i>	0	3,120	3,120	0
w/2 PAX		<i>2,080</i>	<i>1,480</i>	0	<i>2,552</i>	<i>1,740</i>	0			0
w/4 PAX		<i>1,965</i>	<i>1,365</i>	0	<i>2,435</i>	<i>1,625</i>	0			0
w/6 PAX		<i>1,845</i>	<i>1,250</i>	0	<i>2,435</i>	<i>1,505</i>	0			0
0 nm Range in Ice/Snow column indicates that the aircraft's required takeoff or landing length exceeds the available runway length when snow packed										
Falcon 50	3,200			<i>1,200</i>			<i>1,700</i>			<i>2,400</i>
Snow 15C		3,200	<i>2,000</i>		3,200	2,500		3,200	3,200	
Challenger 60	2,800			<i>968</i>			<i>1,252</i>			<i>1,584</i>
0C					<i>2,024</i>	<i>1,760</i>		<i>2,332</i>	<i>2,068</i>	
20C		<i>1,760</i>	<i>1,408</i>							
Global Express BBD-700	6,150*			<i>2,350</i>						<i>3,530</i>
0C		<i>4,580</i>			<i>4,935</i>	<i>2,820</i>		<i>5,800</i>		
15C		<i>4,230</i>			<i>4,700</i>			<i>5,640</i>		
30C		<i>4,000</i>			<i>4,500</i>			<i>5,450</i>		
Citation 550	1,200	1,200	<i>750</i>		1,200	1,200		1,200	1,200	

For above aircraft, italics indicate less than maximum range.

*Range from www.bombardier.com at 0.85 mach

Source: Key Users Survey compiled by Aerofinity, Inc., May 2007.

Examining the range (trip length) available for the three runway lengths above, if the runway is extended to at least 6,000 feet, the most frequent operators at Cuyahoga County Airport should be able to use the full capability of their aircraft in wet or dry conditions.

Weather Data

The above analysis identified that in normal dry conditions the existing runway length at Cuyahoga County Airport is usable, in wet or other contaminated conditions it is constrained. To assess the frequency of wet or other contaminated conditions the National Climatic Data Center was contacted to determine the closest representative data for Cuyahoga County Airport. The closest available data are for the Cleveland

Hopkins International Airport station 1971 – 2000¹. The mean annual precipitation is 38.71 inches, with the most precipitation occurring during the month of June with a mean of 3.89 inches. There were a mean of 156.8 days with precipitation (≥ 0.1 inch). While the precipitation may not occur all day more than 40 percent of the days in a year experienced some precipitation. The mean annual snow total is 61.4 inches, with the most snow occurring during the month of January with a mean of 16.8 inches. There is the potential for snow from October through early May. This data also identified that the highest temperature recorded was 104° F while the lowest record temperature recorded was -20° F.

Summary

Currently, with a 5,100-foot runway length Cuyahoga County Airport is a constrained facility, particularly in wet or snowy conditions which occur on more than 40 percent of the days. However, it is a desirable airport as demonstrated by the high level of business jet operations. Airports are part of communities' transportation infrastructure. The aircraft operators at Cuyahoga County Airport are able to use the existing runway length especially in dry conditions, although the trip length may be constrained thus being unable to take advantage of the full capability (range) of the aircraft. Business jets are operated by their owners as a time and/or money saving tool. Operating below optimum capabilities may reduce the return on the investment in the aircraft. In wet or other contaminated conditions, particularly for Part 135 and Part 91K operators, the existing runway length is a constraint.

Improvements to the runway at Cuyahoga County Airport are needed to upgrade the airport to meet current FAA runway safety area standards. While improvements are being constructed, it would be beneficial to the business jet operators and the business community to provide the greatest opportunity for optimal utilization of their investments while being sensitive to the surrounding community.

The FAA recommended runway length guidance identifies up to 8,010 feet of runway length to serve 100 percent of business jet aircraft at 90 percent useful load at Cuyahoga County Airport. After examining the range potential of the business jets commonly using the airport, at least 6,000 feet of runway length would meet most frequent users' takeoff needs and would provide approximately 5,000 feet of landing length beyond the glide slope in poor weather. Thus, it is recommended that a future runway length of at least 6,000 feet be used when considering runway improvements at Cuyahoga County Airport.

¹ National Climatic Data Center, *Climatology of the United States No. 20 1971-2000*, Cleveland Hopkins International Airport, Ohio, issued February 2004.

While Flight Options, with more than 500 employees at the airport², is the single most active business jet operator at Cuyahoga County Airport, they only accounted for 24 percent of the airport's business jet operations in 2006. The other 76 percent of business jet operations are conducted by other companies, including flights in the same type of aircraft as operated by Flight Options. In 2006, there were more than 7,900 business jet operations conducted by other based and transient business jets, more than 15 times the FAA defined level of significant operations. Therefore, to benefit all the business jet operators, both based and transient, **it is recommended that a future runway length of at least 6,000 feet be used when considering runway improvements at Cuyahoga County Airport.**

² Plain Dealer Reporter, *Flight Options expands in Vegas, Runway issues could threaten Cuyahoga hub*, Peter Krouse, June 14, 2007.

Attachment A

**12,500 pound to 60,000 pound Airplane Groups from
FAA Advisory Circular 150/5325-4B**

Table 3-1. Airplanes that Make Up 75 Percent of the Fleet

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

Table 3-2. Remaining 25 Percent of Airplanes that Make Up 100 Percent of Fleet

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

Note: Airplanes in tables 3-1 and 3-2 combine to comprise 100% of the fleet.