Appendix H - Forecast

This appendix includes the Aviation Activity Demand Forecast (Forecast) that was prepared for the John Glenn Columbus International Airport (CMH). This Forecast was prepared based on actual operating data from 2018 and includes a forecast for conditions from 2019 through 2039. The Forecast was submitted to the FAA for review in January 2020. The FAA approved this Forecast on March 3, 2020. A copy of the approval letter is included at the back of this Appendix.

The forecasts for the CMH Part 150 were prepared and submitted to FAA prior to the COVID-19 public health emergency. FAA acknowledges the current impacts of the COVID-19 public health emergency and the resulting decline in aviation and transit travel demand. However, over the long term, demand and airline capacity are expected to grow in line with the US Gross Domestic Product (GDP), a relationship that has been in place since before airline industry deregulation in 1978. Airport passenger activity is historically resilient, as people both want to travel for leisure purposes and need to travel for business purposes. Airline passenger travel and capacity (measured in terms of available seats) fell drastically after the terrorist attacks of September 11, 2001, and during the recession in 2009/2010. At CMH, passenger activity recovered in the following 3 to 4 years after each shock event. Airline passenger activity is expected to recover from COVID-19 impacts in broadly similar ways in the next several years as vaccines become widely available and social distancing measures are discontinued. Airlines for America (A4A), the trade organization of the leading US passenger and cargo airlines, projects that recovery to 2019 passenger volumes could occur in 2023 using optimistic assumptions, but most likely would not occur until after 2024. Similarly, Airports Council International (ACI), the trade association of the world's airports, projects that domestic passenger activity may recover as early as 2023 and international passenger traffic may recover as early as 2024. Leisure travel is expected to lead the recovery in aviation demand (as evidenced by travel spikes during the 2020 Thanksgiving and Christmas holidays, indicating that people desire to travel for leisure). Recovery in business travel is predicted to be comparatively slower as businesses evolve after the COVID-19 public health emergency; but business travel will remain an essential function.

The final 2020 TAF was published in May 2021. Recovery periods for passenger enplanements and operations are anticipated to be between 2024 and 2025, meaning that by 2026 the airport should be at 2019 activity levels and continuing to grow. Although it is impossible to precisely predict future changes to enplanements and operations, historical recovery from other shock events has been taken under consideration. The enplanement and operations forecasts prepared for the Part 150 Study remain valid, as the airport will experience these levels, although with a slight delay. Thus, it is anticipated that passenger and airline activity in the short-term will be lower than forecast but will recover with long-term forecast activity being realized later than stated in Table 8-2, FAA TAF Forecast Comparison.

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Aviation Activity Demand Forecast

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PREPARED FOR
Columbus Regional Airport Authority

PRESENTED BY
Landrum & Brown, Incorporated

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1   Purpose and Context

This document presents a comprehensive forecast of aviation demand for John Glenn Columbus International Airport (CMH or the Airport) to support the Part 150 Update. Activity levels are forecast through 2039 with a base year of 2018 and an estimate for 2019.

The objective of this forecast is to project the future aviation demand that will provide the basis for future planning analyses. The forecast presented herein represents market driven demand for air service. The forecast is "unconstrained" and as such does not take facility constraints or other outside limiting factors into consideration. In other words, for purposes of estimating future demand, the forecast assumes facilities can be provided to meet the demand.

2 Prior Forecasts

2.1 2014 Loop Road Land Use Study

In April 2014, Ricondo & Associates, Inc. (Ricondo) prepared an aviation activity forecast of enplaned passengers and aircraft operations to determine facility requirements associated with the proposed Loop Road Area development. The forecast used a base year of 2013, which was the last full year of data available at the time, and activity was forecast through 2044.

Ricondo attempted to forecast the enplanements at CMH using socio-economic regression to quantify the relationship of enplanements to population, employment, income, per capita personal income, and gross domestic product. However, this approach did not result in any adequate models.

Therefore, Ricondo used a market share methodology. The approach used a ratio of the historical activity at CMH with the activity in the United States (U.S.) as a whole. The base year ratio of 0.415% was assumed to remain constant through the forecast period and was applied to a national forecast for the U.S. enplaned passengers. The result was that enplaned passengers at CMH would grow from 3.1 million in 2013 to 5.3 million in 2044, representing a compound annual growth rate (CAGR) of 1.8%.

Ricondo used the enplaned passenger forecast, load factor assumptions, and estimated average seats per departure (ASPD) to determine the passenger airline operations. Ricondo projected that load factors at CMH would increase from 77.5% in 2013 to 81.9% in 2044 while ASPD were projected to increase from 84.2 seats to 115.5 seats over the same span. The result was that passenger airline departures would increase from 47,711 (95,422 operations) in 2013 to 56,470 (112,941 operations) in 2044, representing a CAGR (AAGR) of 0.5%. Other air taxi and general aviation (GA) operations were expected to grow in line with the national forecast at 0.5% per year through the forecast period, growing from 32,203 in 2013 to 37,330 in 2044. Military operations were assumed to remain constant at 560 operations per year through the forecast period.

In addition to the base forecast, Ricondo developed low-growth and high-growth forecast scenarios. These were developed to account for economic and industry uncertainty. The result of these scenarios was that by 2044 enplaned passengers ranged between 4.3 million and 6.4 million and operations ranged between 137,641 and 167,270. **Table 2-1,** ***Loop Road Forecast Summary***, provides a summary of Ricondo's forecast.

Table 2-1 **2014 Loop Road Forecast Summary**

	Enplaned Passengers			Aircraft Operations		
Year	Low-Growth	Baseline	High-Growth	Low-Growth	Baseline	High-Growth
Historical						
2009		3,122,989			146,439	
2010		3,183,792			136,086	
2011		3,190,068			135,377	
2012		3,174,814			129,450	
2013	3,114,695	3,114,695	3,114,695	128,187	128,187	128,187
Forecast						
2015	3,192,600	3,218,400	3,246,600	127,723	128,223	128,820
2018	3,299,800	3,408,200	3,514,700	128,689	130,469	132,680
2023	3,483,400	3,745,100	3,987,400	130,329	134,259	139,170
2033	3,860,300	4,458,600	5,034,500	133,709	142,009	152,360
2044	4,302,100	5,344,100	6,371,000	137,641	150,831	167,270
CAGR						
2013-44	1.0%	1.8%	2.3%	0.2%	0.5%	0.9%

Source: Ricondo & Associates, Inc.

2.2 2015 Planning Forecast

In November 2015, Landrum & Brown, Incorporated (L&B) prepared an unconstrained aviation activity forecast of enplaned passengers and aircraft operations to support the development of facility requirements for airport improvements. The forecast used a base year of 2014, which was the last full year of data available at the time, and activity was forecast through 2035.

L&B used a multivariate regression model to forecast domestic enplanements at CMH using U.S. domestic enplanements, yield, and a dummy variable as independent variables. The result was that domestic enplaned passengers at CMH were forecast to grow from 3.1 million in 2014 to 5.0 million in 2035, representing a compound annual growth rate (CAGR) of 2.2%.

International passenger levels had fluctuated from 2011 to 2014 and represented approximately 0.6% of total passengers at CMH. Therefore, L&B assumed that international enplaned passengers would continue to account for 0.6% of total enplanements through 2018 when new international wide-body service would commence. International enplanements were forecast to grow from 28,356 in 2014 to 272,900 in 2035, an annual average growth rate of 12.7%.

L&B used the enplaned passenger forecast, load factor assumptions, and estimated average seats per departure (ASPD) to determine the passenger airline operations. L&B projected that air carrier load factors at CMH would increase from 75.8% in 2014 to 84.0% in 2035 while ASPD were projected to increase from 150.2 seats to 165.8 seats over the same span. L&B projected that commuter load factors at CMH would increase from 75.2% in 2014 to 84.0% in 2035 while ASPD were projected to increase from 58.3 seats to 69.2 seats over the same span.

In addition to the base forecast, L&B developed a high-growth forecast scenario. The high scenario assumed that CMH's share of national traffic would grow from an estimated 0.48% in 2015 to 0.58% by 2035. The high scenario forecasted 5.9 million enplaned passengers and 183,600 aircraft operations by 2035. **Table 2-2, *2015 Forecast - Total Enplanements*** provides a summary of projected enplanements from the 2015 Forecast.

Table 2-2　　**2015 Forecast - Total Enplanements**

| Year | Enplanements | | | |
	Domestic	International	Total	High Case
Historical				
2000	3,452,627	10,293	3,462,920	3,462,920
2001	3,326,605	9,422	3,336,027	3,336,027
2002	3,327,680	20,776	3,348,456	3,348,456
2003	3,123,550	32,970	3,156,520	3,156,520
2004	3,082,360	30,510	3,112,870	3,112,870
2005	3,281,964	24,789	3,306,753	3,306,753
2006	3,339,325	23,675	3,363,000	3,363,000
2007	3,840,993	24,488	3,865,481	3,865,481
2008	3,438,618	20,816	3,459,434	3,459,434
2009	3,109,731	13,258	3,122,989	3,122,989
2010	3,166,387	17,405	3,183,792	3,183,792
2011	3,169,469	20,599	3,190,068	3,190,068
2012	3,165,245	9,569	3,174,814	3,174,814
2013	3,093,217	21,478	3,114,695	3,114,695
2014	3,144,690	28,356	3,173,046	3,173,046
Forecast				
2015E	3,371,637	26,352	3,397,989	3,397,952
2016	3,559,700	20,900	3,580,600	3,626,500
2017	3,713,200	21,800	3,735,000	3,834,400
2018	3,743,200	93,800	3,837,000	3,983,500
2019	3,841,600	104,400	3,946,000	4,112,800
2020	3,919,400	115,000	4,034,400	4,223,500
2021	3,985,600	125,600	4,111,200	4,323,100
2022	4,021,900	136,200	4,158,100	4,424,500
2023	4,097,400	146,800	4,244,200	4,532,000
2024	4,168,800	157,400	4,326,200	4,636,500
2025	4,246,800	168,000	4,414,800	4,748,700
2026	4,301,000	178,600	4,479,600	4,870,200
2027	4,398,000	189,200	4,587,200	5,005,100
2028	4,500,400	199,800	4,700,200	5,146,800
2029	4,603,400	210,400	4,813,800	5,290,500
2030	4,638,500	221,000	4,859,500	5,435,700
2031	4,740,000	231,600	4,971,600	5,581,100
2032	4,846,100	242,200	5,088,300	5,732,300
2033	4,952,400	252,800	5,205,200	5,885,500
2034	5,058,200	263,400	5,321,600	6,039,500
2035	5,167,300	274,000	5,441,300	6,197,000
CAGR				
2000-14	-0.7%	7.5%	-0.6%	-0.6%
2014-35	2.4%	11.4%	2.6%	3.2%
2015-35	2.2%	12.4%	2.4%	3.1%

Note:　　2015E is an estimated value based on 2015 year to date values through August.
Sources:　　CRAA and Landrum & Brown.

The result was that passenger airline departures were forecast to increase from 46,606 (93,212 operations) in 2014 to 60,650 (121,300 operations) in 2035, representing a CAGR (AAGR) of 1.3%. Non-commercial air taxi operations were forecast to grow at 3.6% on average and general aviation (GA) operations were expected to grow in line with the national forecast at 0.6% per year through the forecast period. Cargo freighter and military operations were assumed to remain constant at their respective 2014 levels through the forecast period. **Table 2 3,** *2015 Forecast - Total Aircraft Operations,* provide a summary of L&B's operations forecast.

Table 2-3   **2015 Forecast - Total Aircraft Operations**

		Annual Operations							
		Air Carrier	Commuter	Total Passenger Operations	Cargo	Military	Non-Commercial Air Taxi	General Aviation	Total
Historical	2008	37,597	72,751	110,348	54	1,451	15,445	28,716	156,014
	2009	33,326	66,272	99,598	68	2,559	13,648	30,674	146,547
	2010	31,666	64,310	95,976	354	931	13,511	25,583	136,355
	2011	32,184	65,949	98,133	172	349	12,624	24,096	135,374
	2012	32,366	60,681	93,047	108	540	12,232	23,263	129,190
	2013	32,538	59,224	91,762	134	559	13,364	21,792	127,611
	2014	32,200	61,012	93,212	200	609	9,457	20,636	124,114
Forecast	2015	33,200	62,200	95,400	200	600	10,400	20,200	126,800
	2016	35,200	63,200	98,400	200	600	10,700	20,200	130,100
	2017	36,000	63,900	99,900	200	600	11,000	20,300	132,000
	2018	36,800	64,600	101,400	200	600	11,400	20,400	134,000
	2019	37,100	65,300	102,400	200	600	11,800	20,500	135,500
	2020	37,300	66,100	103,400	200	600	12,100	20,600	136,900
	2021	37,400	66,800	104,200	200	600	12,500	20,700	138,200
	2022	37,300	67,500	104,800	200	600	12,900	20,900	139,400
	2023	38,000	68,200	106,200	200	600	13,300	21,100	141,400
	2024	38,300	68,900	107,200	200	600	13,800	21,100	142,900
	2025	38,600	69,800	108,400	200	600	14,200	21,400	144,800
	2026	39,000	70,600	109,600	200	600	14,700	21,500	146,600
	2027	39,200	71,300	110,500	200	600	15,200	21,700	148,200
	2028	39,500	72,300	111,800	200	600	15,700	21,900	150,200
	2029	39,800	73,100	112,900	200	600	16,300	22,100	152,100
	2030	40,500	73,100	113,600	200	600	16,800	22,200	153,400
	2031	40,900	74,700	115,600	200	600	17,400	22,400	156,200
	2032	41,300	75,600	116,900	200	600	17,900	22,700	158,300
	2033	41,700	76,400	118,100	200	600	18,500	22,900	160,300
	2034	42,000	77,400	119,400	200	600	19,200	23,100	162,500
	2035	43,000	78,300	121,300	200	600	19,900	23,300	165,300
Growth									
2008-14		-2.5%	-2.9%	-2.8%	24.4%	-13.5%	-7.9%	-5.4%	-3.7%
2014-35		1.4%	1.2%	1.3%	0.0%	-0.1%	3.6%	0.6%	1.4%
2015-35		1.3%	1.2%	1.2%	0.0%	0.0%	3.3%	0.7%	1.3%

Sources: Airport Records; FAA OPSNET; Landrum & Brown analysis.

3   Drivers of Air Traffic Demand

Forecasting future aviation activity is an inexact science and there are many factors that influence future aviation trends. This section discusses the various factors that could affect aviation demand at the Airport.

3.1   Catchment Area

The Airport is located approximately 6 miles east of downtown Columbus, Ohio in Franklin County. The majority of the Airport's air passengers originate from the primary market area defined as a 60-mile radius around the City of Columbus.[1] The Columbus Ohio Metropolitan Statistical Area (MSA) has the largest socio-economic impact on the primary market area. Therefore, the socio-economic factors presented in this document will focus on the Columbus Ohio MSA which is illustrated in **Figure 3-1, Columbus Ohio Metropolitan Statistical Area**.

Figure 3-1   Columbus Ohio Metropolitan Statistical Area
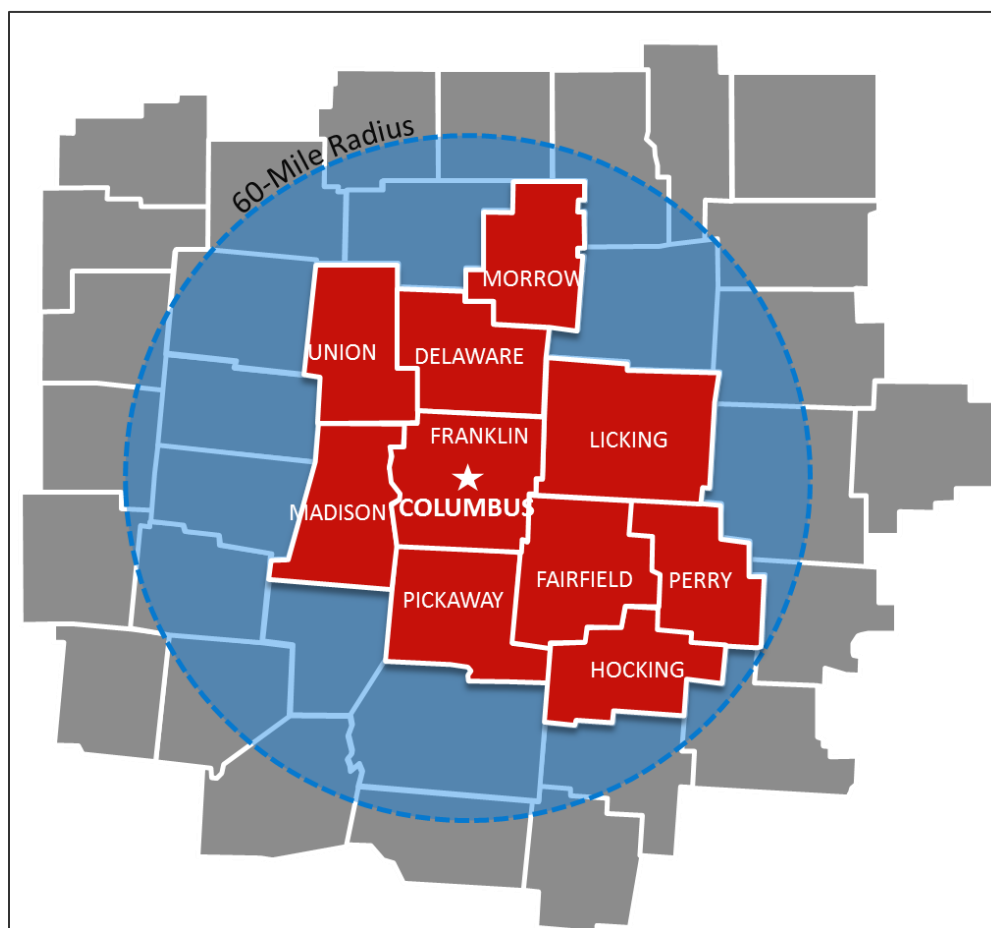
Source: Landrum & Brown.

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[1]   Columbus Regional Airport Authority, Economic Impacts of the Columbus Regional Airport Authority in 2017, January 2019.

3.2   Economic Cycles

Historically, the U.S. economy, as measured by Gross Domestic Product (GDP), grew at a relatively steady rate, averaging 2.8% per annum between 1970 and 2018. Individual years have fluctuated around the long-term trend for a variety of reasons including pure macro-economic factors, fuel shocks, war, and terrorist attacks.

There have been two official economic recessions in the U.S. thus far in the 21st century. The first occurred between March and November of 2001 and was compounded by the September 11, 2001 terrorist attacks. The negative impact of these events on the airline industry is well documented. The recession itself was short-lived by historical standards and the economy quickly returned to positive growth rates, driven in part by a gradual but prolonged reduction in interest rates.

The second recession, often referred to as the 'Great Recession', occurred between December 2007 and June 2009.[2] This was the worst financial crisis to affect the U.S. since the Great Depression; and it was the longest recession since the time the airline industry was deregulated[3] in 1978. The nation's unemployment rate rose from 5.0% in December of 2007 to a high of 10.0% in October 2009.[4] In 2009, the American Recovery and Reinvestment Act (ARRA) was implemented in response to the economic crisis. This stimulus plan invested over $800 billion, with over half of it being spent during 2010.[5] **Figure 3-2, U.S. Aviation System Recoveries,** illustrates the ongoing trend in aviation growth amidst the impacts of economic system shocks.

Figure 3-2   U.S. Aviation System Recoveries
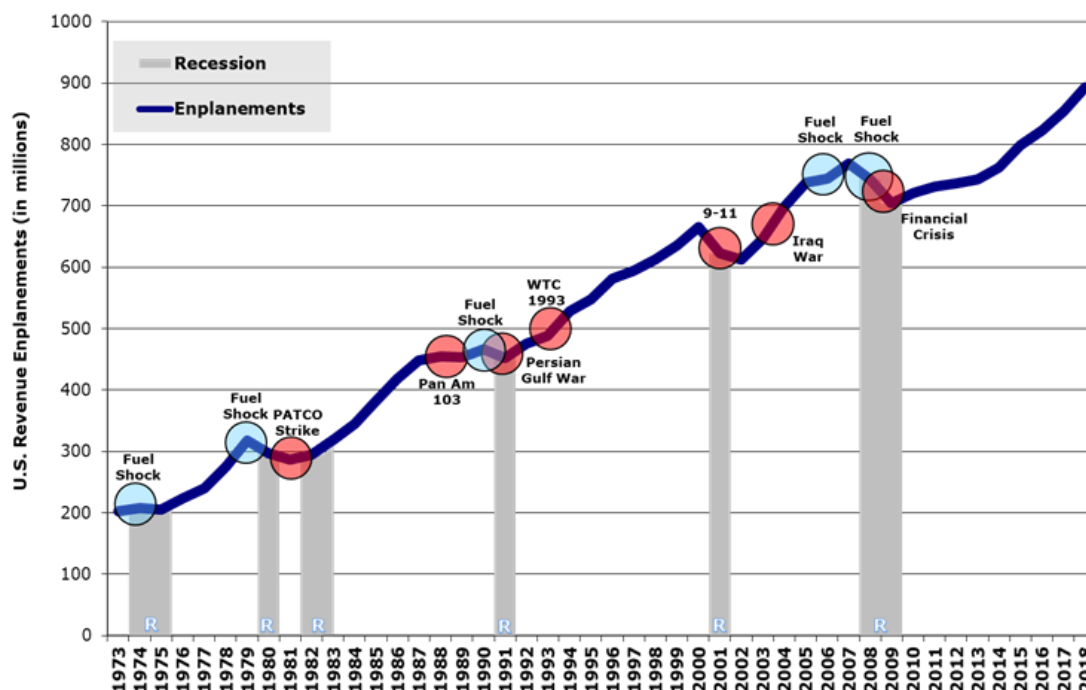
Sources: Landrum & Brown; BTS air passenger data

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[2]   National Bureau of Economic Research, US Business Cycle Expansions and Contractions, September 20, 2010.
[3]   Deregulation refers to the Airline Deregulation Act of 1978 which reduced government control over the commercial aviation industry.
[4]   National Bureau of Economic Research, US Business Cycle Expansions and Contractions, September 20, 2010.
[5]   Congressional Budget Office, Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from October 2011 Through December 2011, February 2012.

3.3   Gross Regional Product

From 2000 to 2018, the Columbus Ohio MSA's gross regional product (GRP) increased at a compound annual growth rate (CAGR) of 2.2%, while the State of Ohio (State) experienced annual GRP growth at an average of 1.2%.

Over the next 20 years, the Columbus MSA's GRP is forecast to grow at an average annual rate of 2.2% which is above the national average of 1.7% and the 1.4% expected for the State of Ohio. **Table 3-1,** *Historical and Forecast Gross Domestic/Regional Product*, provides the historical and forecast growth of the GDP and GRP of the U.S., the State of Ohio and the Columbus MSA.

Table 3-1   Historical and Forecast Gross Domestic/Regional Product

Year	Gross Domestic/Regional Product (in billions; 2012USD)		
	United States	State of Ohio	Columbus MSA
Historical			
2000	13,020,299	499,952	88,749
2001	13,187,613	496,153	89,846
2002	13,453,344	509,930	92,633
2003	13,824,371	515,937	94,782
2004	14,379,360	527,824	98,377
2005	14,925,744	536,572	100,380
2006	15,399,046	535,112	100,850
2007	15,711,012	536,938	101,440
2008	15,525,015	526,378	99,752
2009	15,251,545	510,470	97,616
2010	15,556,281	519,522	99,689
2011	15,725,298	535,395	103,931
2012	16,083,776	540,819	109,043
2013	16,450,116	553,594	111,376
2014	16,922,535	576,496	115,217
2015	17,558,494	591,154	121,961
2016	17,838,842	595,703	125,313
2017	18,263,108	608,776	127,520
2018	18,647,434	622,201	131,377
Forecast			
2023	20,481,717	672,901	147,099
2028	22,380,351	724,640	164,042
2033	24,333,719	776,784	182,248
2038	26,289,705	827,533	201,441
CAGR			
2000-18	2.0%	1.2%	2.2%
2018-38	1.7%	1.4%	2.2%

Source: Woods & Poole, 2019.

3.4   Population

The population in the Columbus MSA grew from 1.7 million people in 2000 to almost 2.1 million people in 2018, representing a CAGR of 1.2%. During this period, the population of the State of Ohio grew at a CAGR of 0.2% while the nation grew 0.8% annually.

The rate of growth in population for the Columbus MSA is forecast to continue to exceed that of the nation and the State of Ohio. At a CAGR of 0.8% over the next 20 years, the Columbus MSA is forecast to reach 2.5 million people by 2038. From 2018 to 2038, the State of Ohio is forecast to grow at a CAGR of 0.2% while the nation grows at 0.6% annually. **Table 3-2,** *Historical and Forecast Population Trends*, provides the historical and forecast population for the U.S., the State of Ohio, and the Columbus MSA.

Table 3-2   Historical and Forecast Population Trends

Year	Population (in thousands)		
	United States	State of Ohio	Columbus MSA
Historical			
2000	282,162	11,364	1,682
2001	284,969	11,387	1,707
2002	287,625	11,408	1,726
2003	290,108	11,435	1,749
2004	292,805	11,452	1,770
2005	295,517	11,463	1,791
2006	298,380	11,481	1,817
2007	301,231	11,500	1,842
2008	304,094	11,515	1,866
2009	306,771	11,529	1,888
2010	309,338	11,539	1,906
2011	311,644	11,543	1,926
2012	313,993	11,547	1,947
2013	316,234	11,568	1,971
2014	318,622	11,594	1,998
2015	321,042	11,606	2,023
2016	323,411	11,623	2,047
2017	325,719	11,659	2,079
2018	328,094	11,689	2,099
Forecast			
2023	339,666	11,822	2,197
2028	351,210	11,939	2,295
2033	362,290	12,025	2,389
2038	372,691	12,074	2,477
CAGR			
2000-18	0.8%	0.2%	1.2%
2018-38	0.6%	0.2%	0.8%

Source: Woods & Poole, 2019.

3.5   Employment

Growth in employment is an important indicator of the overall health of the local economy. Population changes and employment changes tend to be closely correlated as people migrate in and out of areas, largely depending on their ability to find work in the local economy. Employment in the Columbus MSA grew at a slightly higher rate than the nation from 2000-2018, at 1.2% compared to 1.0%, while the State of Ohio experienced average annual growth of 0.2% in employment.

At 1.4% average annual growth, the Columbus MSA is forecast to continue to outpace the State of Ohio's projected growth of 0.8% and the nation's 1.1% through 2038. **Table 3-3,** *Historical and Forecast Employment Trends*, provides the historical and forecast employment for the U.S., the State of Ohio, and the Columbus MSA through 2038.

Table 3-3   Historical and Forecast Employment Trends

Year	Employment (in thousands)		
	United States	State of Ohio	Columbus MSA
Historical			
2000	165,371	6,789	1,132
2001	165,522	6,726	1,142
2002	165,095	6,640	1,136
2003	165,922	6,621	1,137
2004	168,840	6,667	1,151
2005	172,338	6,709	1,167
2006	175,869	6,747	1,181
2007	179,544	6,795	1,206
2008	179,214	6,725	1,204
2009	173,637	6,455	1,174
2010	172,902	6,418	1,173
2011	176,092	6,522	1,201
2012	178,980	6,606	1,228
2013	182,325	6,681	1,257
2014	186,236	6,771	1,286
2015	190,318	6,860	1,315
2016	193,369	6,929	1,345
2017	196,132	6,995	1,370
2018	199,426	7,091	1,396
Forecast			
2023	212,499	7,418	1,506
2028	225,416	7,726	1,618
2033	237,961	8,005	1,730
2038	249,606	8,239	1,839
CAGR			
2000-18	1.0%	0.2%	1.2%
2018-38	1.1%	0.8%	1.4%

Source: Woods & Poole, 2019.

3.6   Per Capita Personal Income (PCPI)

Income statistics are broad indicators of the relative earning power and wealth of an area and inferences can be made relative to an individual's or community's ability to purchase air travel. Since 2000, the Columbus MSA has had a higher per capita personal income (PCPI) than the State, but it has been lower than that of the U.S. as a whole since 2001. The Columbus MSA's PCPI grew at an average rate of 1.0% per annum since 2000 which is a slightly lower rate than the State of Ohio and the U.S. as a whole.

Current projections indicate continued growth in PCPI for the Columbus MSA and the State of Ohio, averaging 1.4% and 1.4%, respectively, per year through 2038. This growth is slightly higher than that projected for the U.S. as a whole. **Table 3-4,** *Historical and Forecast Per Capita Personal Income Trends*, provides the PCPI for the U.S., the State of Ohio, and the Columbus MSA.

Table 3-4   Historical and Forecast Per Capita Personal Income Trends

	Per Capita Personal Income (2012USD)		
Year	United States	State of Ohio	Columbus MSA
Historical			
2000	$39,186	$36,664	$39,669
2001	$39,616	$36,862	$39,071
2002	$39,401	$36,881	$39,254
2003	$39,681	$37,143	$39,356
2004	$40,576	$37,576	$39,789
2005	$41,295	$37,589	$39,905
2006	$42,742	$38,396	$40,530
2007	$43,575	$38,960	$41,154
2008	$43,431	$38,994	$40,946
2009	$41,750	$37,875	$39,964
2010	$42,364	$38,308	$40,353
2011	$43,540	$39,894	$42,060
2012	$44,582	$40,695	$43,719
2013	$44,231	$40,640	$43,463
2014	$45,714	$41,632	$44,293
2015	$47,456	$43,104	$45,976
2016	$47,806	$43,340	$46,238
2017	$48,684	$44,056	$46,801
2018	$49,448	$44,893	$47,681
Forecast			
2023	$53,372	$48,654	$51,561
2028	$57,224	$52,378	$55,476
2033	$60,675	$55,708	$59,159
2038	$63,898	$58,834	$62,783
CAGR			
2000-18	1.3%	1.1%	1.0%
2018-38	1.3%	1.4%	1.4%

Source: Woods & Poole, 2019.

3.7   Airline Yield

Yields are the aviation industry's measure for average ticket prices. Yield is the average fare paid by customers to fly one mile. As prices decline, passengers can better afford to fly and thus, traffic typically increases. **Figure 3-3,** **_CMH Historical Yield and Domestic Enplanements_**, provides a graphical representation of how domestic yields have changed over the years in relationship to domestic enplanements at CMH.

Figure 3-3   CMH Historical Yield and Domestic Enplanements
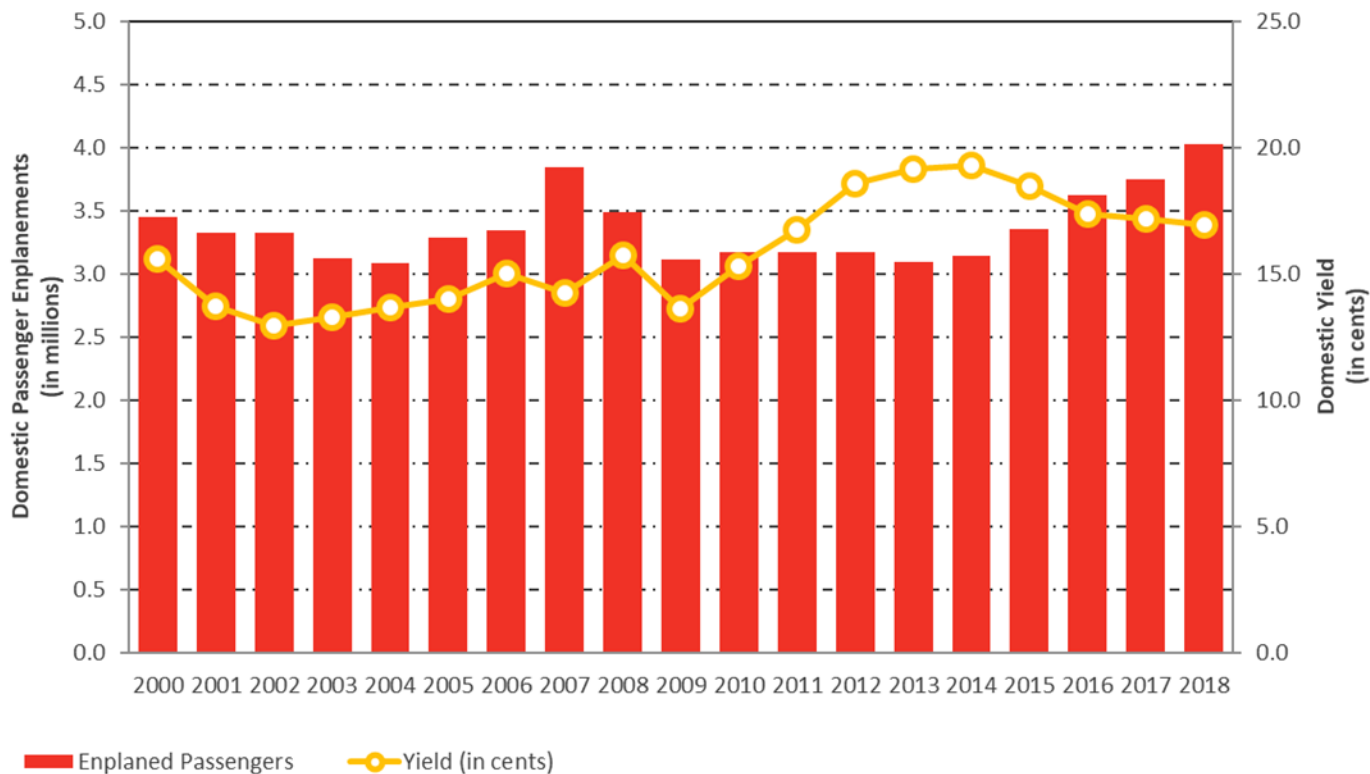
Sources: Airport; FAA O&D Passenger Survey.

The Federal Aviation Administration (FAA) projects national domestic mainline passenger real yield (adjusted for inflation) will decline 0.6% annually from 2018 through 2038.

The FAA forecast for international mainline real yield is expected to decrease 0.6% annually through 2038.

This forecast of declining yield is a result of continued penetration of the total airline market by low cost carriers and the gradual transition of the airline industry towards larger capacity aircraft and a lower fare structure. Local yields at CMH are expected to follow national trends over the forecast period.

Table 3-5, *FAA Aerospace Yield Forecast*, displays the yield growth rates forecast by the FAA Aerospace Forecast Fiscal Years 2018-2038.

Table 3-5   **FAA Aerospace Yield Forecast**

Year	Passenger Yield (in 2018 cents)		
	Domestic	International	Total
Historical			
2010	14.49	14.74	14.58
2011	15.24	15.77	15.42
2012	15.39	16.11	15.62
2013	15.50	15.91	15.64
2014	15.99	15.80	15.93
2015	15.60	14.94	15.39
2016	14.59	13.46	14.24
2017	14.25	13.20	13.93
2018	13.91	13.60	13.82
Forecast			
2023	13.31	13.20	13.27
2028	13.01	12.82	12.95
2033	12.68	12.47	12.61
2038	12.30	12.06	12.22
CAGR 2018-38	-0.6%	-0.6%	-0.6%

Notes: System refers to all of the airports in the nation's aviation system.
            The total yield reflects the weighted average of the proportional domestic and international traffic segments.
Source: FAA Aerospace Forecast: Fiscal Years 2019-2039.

3.8   National Domestic Enplanement Trends

The FAA projects U.S. domestic revenue passenger enplanements will grow from 780 million in 2018 to 1,100 million by 2038, representing a CAGR of 1.7%. **Figure 3-4,** *FAA Aerospace Domestic Enplanement Forecast*, graphically depicts the historical and forecast U.S. revenue passenger enplanements.

Figure 3-4   **FAA Aerospace Domestic Enplanement Forecast**
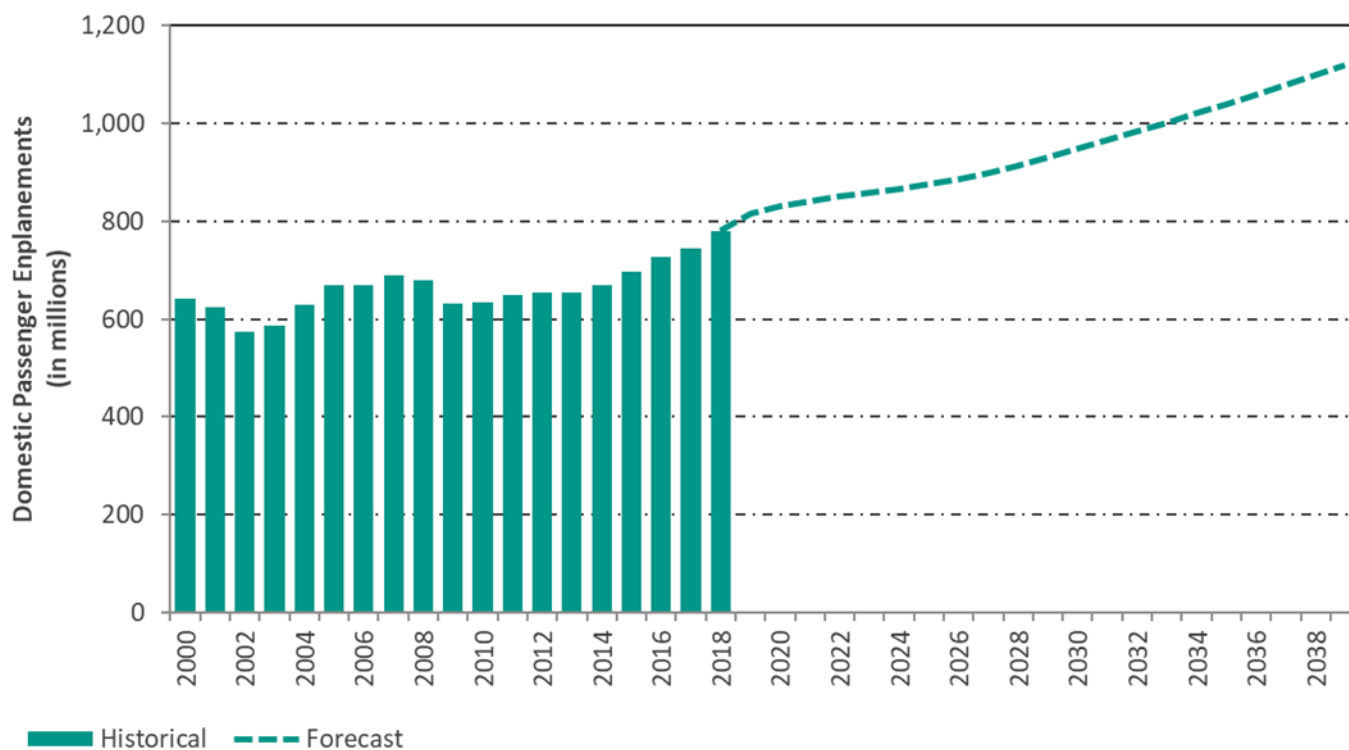
Source: FAA Aerospace Forecast Fiscal Years 2019-2039.

3.9 Airline Industry

The financial health of the airlines will play a major role in the determination of future forecasts for CMH. This section contains a summary of the airline industry factors that were considered in developing the CMH Forecast.

3.9.1 Low Cost Carriers

When Low Cost Carriers (LCC) enter air markets, prices tend to decline and discretionary leisure travel increases. America West began hubbing operations at CMH in the 1990s but significantly reduced operations in 2003 due to financial losses. In 2006, JetBlue Airways began service at CMH. Just a year later, Skybus Airlines, an ultra LCC, began hubbing operations at the Airport. These two LCCs, combined with Southwest Airlines, prompted competing carriers to offer lower fares. However, in 2008 Skybus filed for Chapter 11 Bankruptcy thereby ceasing all operations. Additionally, JetBlue ended operations at CMH in the same year. Since then, Southwest fares have increased and are now more in line with the legacy airlines such as American Airlines and Delta Air Lines. At this time, the only true LCCs operating at the Airport are Spirit and Frontier which started service at CMH in 2013 and 2018, respectively.

3.9.2 Airline Bankruptcies

There have been dramatic changes to the financial health of the airline industry in the 21st century. Numerous airlines have declared Chapter 11 bankruptcy at least once, including five of the six legacy carriers (before the latest round of mergers). There was a rash of bankruptcies between 2001 and 2005, and another more recent round in 2008 as a result of the economic recession. The most recent airline to declare bankruptcy was American Airlines which entered bankruptcy protection in November 2011. As shown in **Table 3-6,** *Airline Bankruptcy Status*, nine airlines that operated at CMH have declared bankruptcy this century. CMH's largest carrier, Southwest, has never declared bankruptcy.

Table 3-6   Airline Bankruptcy Status

Airline	Status
Trans World Airways (TWA)	Filed Chapter 11 in January 2001 as part of acquisition by American.
US Airways	Filed Chapter 11 in August 2002 and again in September 2004; emerged in September 2005 in conjunction with acquisition by America West. Acquired by American Airlines in 2013.
United Airlines	Filed Chapter 11 in December 2002; emerged in February 2006.
Air Canada	Filed Chapter 11 in April 2003; emerged in September 2004.
Northwest Airlines	Filed Chapter 11 in September 2005; emerged in May 2007. Acquired by Delta in 2008.
Delta Air Lines	Filed Chapter 11 in September 2005; emerged in April 2007. Wholly owned subsidiary Comair Airlines taken in bankruptcy with Delta Airlines
Skybus Airlines	Filed Chapter 11 in April 2008; ceased operations.
Frontier Airlines	Filed Chapter 11 in April 2008; emerged in October 2009.
American Airlines	Filed Chapter 11 in November 2011. Wholly owned subsidiary American Eagle Airlines taken into bankruptcy with American Airlines. Emerged in December 2013.

Source: Landrum & Brown.

3.9.3   Mergers and Alliances

Many airlines have merged or been acquired since the turn of the 21st century, including American/TWA in 2001, US Airways/America West in 2005, Delta/Northwest Airlines in 2008-2010, Southwest/AirTran in 2010, United/Continental Airlines in 2010-2012, American/US Airways in 2013, and Alaska/Virgin America in 2016-2017.

In addition, airlines form alliances in order to reduce costs and improve service offerings. The alliances provide revenue generating opportunities and cost savings through the codeshare benefits of linked networks, frequent flyer programs, facilities, and services.

Figure 3-5, *Major U.S. Airline Mergers in the 21st Century*, provides a graphical summary of the various mergers in the 21st century.

Figure 3-5   Major U.S. Airline Mergers in the 21st Century
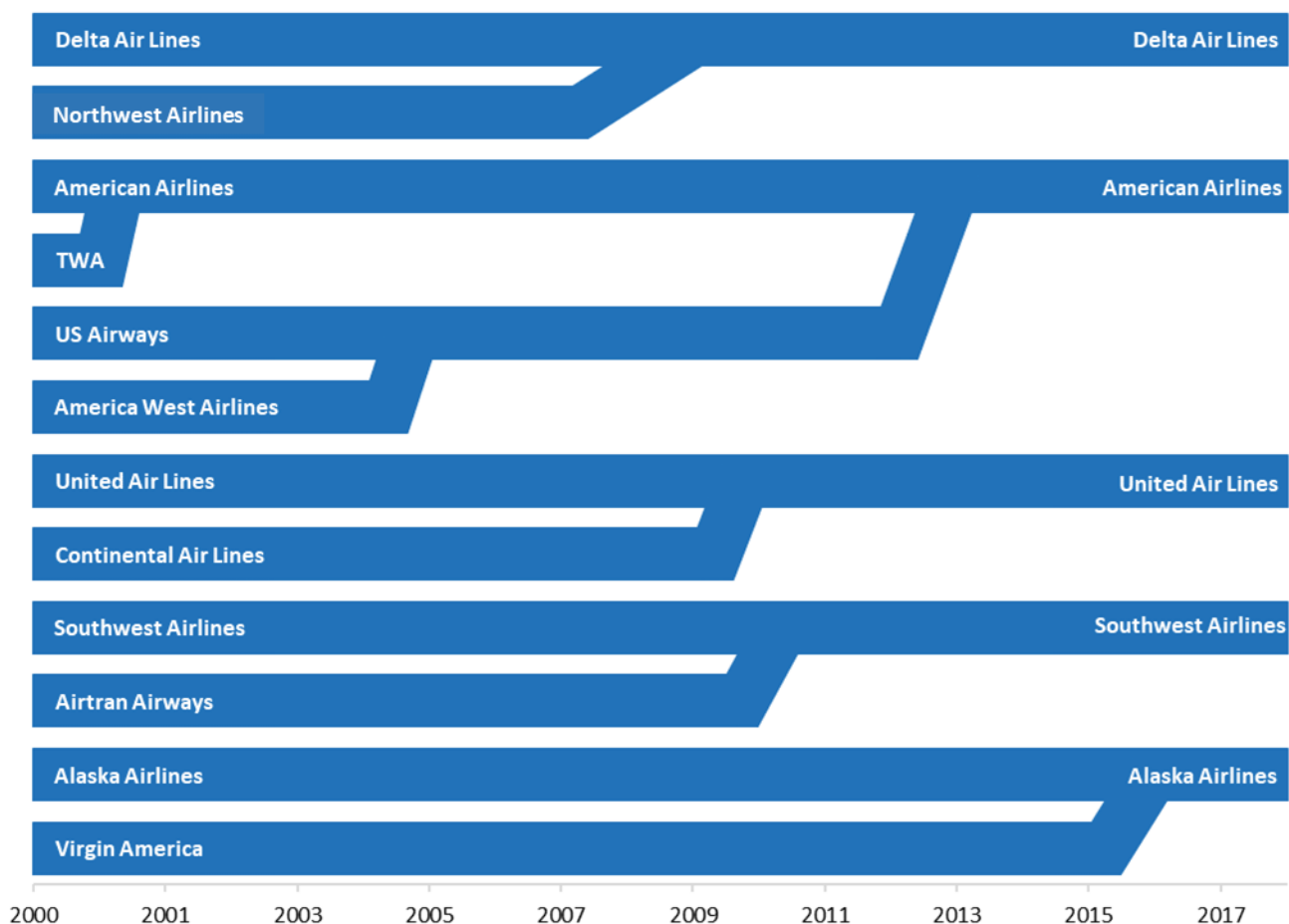
Source: Airlines for America, U.S. Airline Mergers and Acquisitions, accessed September 2019 online at http://airlines.org/dataset/u-s-airline-mergers-and-acquisitions/.

3.10   Price of Fuel

The price of oil and the associated cost of jet fuel is the largest single cost affecting the airline industry. In 2000, the cost of jet fuel to end-users averaged $0.89 per gallon. The average cost of jet fuel climbed steadily through 2007. However, in 2008, crude oil prices and, consequently, jet fuel surged in price as a result of strong global demand, a weak U.S. dollar, commodity speculation, political unrest, and a reluctance to materially increase supply. In July 2008, jet fuel reached an average price of $4.01, nearly double the price the year prior. Reduced demand in 2009 stemming from the global financial crisis and subsequent economic downturn resulted in a sharp decline in price. However, as the economic climate improved and political unrest continued in the Middle East, oil prices increased in the subsequent three years. The increase in the price of jet fuel put upwards pressure on airline operating costs.

As a result, airlines were faced with cutting capacity or increasing fares, and sometimes both. The average price of jet fuel dropped significantly in 2015 and 2016, reaching a low of $1.03 per gallon in February 2016. Since then, jet fuel prices have steadily climbed.

The U.S. Energy Information Administration (EIA) provides forecasts of jet fuel refiner price to end-users in a report entitled Short-Term Energy Outlook. In the May 2019 release, the EIA projects that jet fuel prices will reach $2.21 per gallon by December 2020. **Figure 3-6,** *Historical and Forecast Jet Fuel Prices (Jan. 1998 –* *Dec. 2020)*, presents the historical price for jet fuel refiner price to end-users and the EIA's forecast of that price.

Figure 3-6   Historical and Forecast Jet Fuel Prices (Jan. 1998 – Dec. 2020)

Jet Fuel Refiner Price to End Users (Dollars per Gallon)
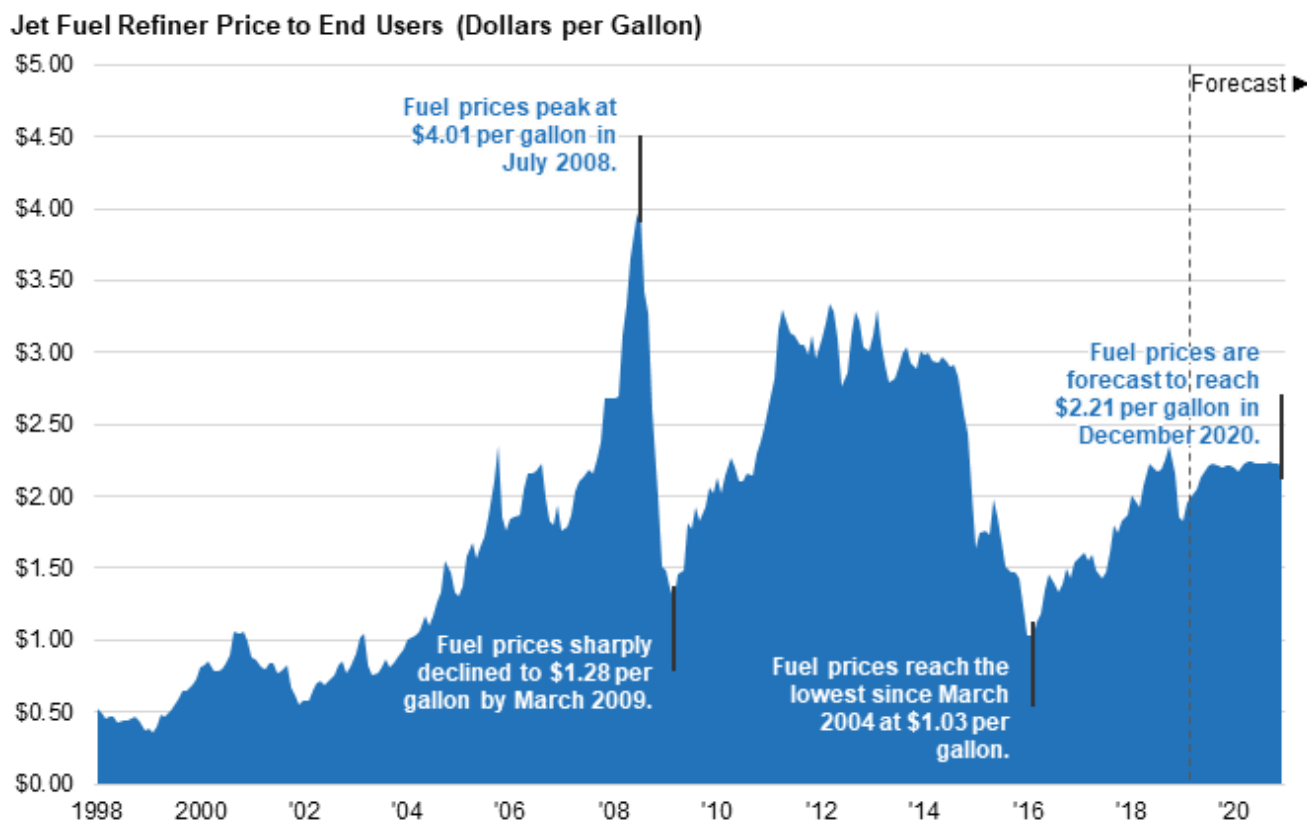
Source: U.S. Energy Information Administration, Short-Term Energy Outlook (February 2019), accessed online at https://www.eia.gov/outlooks/steo/data/browser/.

4   Historical Air Traffic

This section provides a discussion of CMH's role in the region and within the U.S. transportation system in terms of serving aviation demand. This section also provides a summary of historical activity levels and current domestic and international passenger air service. The purpose of this section is to start building a context for the forecast. The past is not always a perfect predictor of the future; however, analysis of historical data provides the opportunity to understand those factors which have either caused traffic to increase or decrease and how they may change in the future, thus influencing the forecast. While the socioeconomic base is one of the fundamental underpinnings of the forecast, demand cannot be realized without air service being offered at a price that induces demand. Ultimately, understanding the historical relationships between the economy and aviation activity at CMH will form the building blocks of the forecast.

4.1   Historical Enplanements

CMH is designated as a "Medium Hub Primary Commercial Service Airport" by the FAA.[6] From 2000 through 2018, domestic enplanements at CMH increased at an average annual rate of 0.9%, international enplanements increased at an average annual rate of 8.8%, and total enplanements increased at a CAGR of 0.9%. International growth was fuelled by new service by Vacation Express and Southwest which had a larger impact on the average annual growth rate since 2000 due to a smaller baseline compared to domestic enplanements. **Figure 4-1, *Historical Enplanements***, presents the historical passenger enplanements at CMH from 2000 through 2018.

Figure 4-1   Historical Enplanements
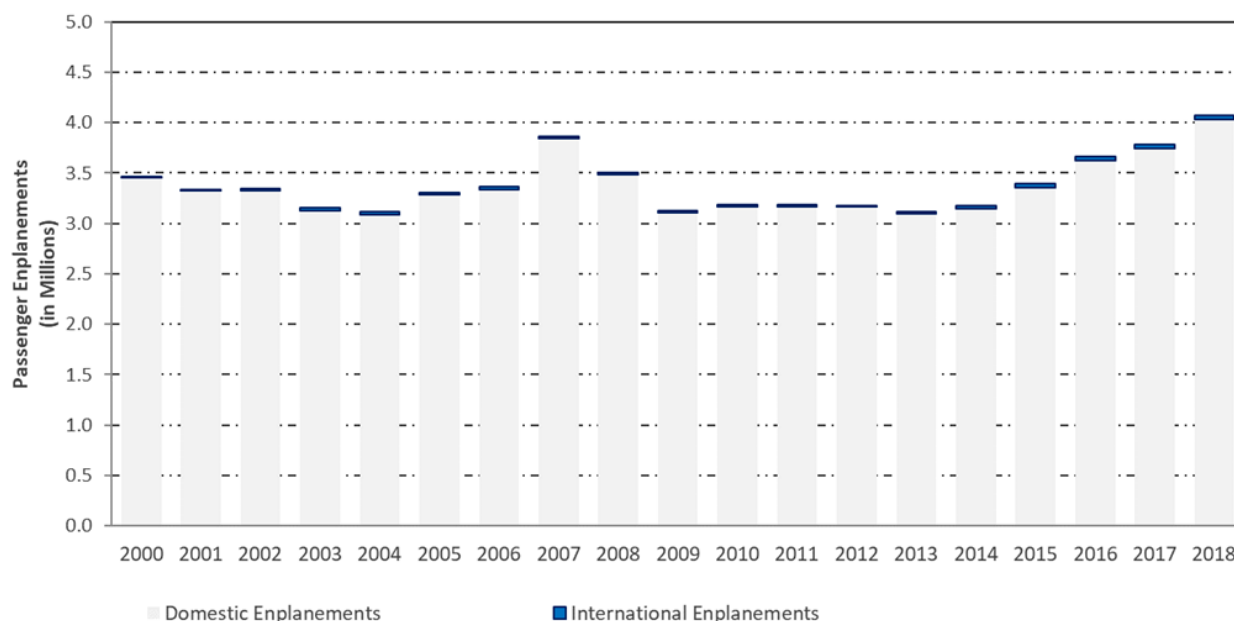
Source: CRAA.

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[6]   2019-2023 National Plan of Integrated Airport Systems (NPIAS)

From 2000 to 2014, international enplanements accounted for 1.0% or less of the total enplanements at the Airport. Recent growth increased international enplanements to 1.2% by 2018.

Passenger activity at CMH is almost entirely origin and destination (O&D) in nature with passengers beginning or terminating their itineraries at the Airport. Essentially there is very little or no real connecting traffic at CMH due to the carriers operating at the Airport and the manner in which they schedule traditional point to point operations. The passenger activity analysis will therefore maintain that passengers at CMH are O&D and it is assumed that future activity will be similar assuming no significant level of connecting traffic during the forecast period.

4.2   Scheduled Passenger Air Service

According to airline schedule filings with the Official Airline Guide (OAG), in 2019 the airlines operating scheduled commercial passenger service at CMH provided at least weekly service to 36 domestic destinations, representing 26 markets, and international flights to Toronto, Canada (YYZ) with seasonal service to Cancun, Mexico (CUN). Although not included in the OAG filings, there is limited seasonal charter service to Punta Cana, Dominican Republic from CMH. In 2019, scheduled domestic air service accounted for 98.7% of total scheduled passenger flights and 99.3% of scheduled seats at CMH. **Figure 4-2,** ***Top 10 Scheduled Passenger Markets by Daily Departures***, provides a graphical representation of the top ten markets by number of daily departures served at CMH in 2019.

Figure 4-2   Top 10 Scheduled Passenger Markets by Average Daily Departures
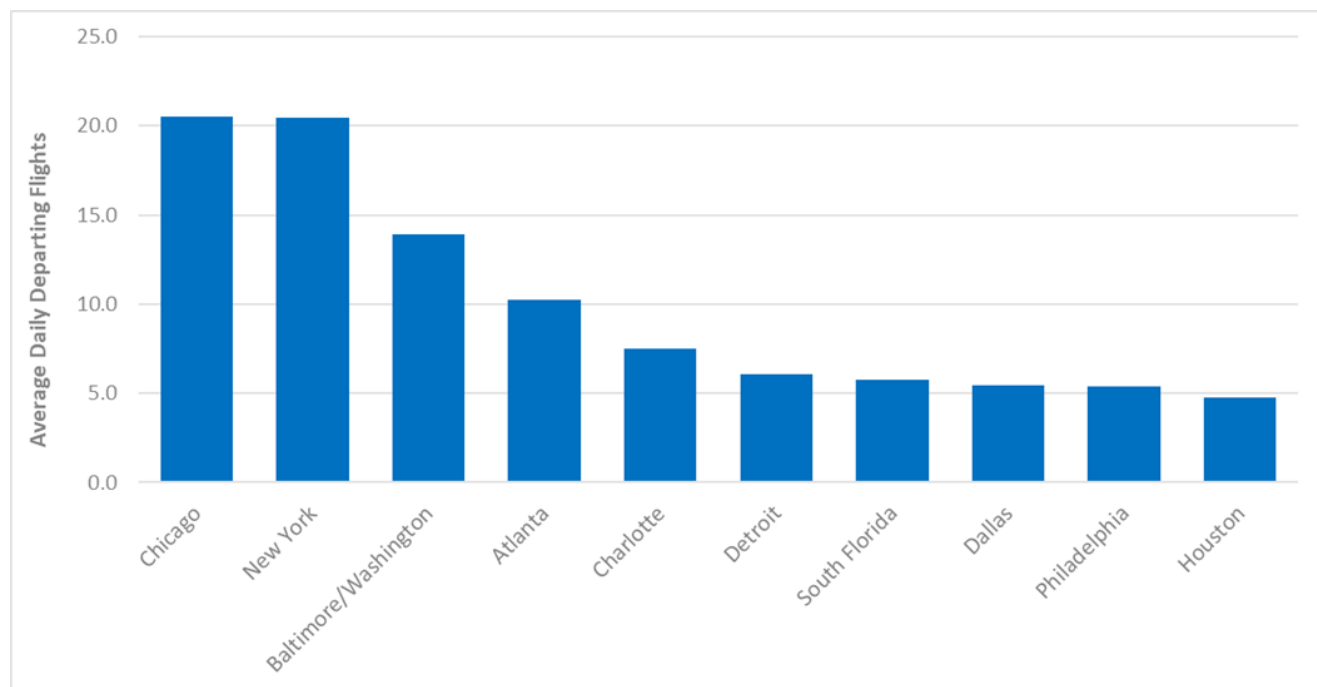
Source: OAG via Diio
Notes: New York = Kennedy, LaGuardia, and Newark
          Baltimore/Washington = Dulles, National, and BWI
          South Florida = Miami, Ft. Lauderdale, and West Palm Beach

4.3   Passenger Airline Market Share

Southwest Airlines is the largest carrier at the Airport with 1.5 million enplanements accounting for 35.7% of the total enplaned passengers in 2018. American Airlines was the second largest carrier in 2018, accounting for 23.0% of total passenger enplanements, followed by Delta Air Lines at 21.3% and United Airlines at 12.3%. The remaining carriers, including charter services, accounted for 7.7% of the traffic. Note that Allegiant Air does not operate at CMH but has scheduled operations at Rickenbacker International Airport. **Figure 4-3, *Historical Enplanements by Airline***, displays the enplaned passengers of the top carriers at CMH from 2011 to 2018.

Figure 4-3   Historical Enplanements by Airline
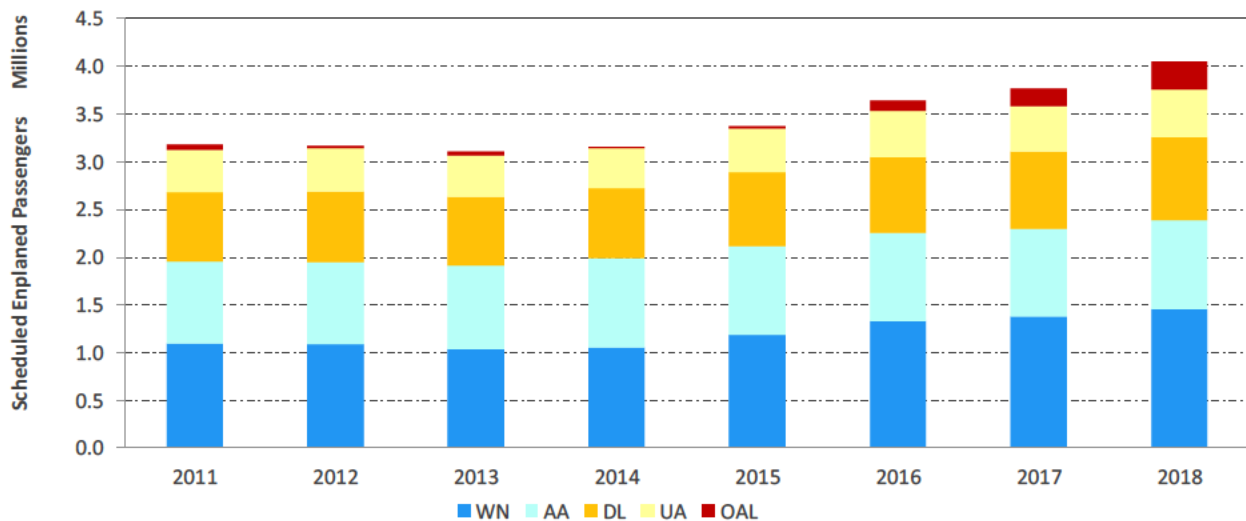
Carrier	2011	2012	2013	2014	2015	2016	2017	2018	CAGR 2011-18
Southwest Airlines	1,092,420	1,086,756	1,038,707	1,056,989	1,189,877	1,326,922	1,381,720	1,453,801	4.2%
American Airlines	865,615	860,519	879,044	934,094	923,886	925,489	920,629	935,721	1.1%
Delta Air Lines	726,261	743,930	711,403	733,138	776,838	800,711	810,079	868,062	2.6%
United Airlines	440,098	450,990	440,821	415,119	459,185	480,275	475,198	502,355	1.9%
All Other	65,674	32,619	38,108	33,706	43,723	125,308	196,881	315,642	25.1%
Total	3,190,068	3,174,814	3,108,083	3,173,046	3,393,509	3,658,705	3,784,507	4,075,581	3.6%

Notes: 1.   OAL = All Other (includes Frontier, Spirit, Air Canada and charter services)
            2.   Southwest (WN) includes AirTran
            3.   American (AA) includes US Airways
            4.   Delta (DL) includes Northwest
            5.   United (UA) includes Continental
Sources: CRAA and Landrum & Brown analysis

4.4　　Historical Aircraft Operations

Figure 4-4, *Historical Aircraft Operations*, provides a graphical representation of the historical aircraft operations at CMH from 2011 through 2018. Total operations have been relatively steady during this period declining 0.1% per year on average but have been increasing very modestly since the recent low in 2014.

Figure 4-4　　Historical Aircraft Operations
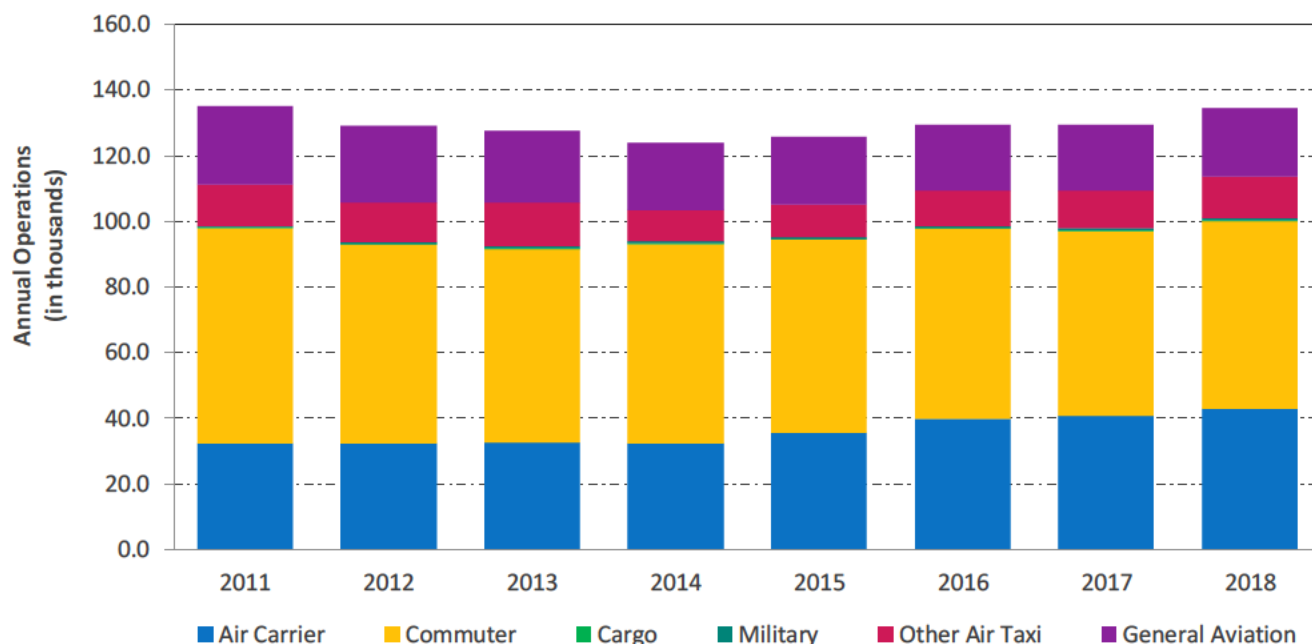
Type	2011	2012	2013	2014	2015	2016	2017	2018	CAGR 2011-18
Air Carrier	32,184	32,366	32,538	32,200	35,548	39,718	40,752	42,814	4.2%
Commuter	65,949	60,681	59,224	61,012	59,050	58,268	56,480	57,366	-2.0%
Cargo	172	108	134	200	212	136	240	248	5.4%
Military	349	540	559	609	577	438	500	632	8.9%
Other Air Taxi	12,624	12,232	13,364	9,457	9,779	10,995	11,605	12,792	0.2%
General Aviation	24,096	23,263	21,792	20,636	20,561	20,007	19,869	20,930	-2.0%
Total	135,374	129,190	127,611	124,114	125,727	129,562	129,446	134,782	-0.1%

Sources:　　CRAA; FAA Operational Network (OPSNET).

4.5   Passenger Aircraft Fleet Mix

Narrow-body aircraft form the majority of passenger operations at the Airport followed by large regional jets and small regional jets. **Table 4-1,** *2019 Scheduled Passenger Aircraft Fleet Mix*, gives a breakdown of the passenger fleet mix based on operations (total of take-offs and landings). A narrow-body aircraft is an airliner with seating arranged 2 to 6 abreast along a single aisle and a fuselage diameter of three to four meters, or up to 13 feet. A regional jet describes short to medium haul aircraft. A large regional jet will typically accommodate between 65 and 100 passengers, while small regional jets handle 50 or fewer passengers. The 2019 passenger fleet mix reflects a recent trend of upgauging to larger aircraft with fewer small regional jets operating at CMH and more larger regional jets and narrow-body jets in the fleet.

Table 4-1   **2019 Scheduled Passenger Aircraft Fleet Mix**

Aircraft Category	Operations	% Share
Narrow-body	46,664	45.1%
Large RJ	43,066	41.6%
Small RJ	13,808	13.3%
Total	**103,538**	**100.0%**

Sources: OAG via Diio; Landrum & Brown analysis.

5   Passenger Forecast

This section presents the forecast of passenger enplanements for CMH through 2039 including the methodology and assumptions used to develop these forecasts. The enplanement forecast provides the basis for the commercial passenger operations forecast which is derived based on assumptions related to average aircraft size and load factor.

5.1   Enplanement Forecast Methodology

The first step in developing the passenger forecast model was to collect and analyze demographic data, socioeconomic data, and trends in the airline industry. The enplanement forecast was guided by an approach that quantifies the relationship between passengers and these independent variables. The forecast models were developed using the classical technique of linear regression, where the relationship of the dependent variable (passenger enplanements) to one or more independent variables is modelled through a linear function. This methodology recognizes that the key independent variables will change over time but assumes their fundamental relationships to the dependent variables will remain and support the forecasts.

5.2   Domestic Enplanement Forecast

In order to develop the forecast model for domestic enplanements, several potential independent variables were tested against the dependent variable. Historical domestic enplanements at CMH were used as the dependent variable in the regression models for the years 2009 to 2018.

A multivariate linear regression model using data for Columbus Ohio MSA PCPI and airline yield specific to CMH in constant 2018 USD as independent variables was selected to forecast domestic enplanements at the Airport. The regression inputs used in the model are displayed in **Table 5-1,** *Domestic Regression Inputs*.

The model equation is provided below:

$$\hat{Y} = 665,307.7 + 108.611 * X_{MSA\ PCPI} - 113,347 * X_{CMH\ Yield}$$

The summary output from the regression model is shown below. The model exhibits relatively strong regression statistics (coefficient of determination, t-statistics, and p-values) compared to the models using other combinations of independent variables.

SUMMARY OUTPUT		ANOVA					
			df	SS	MS	F	Significance F
Regression Statistics		Regression	2	9.0415E+11	4.5208E+11	64.12628	3.1538E-05
Multiple R	0.9738	Residual	7	49348346405	7049763772		
R Square	0.9482	Total	9	9.53499E+11			
Adjusted R Square	0.9335						
Standard Error	83963		Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
		Intercept	665303.6828	532686.824	1.2489584	0.251826	-594300.5	1924907.865
		MSA PCPI	108.6110171	10.60394095	10.2425143	1.83E-05	83.53668117	133.685353
Observations	10	CMH Yield	-113346.864	18029.08151	-6.2868906	0.000409	-155978.867	-70714.8604

Table 5-1   **Domestic Regression Inputs**

Year	Domestic CMH Enplanements	Columbus Ohio MSA PCPI (2018 $)	CMH Average Airline Yield (in cents, 2018 $)
2009	3,109,731	39,964	15.80
2010	3,166,387	40,353	17.45
2011	3,169,469	42,060	18.60
2012	3,165,245	43,719	20.13
2013	3,093,217	43,463	20.42
2014	3,144,690	44,293	20.25
2015	3,356,639	45,976	19.33
2016	3,619,806	46,238	18.04
2017	3,744,014	46,801	17.47
2018	4,028,310	47,681	16.94
2019		48,515	16.77
2020		49,290	16.54
2021		50,014	16.50
2022		50,800	16.42
2023		51,561	16.35
2024		52,337	16.24
2025		53,131	16.11
2026		53,918	16.00
2027		54,699	15.90
2028		55,476	15.79
2029		56,254	15.68
2030		57,017	15.55
2031		57,741	15.41
2032		58,451	15.27
2033		59,159	15.13
2034		59,878	14.99
2035		60,628	14.85
2036		61,372	14.71
2037		62,088	14.59
2038		62,783	14.46
2039		63,474	14.29

Sources: CRAA; Woods and Poole; Landrum & Brown.

Figure 5-1, *Domestic Enplanement Model*, illustrates the model fit when plotted against the actual historical traffic at CMH. The model predicted traffic compares well to the actual traffic.

Figure 5-1 **Domestic Enplanement Model**
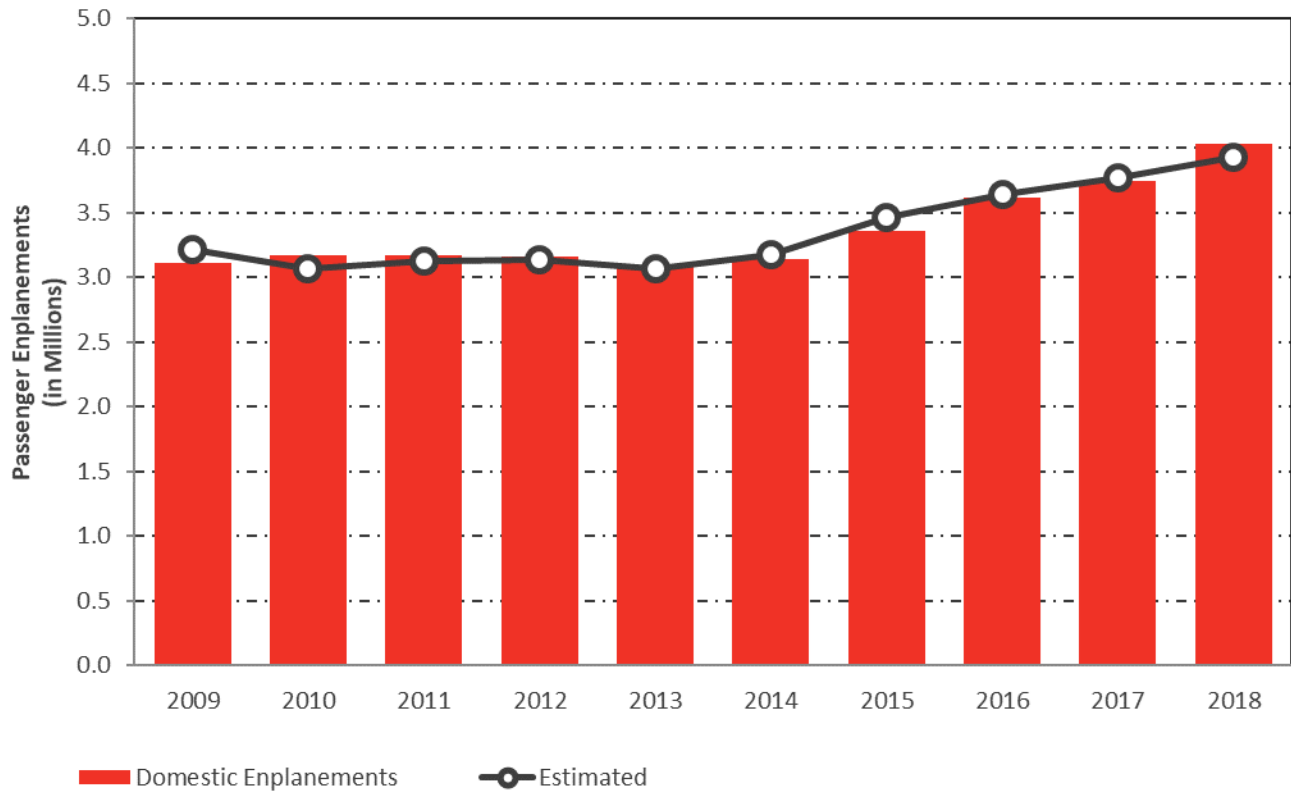
Note: Estimated values are recalculated enplanement figures using the regression inputs and formula.
Sources: CRAA; Landrum & Brown

The regression statistics and model-predicted traffic comparison indicate that the model provides a reasonable basis from which to forecast passenger traffic for CMH. The model equation was applied to the forecasts of MSA PCPI and CMH yield to determine the growth rates for the Airport's domestic passenger demand.

Based on the model, domestic enplanements for the Airport are forecast to increase from just over 4.0 million in 2018 to nearly 6.4 million in 2039, representing an average annual growth rate of 2.2%.

Figure 5-2, *Domestic Enplanement Forecast*, displays the result of the domestic enplanement forecast.

Figure 5-2   Domestic Enplanement Forecast
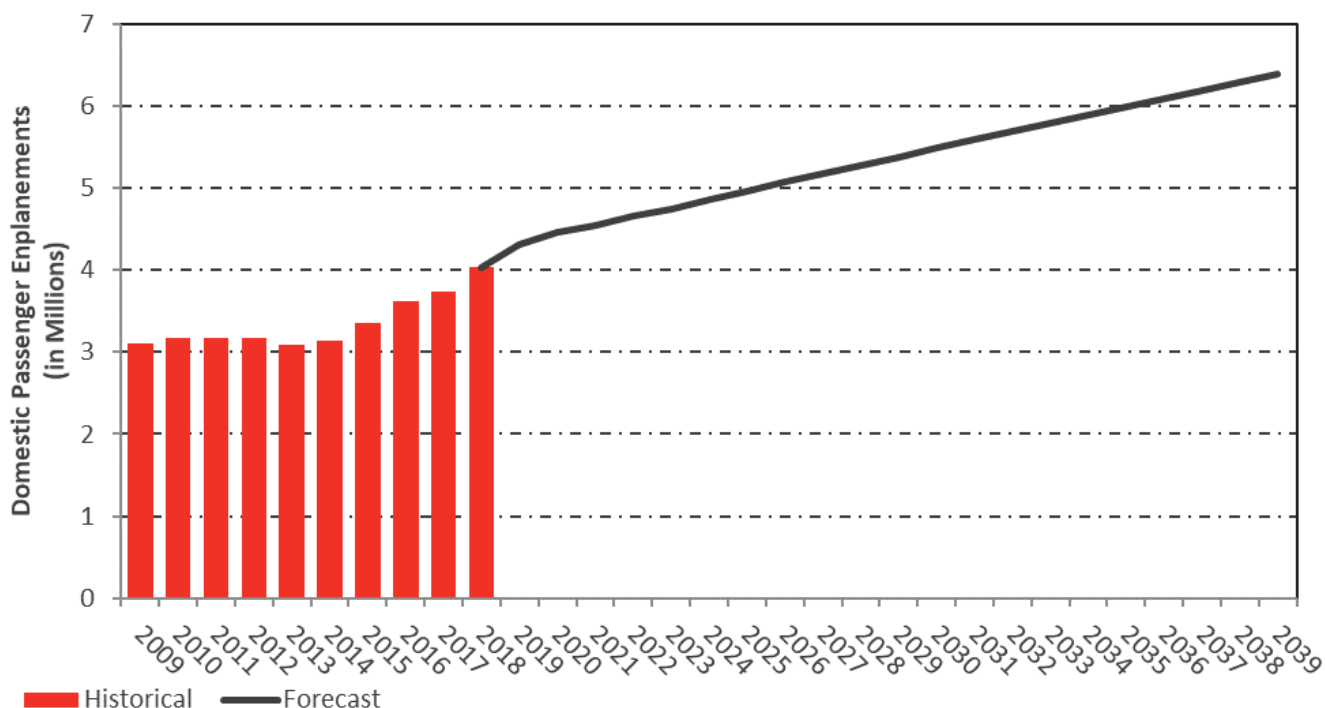
Sources: CRAA; Landrum & Brown

5.3   International Enplanement Forecast

International enplanements represent non-stop traffic to an international destination and does not show the passengers connecting to an international destination through another domestic airport. International enplanements have historically fluctuated at CMH. As such, an acceptable model obtained through linear regression was not reasonably possible.

Since 2014, international enplanements have accounted for an average of 1.1% of the total enplanements at CMH. Near-term scheduled activity into 2020 did not suggest increases in international traffic which is comprised mainly of daily service to Canada on small regional jets and seasonal traffic to leisure destinations in Mexico (and some charter services to the Dominican Republic). Therefore, it was assumed international enplanements would continue to account for approximately 1.1% of the total enplanements at the Airport during the forecast period through 2039. It is possible, but was not presumed reasonable at this time, to assume specific new international services would commence at CMH during this base forecast scenario, and based on industry benchmark trends and available CMH airlines air service plans. Demand may stimulate growth among existing markets or through new markets.

International enplanements for the Airport are forecast to increase from an estimated 47,271 in 2018 to 69,200 in 2039, representing a CAGR of 1.8%. **Figure 5-3,** *International Enplanement Forecast*, displays the result of the international enplanement forecast.

Figure 5-3   International Enplanement Forecast
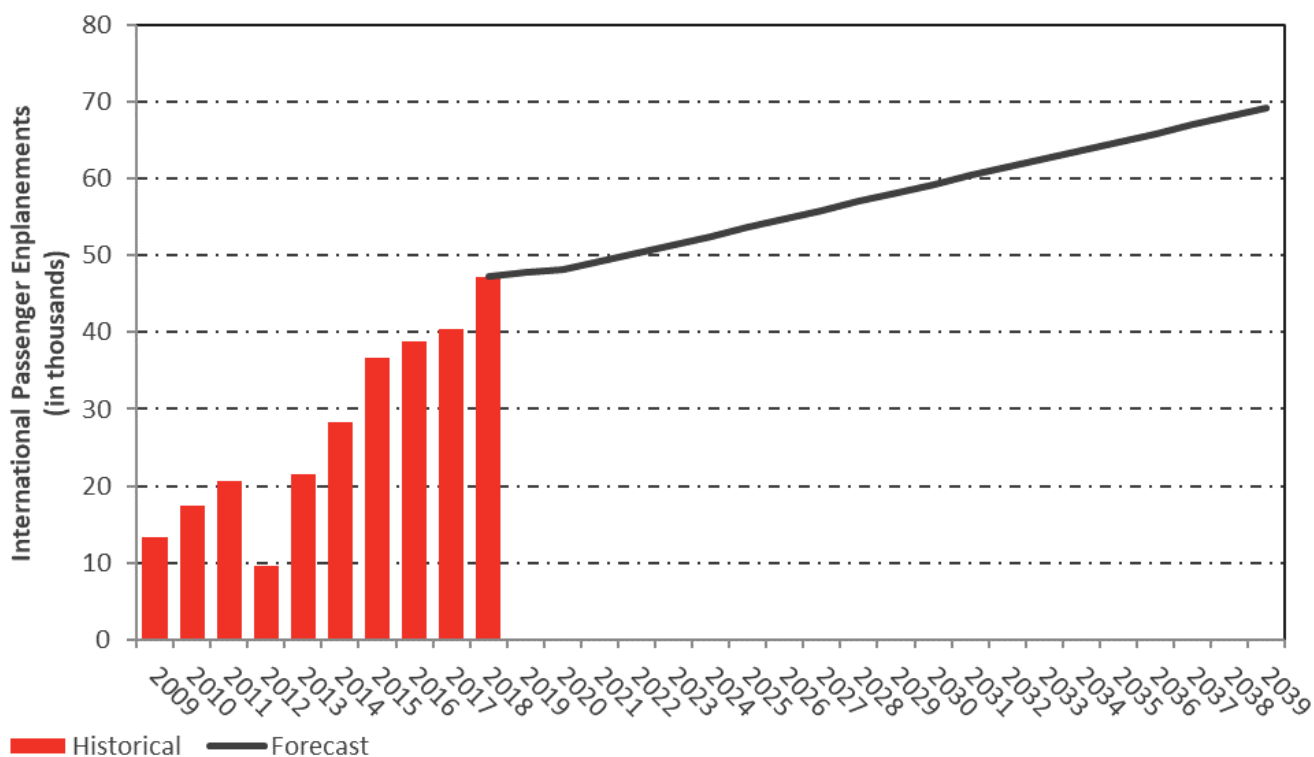
Sources: CRAA; Landrum & Brown

5.4   Enplanement Forecast Summary

The total enplanement forecast is the aggregation of the separately developed domestic and international enplaned passenger demand forecasts. Overall, the total enplaned passengers at CMH are forecast to increase from an estimated 4.1 million in 2018 to nearly 6.5 million by 2039, averaging growth of 2.2% per year. **Figure 5-4,** *Total Enplanement Forecast,* and **Table 5-,** *Total Enplanement Forecast by Segment*, provide the results of the enplaned passenger forecasts.

Figure 5-4   Total Enplanement Forecast
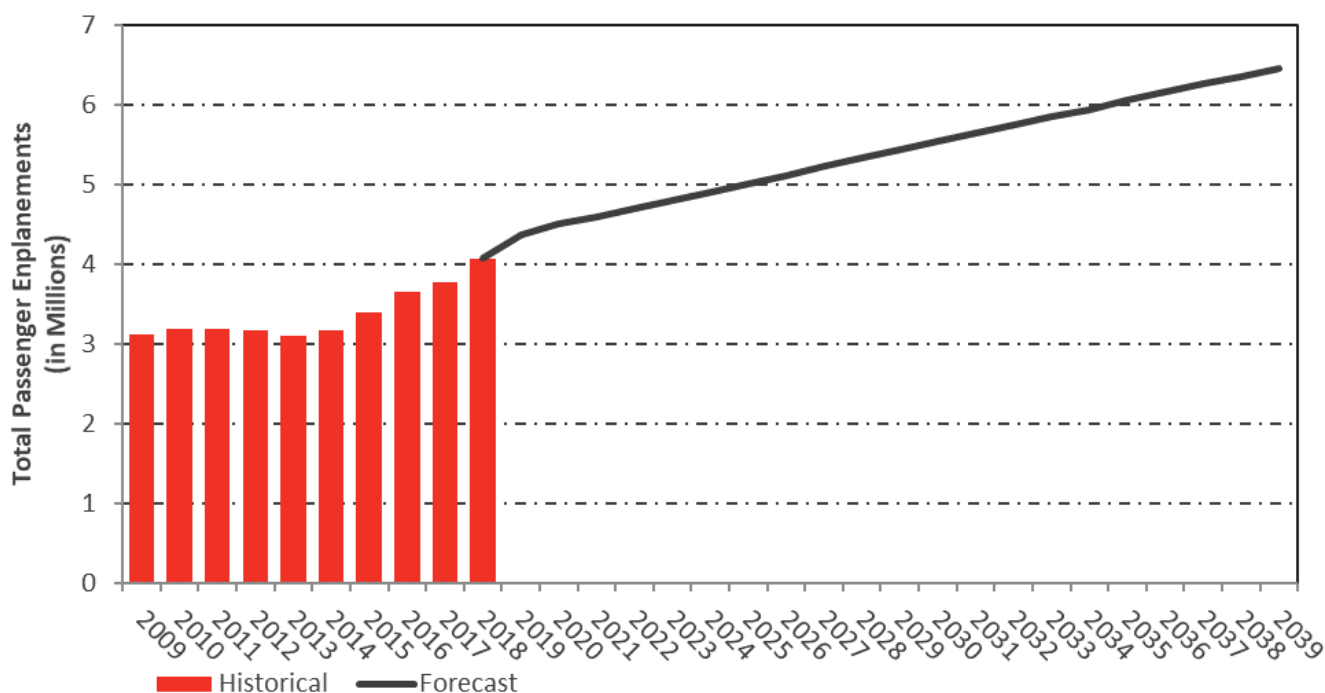
Sources: CRAA; Landrum & Brown

Table 5-2   **Total Enplanement Forecast by Segment**

| Year | Enplanements | | |
	Domestic	International	Total
Historical			
2000	3,452,627	10,293	3,462,920
2001	3,326,605	9,422	3,336,027
2002	3,327,680	20,776	3,348,456
2003	3,123,550	32,970	3,156,520
2004	3,082,360	30,510	3,112,870
2005	3,281,964	24,789	3,306,753
2006	3,339,325	23,675	3,363,000
2007	3,840,993	24,488	3,865,481
2008	3,483,618	20,816	3,504,434
2009	3,109,731	13,258	3,122,989
2010	3,166,387	17,405	3,183,792
2011	3,169,469	20,599	3,190,068
2012	3,165,245	9,569	3,174,814
2013	3,086,605	21,478	3,108,083
2014	3,144,690	28,356	3,173,046
2015	3,356,875	36,634	3,393,509
2016	3,619,806	38,899	3,658,705
2017	3,744,014	40,493	3,784,507
2018	4,028,310	47,271	4,075,581
Forecast			
2019	4,316,700	47,800	4,364,500
2020	4,460,900	48,200	4,509,100
2021	4,550,600	49,200	4,599,800
2022	4,652,100	50,300	4,702,400
2023	4,750,300	51,400	4,801,700
2024	4,854,800	52,500	4,907,300
2025	4,962,700	53,700	5,016,400
2026	5,068,800	54,800	5,123,600
2027	5,172,600	55,900	5,228,500
2028	5,276,300	57,100	5,333,400
2029	5,381,300	58,200	5,439,500
2030	5,486,300	59,300	5,545,600
2031	5,588,000	60,400	5,648,400
2032	5,687,600	61,500	5,749,100
2033	5,787,200	62,600	5,849,800
2034	5,888,400	63,700	5,952,100
2035	5,993,700	64,800	6,058,500
2036	6,097,000	65,900	6,162,900
2037	6,196,300	67,000	6,263,300
2038	6,292,900	68,100	6,361,000
2039	6,394,500	69,200	6,463,700
CAGR			
2000-18	0.9%	8.8%	0.9%
2018-19	7.2%	1.1%	7.1%
2019-39	2.0%	1.9%	2.0%
2018-39	2.2%	1.8%	2.2%

Sources: CRAA and Landrum & Brown.

6 Aircraft Operations Forecast

Aircraft operations, defined as the total of all arrivals and departures, were forecast for five major categories of users at CMH: passenger airlines, all-cargo, non-commercial air taxi, general aviation, and military.

6.1 Passenger Airline Operations

Passenger airline aircraft operations were derived from the enplaned passenger forecast. The aggregate number of passenger operations at an airport depends on three factors: total passengers, average aircraft size (number of available seats), and average load factor (percent of seats occupied). The relationship is shown in the equation below.

$$Operations = \frac{TotalPassengers}{AverageLoadFactor * AverageAircraftSize}$$

This relationship permits all combinations of load factors, average aircraft size, and operations to accommodate a given number of passengers. The fundamental approach to deriving the passenger operations forecast is essentially the same at all airports. However, the underlying assumptions at each airport are inherently different due to differences in how airlines choose to serve the demand for air travel to, from, and over each airport. These differences may result, if there is a strategic focus on unit revenues versus unit costs, or an emphasis on a hub-and-spoke operation versus a point-to-point operation.

Average seats per departure (ASPD) for each of the major groups of passenger activity was calculated from total departures and total departing seats. Aircraft load factors were calculated for each group of passenger operations by dividing total enplaned passengers by total departing seats. To calculate total operations, the total number of departures was multiplied by a factor of two.

6.1.1 Average Seats Per Departure and Load Factor Assumptions

Table 6-1, *Average Seat Per Departure and Load Factor Assumptions*, presents the ASPD and load factor assumptions, respectively, for each segment of passenger activity at the Airport. The following sections provide discussions on the assumptions used to develop the average seats per departure and load factor forecasts.

Over the past 11 years, from 2008 to 2018, passenger aircraft operations at CMH decreased from 114,596 operations to 100,180 operations at 1.3% per annum. However, passenger aircraft operations have shown an overall general increase since reaching a low of 93,304 in 2014. Average annual growth from 2014 to 2018 is 1.8%. Load factors for air carrier aircraft operations fluctuated somewhat up and down between 2008 to 2018, with a low of 71.7%, a high of 81.2%, and 81.1% estimated for 2018. Likewise, the load factors for commuter aircraft operations fluctuated between 2008 and 2018, peaking at 77.5% in 2018 with a low of 71.6% in 2011. Average aircraft size (measured in available seats) increased at 1.2% per annum from 2008 to 2018 for the air carrier segment (widebody and narrowbody passenger aircraft) and 1.7% per annum for the commuter aircraft segment (regional and air taxi commercial passenger aircraft). Average seats per departure (ASPD) increased to 150.6 seats on air carrier aircraft and 65.3 seats on commuter aircraft at CMH in 2018.

Table 6-2, Domestic and International Average Seats Per Departure Assumptions, shows the general variance between the domestic and international aircraft gauges. International flights to Canada were nearly 95% commuter aircraft in 2018 and are expected to remain the majority the fleet during the forecast period.

Table 6-1   Average Seats Per Departure and Load Factor Assumptions

Year	ASPD Air Carrier	Load Factor Air Carrier	ASPD Commuter	Load Factor Commuter
Historical				
2008	**134.1**	**71.7%**	**55.4**	**74.2%**
2009	134.1	74.1%	56.1	73.3%
2010	136.5	80.2%	56.2	77.0%
2011	136.1	81.2%	57.8	71.6%
2012	136.7	80.8%	57.6	74.7%
2013	139.5	77.0%	58.5	74.8%
2014	143.8	78.4%	59.9	75.1%
2015	145.2	78.7%	61.1	76.5%
2016	146.8	78.4%	63.5	74.7%
2017	147.7	80.0%	65.3	75.0%
2018	150.6	81.1%	65.3	77.5%
Forecast				
2019	152.7	80.1%	67.5	80.1%
2020	153.3	80.3%	67.4	80.3%
2021	153.6	80.4%	67.8	80.4%
2022	153.8	80.6%	68.2	80.6%
2023	154.1	80.7%	68.5	80.7%
2024	154.5	80.9%	68.9	80.9%
2025	154.8	81.0%	69.2	81.0%
2026	155.2	81.2%	69.5	81.2%
2027	155.6	81.3%	69.8	81.3%
2028	156.0	81.5%	70.1	81.5%
2029	156.5	81.6%	70.7	81.6%
2030	156.9	81.8%	70.9	81.8%
2031	157.4	81.9%	71.2	81.9%
2032	158.0	82.1%	71.4	82.1%
2033	158.6	82.2%	71.6	82.2%
2034	159.2	82.4%	71.8	82.4%
2035	159.9	82.5%	72.0	82.5%
2036	160.6	82.7%	72.3	82.7%
2037	161.4	82.8%	72.5	82.8%
2038	162.2	83.0%	72.7	83.0%
2039	162.4	83.0%	72.8	83.0%
CAGR				
2008-18	1.2%	1.2%	1.7%	0.4%
2018-19	1.3%	-1.2%	3.4%	3.4%
2019-39	0.3%	0.2%	0.4%	0.2%
2018-39	0.4%	0.1%	0.5%	0.3%

Sources: Airport Records; Official Airline Guide; U.S. DOT, Schedule T-100; Landrum & Brown analysis.

Table 6-2   **Domestic and International Average Seats Per Departure Assumptions**

Year	ASPD Domestic	ASPD International
2008	83.0	38.9
2009	83.6	38.7
2010	82.7	38.4
2011	83.5	39.9
2012	84.9	38.3
2013	87.1	38.2
2014	90.0	40.9
2015	94.1	41.8
2016	98.8	49.4
2017	101.3	52.6
2018	103.2	54.4
Forecast		
2019	106.9	55.4
2020	108.1	54.2
2021	108.8	54.4
2022	109.5	54.6
2023	110.2	54.8
2024	111.0	55.0
2025	111.7	55.2
2026	112.5	55.3
2027	113.3	55.5
2028	114.1	56.7
2029	115.1	56.9
2030	115.9	56.8
2031	116.7	57.4
2032	117.6	58.0
2033	118.4	58.6
2034	119.3	59.2
2035	120.2	59.8
2036	121.2	60.4
2037	122.2	60.9
2038	123.3	61.5
2039	123.6	62.0
CAGR		
2008-18	2.2%	3.4%
2018-19	3.6%	1.9%
2019-39	0.7%	0.6%
2018-39	0.9%	0.6%

Sources: Airport Records; Official Airline Guide; Landrum & Brown analysis.

Narrow-body aircraft comprised the entire passenger air carrier traffic segment at CMH in 2018 (no widebody) and accounted for 42.8% of total passenger operations. The narrowbody aircraft fleet at the Airport consists mainly of Boeing 737-700, -800, -900; MD80 series, MD90 and the Airbus 319/320/321 family. Considering the following fleet plans by airlines it is assumed that the narrowbody ASPD will increase from 150.6 seats in 2018 to 162.4 seats in 2039:

- Alaska Airlines has introduced more Airbus 320s and 321s into the fleet
- American Airlines retired all MD80 and MD90 series by September 2019, and replaced them with Boeing 737-800s
- American Airlines is increasing the use of Airbus 319s in the near term rather than increasing usage of Airbus 320s
- Delta Air Lines introduced the Airbus 220-100 aircraft into the market in 2019 as a replacement to the Boeing 717 and should increase utilization during the forecast period
- Southwest Airlines has been forced to delay adding additional frequencies with the Boeing 737 MAX 8, but will likely use this aircraft more notably in the future
- Spirit Airlines is expected to utilize the Airbus 320 more in the future, converting some activity from the Airbus 319
- United Airlines is increasing frequencies of Boeing 737-800 and -900 aircraft

Commuter operations consist of large and small regional jets. Large regional jets (more than 50 seats) accounted for 40.2% of commercial passenger operations at CMH in 2018 and are anticipated to increase in share of the total passenger operations as small regional jets may be progressively phased out and replaced by large regional jets.

This aircraft operations forecast still maintains a smaller share of small regional jets as there is currently no accepted replacement in the industry. The latest attempt at a replacement in 2019 is the Bombardier CRJ-550 which is a CRJ-700 retrofitted with a 3-class 50 seat configuration, and not a true small regional jet replacement. Typically, ERJ 170s, CRJ-700s, and CRJ-900s are being deployed at the Airport in the larger regional jet segment of commuter aircraft. It is anticipated that the commuter ASPD will increase from 65.3 seats in 2018 to 72.8 seats in 2039, and the average load factor will increase from 77.5% in 2018 to 83.0 in 2039.

6.1.2   Passenger Operations Forecast

Air carrier operations at CMH are forecast to grow from 42,856 in 2018 to 70,400 in 2039 growing at 2.4% CAGR, while the commuter operations are forecast to be relatively constant with a nearly 0.0% CAGR during the forecast, dropping slightly from 57,324 in 2018 to just 56,900 operations in 2039.

The result of the enplanements forecasts and the primary assumptions regarding load factors and ASPD project that total commercial passenger traffic will increase from 100,180 operations in 2018 to 127,300 operations by 2039, representing average annual growth of 1.1%.

Table 6-4, *Total Aircraft Operations Forecast*, provides a summary of the operations forecasts for the Airport.

6.2   All-Cargo Operations

All-Cargo freighter operations represent a very small and inconsistent traffic segment at the Airport. Traditionally, all freighter air cargo activity in the Columbus, Ohio region is expected to be handled at Rickenbacker International Airport (LCK), but some smaller express freight or critical freighter operations do occur at CMH each year. In Airport data from 2008 and 2018, as many as 354 and as few as 54 operations were reported at CMH with an average of nearly 210 operations during the last five years. With the lack of a significant historical trend and the focus on all-cargo freighter activity at LCK, operations at CMH are forecast to remain steady through 2039 at the recent average of 210 operations per annum.

6.3   Non-Commercial Air Taxi Operations

The Airport has two fixed base operators (FBO), Lane Aviation and Signature Flight Support. In addition to the FBOs, NetJets also has a large operation at the Airport.

The non-commercial or 'other' air taxi traffic segment had shown no real growth at CMH from 2009 to 2015 which could be attributed to the slow recovery in the economy and the rising cost of fuel. However, as the U.S. economy has improved and the price of fuel has dropped since July 2014, there has been an increase in other air taxi operations at the Airport beginning in 2016.

Projections by the FAA in the FAA Aerospace Forecast Fiscal Years 2019-2039 and a general consensus in industry outlooks, such as the General Aviation Manufacturers Association (GAMA) 2018 Annual Report, it is suggested that other commercial air taxi operations may grow at between 2.8% and 4.3% per annum based on hours flown.

A reasonable correlation was determined for other air taxi operations at CMH and Columbus Ohio MSA GRP for the short period of historical data from 2012 to 2018. A single variable linear regression analysis resulted in an adjusted R^2 value of 0.84. Regression inputs are listed in **Table 6-3,** ***Non-Commercial Air Taxi Regression Inputs***. The model equation is provided below:

$$\hat{Y} = -8365.1 + 0.1561 * X_{MSA\ GRP}$$

The summary output from the regression model is shown below. The model exhibits reasonable regression statistics (coefficient of determination, t-statistics, and p-values) compared to other models using less significant combinations of independent variables.

SUMMARY OUTPUT		ANOVA					
			df	SS	MS	F	Significance F
Regression Statistics		Regression	1	10592123.58	10592123.58	34.37331	0.002046862
Multiple R	0.93435	Residual	5	1540748.134	308149.6268		
R Square	0.87301	Total	6	12132871.71			
Adjusted R Square	0.84761						
Standard Error	555.112		Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
		Intercept	-8365.053407	3207.939699	-2.6076093	0.047808	-16611.32493	-118.781887
Observations	7	GRP	0.156059906	0.02661832	5.862875832	0.002047	0.087635336	0.224484476

The regression model predicts that through the correlation to MSA GRP the other air taxi operations at CMH are forecast to grow from 12,792 in 2018 to 25,000 in 2039 growing at 3.2% per annum during the forecast period.

Table 6-3   **Non-Commercial Air Taxi Regression Inputs**

Year	Other Air Taxi Operations	Columbus Ohio MSA GRP (Millions of 2012 USD)
2012	9,073	109,043
2013	9,215	111,376
2014	9,365	115,217
2015	9,779	121,961
2016	10,995	125,313
2017	11,598	127,520
2018	12,792	131,377
Forecast		
2019		134,641
2020		137,733
2021		140,729
2022		143,922
2023		147,099
2024		150,375
2025		153,703
2026		157,087
2027		160,541
2028		164,042
2029		167,601
2030		171,207
2031		174,853
2032		178,533
2033		182,248
2034		185,999
2035		189,794
2036		193,631
2037		197,513
2038		201,441
2039		205,420

Sources: CRAA; Woods and Poole; Landrum & Brown.

6.4   General Aviation Operations

Traditional general aviation activity at the Airport has declined since peak traffic levels in 2009, which is comparable with a general trend throughout the U.S. This can be attributed to a decline in piston engine operations which is expected to either continue to slow down or remain flat, with no foreseeable growth in well established markets. Since the peak in 2009 with 30,676 operations, operations decreased to the 20,000 operations per year level and have been fairly stable for the last five years.

Based on industry trends in traditional general aviation, the recent lack of growth at CMH and current general projections by the FAA in the Aerospace Forecast Fiscal Years 2019-2039, it is proposed to forecast a conservative approach in that general aviation aircraft operations will remain flat and exhibit no observable growth at the Airport during the forecast period. Although there is a large share of jet aircraft in the general aviation segment, the assumed growth in business jet activity by the FAA is considered most likely from the other air taxi operators and less from the independent business jet owners or private jet owners at CMH. Future annual general aviation operations are therefore set at 20,930 operations per annum through 2039.

6.5   Military Operations

Military operations at the airport have been declining since 2008 with some variability in traffic. Operations increased from 500 in 2017 to 632 operations in 2018. Generally, military or government operations occur as needed at each U.S. airport. As is customary in FAA forecasts, total military operations are projected annually at essentially the last year's level of activity as a constant value in the forecast. Thus, military operations at CMH are forecast to remain steady through 2039 at 630 operations per annum.

6.6   Total Aircraft Operations

Total aircraft operations at CMH as independently developed in Sections 6.1 to 6.5 are collectively forecast to grow at 1.2% annually from 134,782 in 2018 to 174,070 in 2039.

Table 6-4   Total Aircraft Operations Forecast

	Annual Aircraft Operations										
	Passenger				Non-Passenger						
Year	Air Carrier	Commuter	Passenger Total	% Pax Ops	Cargo	Other Air Taxi	General Aviation	Military	Non-Pax Total	% Non-Pax Ops	Airport Total
Historical											
2008	41,032	73,564	114,596	81%	54	5,742	19,936	1,345	27,077	19%	141,673
2009	35,841	67,697	103,538	71%	68	9,598	30,676	2,559	42,901	29%	146,439
2010	32,013	67,031	99,044	73%	354	10,172	25,585	931	37,042	27%	136,086
2011	32,446	68,678	101,124	75%	172	9,636	24,096	349	34,253	25%	135,377
2012	32,733	63,703	96,436	74%	108	9,073	23,287	546	33,014	26%	129,450
2013	32,879	62,543	95,422	74%	134	9,215	22,854	562	32,765	26%	128,187
2014	33,022	60,282	93,304	75%	200	9,365	20,641	609	30,815	25%	124,119
2015	36,096	58,502	94,598	75%	212	9,779	20,561	577	31,129	25%	125,727
2016	40,329	57,657	97,986	76%	136	10,995	20,007	438	31,576	24%	129,562
2017	41,278	55,954	97,232	75%	240	11,598	19,876	500	32,214	25%	129,446
2018	42,856	57,324	100,180	74%	248	12,792	20,930	632	34,602	26%	134,782
Forecast											
2019	46,500	56,900	103,400	75%	210	13,330	20,930	630	35,100	25%	138,500
2020	48,300	56,700	105,000	75%	210	13,840	20,930	630	35,610	25%	140,610
2021	49,400	56,900	106,300	75%	210	14,330	20,930	630	36,100	25%	142,400
2022	50,500	57,200	107,700	75%	210	14,860	20,930	630	36,630	25%	144,330
2023	51,700	57,400	109,100	75%	210	15,380	20,930	630	37,150	25%	146,250
2024	52,900	57,600	110,500	75%	210	15,920	20,930	630	37,690	25%	148,190
2025	54,100	57,800	111,900	75%	210	16,470	20,930	630	38,240	25%	150,140
2026	55,300	58,000	113,300	74%	210	17,030	20,930	630	38,800	26%	152,100
2027	56,500	58,100	114,600	74%	210	17,600	20,930	630	39,370	26%	153,970
2028	57,700	58,200	115,900	74%	210	18,180	20,930	630	39,950	26%	155,850
2029	58,900	58,200	117,100	74%	210	18,770	20,930	630	40,540	26%	157,640
2030	60,100	58,200	118,300	74%	210	19,360	20,930	630	41,130	26%	159,430
2031	61,300	58,200	119,500	74%	210	19,960	20,930	630	41,730	26%	161,230
2032	62,400	58,100	120,500	74%	210	20,570	20,930	630	42,340	26%	162,840
2033	63,600	57,900	121,500	74%	210	21,180	20,930	630	42,950	26%	164,450
2034	64,700	57,700	122,400	74%	210	21,800	20,930	630	43,570	26%	165,970
2035	65,900	57,500	123,400	74%	210	22,420	20,930	630	44,190	26%	167,590
2036	67,000	57,300	124,300	73%	210	23,050	20,930	630	44,820	27%	169,120
2037	68,100	57,000	125,100	73%	210	23,690	20,930	630	45,460	27%	170,560
2038	69,100	56,600	125,700	73%	210	24,340	20,930	630	46,110	27%	171,810
2039	70,400	56,900	127,300	73%	210	25,000	20,930	630	46,770	27%	174,070
CAGR											
2008-18	0.4%	-2.5%	-1.3%		16.5%	8.3%	0.5%	-7.3%	2.5%		-0.5%
2018-19	8.5%	-0.7%	3.2%		-15.3%	4.2%	0.0%	-0.3%	1.4%		2.8%
2019-39	2.1%	0.0%	1.0%		0.0%	3.2%	0.0%	0.0%	1.4%		1.1%
2018-39	2.4%	0.0%	1.1%		-0.8%	3.2%	0.0%	0.0%	1.4%		1.2%

Sources: Airport Records; FAA OPSNET; Landrum & Brown analysis

6.7　　Passenger Airlines Aircraft Fleet Mix Forecast

Future aircraft fleet plans announced by airlines operating at CMH and general trends throughout the commercial aviation industry were considered in the development of the passenger aircraft fleet mix forecast for the Airport. The existing passenger airlines fleet mix at CMH along with the future trends and forecast of passenger aircraft operations are presented in **Table 6-5,** *Passenger Airlines Fleet Mix Forecast*.

Table 6-5　　Passenger Airlines Fleet Mix Forecast

Aircraft Type	Seats	2018	2020	2023	2025	2028	2035	2039
Passenger								
Air Carrier								
221	109	-	484	714	930	1,371	3,336	4,998
319	134	4,592	5,314	5,393	5,446	5,509	5,560	5,562
320	162	1,344	1,931	1,971	1,997	2,030	2,074	2,042
321	230	148	144	212	274	402	960	1,408
32A	182	1,858	3,285	3,748	4,095	4,658	6,180	7,111
717	110	8	242	-	-	-	-	-
738	161	2,088	5,314	5,920	6,364	7,064	8,862	9,927
739	180	1,556	2,899	3,318	3,633	4,147	5,544	6,337
73G	126	12	48	52	54	58	66	70
73H	174	4,454	5,072	5,940	6,598	7,698	10,842	12,813
73W	143	20,122	21,154	23,292	23,171	22,355	15,742	9,431
7M8	175	532	724	1,139	1,538	2,408	6,734	10,701
MD80/82/88	140/149	4,930	1,449	-	-	-	-	-
MD90	158	1,212	242	-	-	-	-	-
Total Air Carrier		42,856	48,300	51,700	54,100	57,700	65,900	70,400
Commuter								
CRJ	50	5,842	5,104	4,301	3,834	3,214	1,899	1,650
CR7	66	9,890	7,371	6,881	6,566	6,097	4,989	4,552
CR9	76	3,600	4,366	4,618	4,785	5,033	5,504	5,748
ERJ/ER4/ERD	44/50	10,806	8,051	7,019	6,406	5,575	3,961	3,246
E70	69	9,206	10,773	10,484	10,284	9,955	8,972	8,478
E75	76	17,514	20,637	23,560	25,268	27,441	30,455	30,895
E90	99	86	398	536	656	884	1,721	2,332
BE4 Turboprop	7	380	-	-	-	-	-	-
Total Commuter		57,324	56,700	57,400	57,800	58,200	57,500	56,900
Total Passenger		**100,180**	**105,000**	**109,100**	**111,900**	**115,900**	**123,400**	**127,300**

Note:　　Future CRJ550 operations as they occur could be included in the forecasted CR7 or CRJ operations.
Sources:　　Airport Records; Official Airline Guide; Landrum & Brown analysis.

6.8   Non-Passenger Airlines Aircraft Fleet Mix Forecast

The fleet mix of the non-passenger airlines segments at CMH (cargo, other air taxi, general aviation and military) consists of small piston aircraft up through large business jets and cargo freighter aircraft. Future trends in these fleet segments and the forecast of operations are presented in **Table 6-6,** *Non-Passenger Airlines Fleet Mix Forecast*.

Table 6-6   **Non-Passenger Airlines Fleet Mix Forecast**

Aircraft Type	2018	2020	2023	2025	2028	2035	2039
Cargo							
C310, C208, DC-9	248	210	210	210	210	210	210
Total Cargo	248	210	210	210	210	210	210
Other Air-Taxi							
Jet							
BE40	770	833	836	808	805	897	1,000
C25B	640	692	805	902	1,042	1,345	1,500
C56X	1,863	2,016	2,486	2,865	3,273	4,036	4,500
C680	1,774	1,919	2,210	2,453	2,806	3,587	4,000
C750	397	430	538	649	807	1,121	1,250
CL30	1,310	1,418	1,566	1,667	1,829	2,242	2,500
CL60	386	417	498	572	678	897	1,000
E55P	1,184	1,281	1,372	1,417	1,508	1,794	2,000
F2TH	268	290	318	337	368	448	500
GLEX	418	452	559	666	817	1,121	1,250
GLF5	246	267	356	457	606	897	1,000
H25B	319	346	306	260	229	224	250
LJ35	222	240	231	165	91	-	-
LJ60	142	154	198	246	314	448	500
Turbo Prop							
B350	607	656	699	717	759	897	1,000
PC12	1,639	1,773	1,751	1,668	1,636	1,793	2,000
Piston (Twin)							
BE58	607	656	651	621	612	673	750
Total Other Air-Taxi	12,792	13,840	15,380	16,470	18,180	22,420	25,000

Aircraft Type	2018	2020	2023	2025	2028	2035	2039
General Aviation							
Jet (C25B, C56X,CL60, E550 GLF4, GLF5,LJ60)	15,162	15,162	15,162	15,162	15,162	15,162	15,162
Turbo Prop (B350, C441, PC12 TBM7)	2,084	2,084	2,084	2,084	2,084	2,084	2,084
Piston (Twin) (BE58)	404	404	404	404	404	404	404
Piston (Single) (BE36, C152, C172, C182 P28A, SR22)	3,280	3,280	3,280	3,280	3,280	3,280	3,280
Total General Aviation	20,930	20,930	20,930	20,930	20,930	20,930	20,930
Military							
Non-specified							
Total Military	632	630	630	630	630	630	630

Sources: Airport Records; Official Airline Guide; Landrum & Brown analysis.

6.9   Based Aircraft Fleet Mix Forecast

Aircraft based at an airport are typically classified as GA or air taxi aircraft that use the airport as a domicile or base of operations and are associated with FBOs, aircraft hangars or tie downs and apron areas for aircraft parking. The FAA Form 5010 reported a total of 78 based aircraft at CMH for 2018 and 73 based aircraft in the 2019 5010 report. Based aircraft are generally segmented by the FAA into four categories (single-engine, multi-engine, jets and helicopters). The largest based aircraft segment at CMH is jets which represented 61.5% of based aircraft in 2018 and 57.5% estimated in the November 2019 report by number of aircraft. The drop of five recorded based aircraft at CMH in 2019 (+1 multi-engine and -6 jets) is representative of the variances often observed in based aircraft figures which are influenced by reporting concerns and shifting of aircraft between competing airports and FBOs. Most of the based aircraft at CMH can be linked to the business jet and charter services at the Airport. Based aircraft numbers typically do not change dramatically year by year, and the forecast for CMH projects a small increase of two aircraft from 73 aircraft in 2019 to 75 aircraft in 2039, for a CAGR of 0.1% from 2019 to 2039.

Table 6-7, *Based Aircraft Fleet Mix Forecast* presents the expected transition of the based aircraft fleet at CMH though 2039 based on the 2019 reported fleet with the total fleet growing at the FAA TAF estimate of 0.1% annually, and each segments share changing with the FAA Aerospace Forecast's overall growth rate by segment.

Table 6-7   **Based Aircraft Fleet Mix Forecast**

Aircraft Group	Based Aircraft							
	2018	2019	2020	2023	2025	2028	2035	2039
Single-Engine	23	23	23	22	21	20	17	16
Multi-Engine	5	6	6	6	6	5	5	5
Jet	48	42	42	43	45	47	51	52
Helicopters	2	2	2	2	2	2	2	2
Total	**78**	**73**	**73**	**73**	**74**	**74**	**75**	**75**

Sources: FAA Form 5010; Landrum & Brown.

7   Average Annual Day Forecast

7.1   Average Annual Day Operations

The average annual day forecast by operations category is presented in **Table 7-1,** *Average Annual Day Aircraft Operations*. Average-annual day operations simply represent the annual operations in each category divided by 365 (the number of days in a given year). Average day total aircraft operations are projected to increase from an estimated 369 daily operations in 2018 to 477 daily operations in 2039.

Table 7-1   **Average Annual Day Aircraft Operations**

Operations	2018	2020	2023	2025	2028	2035	2038	2039
Passenger Airlines								
Annual	100,180	105,000	109,100	111,900	115,900	123,400	125,700	127,300
Average Annual Day	274	288	299	307	318	338	344	349
Cargo								
Annual	248	210	210	210	210	210	210	210
Average Annual Day	1	1	1	1	1	1	1	1
Other Air-Taxi								
Annual	12,792	13,840	15,380	16,470	18,180	22,420	24,340	25,000
Average Annual Day	35	38	42	45	50	61	67	68
General Aviation								
Annual	20,930	20,930	20,930	20,930	20,930	20,930	20,930	20,930
Average Annual Day	57	57	57	57	57	57	57	57
Military								
Annual	632	630	630	630	630	630	630	630
Average Annual Day	2	2	2	2	2	2	2	2
Total Operations								
Annual	134,782	140,610	146,250	150,140	155,850	167,590	171,810	174,070
Average Annual Day	369	386	401	412	428	459	471	477

Note: AAD total operations figures equal the aggregate or sum of each individual segment.
Sources: CRAA; FAA OPSNET; Landrum & Brown.

7.2   Average Annual Day Hourly Distributions

The average annual day forecast of hourly distributions is expected to remain consistent during the forecast period with no major operational shifts or capacity constraints foreseen that would materially change the hourly distributions from the base levels of 2018/2019. The hourly operational distributions are segmented by arrivals/ departures and commercial passenger/general aviation across the day while also acknowledging the daytime (7am to 10pm) and night-time (10pm to 7am) operational periods at CMH. These distributions will provide guidance with the average annual daily operations forecast in separate noise modelling efforts for CMH.

Table 7-2, *Average Annual Day Hourly Distributions (Arrivals)* and Table 7-3, *Average Annual Day Hourly Distributions (Departures)* present the percentage distributions of average activity by segment at CMH.

Table 7-2   Average Annual Day Hourly Distributions (Arrivals)

Time Period	Hour	Passenger Operations	General Aviation / Other Operations
Daytime	7:00 - 7:59	1.1%	1.9%
	8:00 - 8:59	3.1%	4.4%
	9:00 - 9:59	5.2%	5.0%
	10:00 - 10:59	5.8%	5.5%
	11:00 - 11:59	6.5%	5.3%
	12:00 - 12:59	3.6%	5.6%
	13:00 - 13:59	6.0%	5.9%
	14:00 - 14:59	5.4%	7.2%
	15:00 - 15:59	5.7%	7.8%
	16:00 - 16:59	6.4%	8.9%
	17:00 - 17:59	8.0%	9.0%
	18:00 - 18:59	6.4%	7.6%
	19:00 - 19:59	4.6%	6.0%
	20:00 - 20:59	4.3%	4.2%
	21:00 - 21:59	6.2%	3.2%
	Daytime Sub-Total	**78.4%**	**87.5%**
Nighttime	22:00 - 22:59	6.9%	2.5%
	23:00 - 23:59	7.9%	3.6%
	0:00 - 0:59	3.7%	1.2%
	1:00 - 1:59	1.2%	1.2%
	2:00 - 2:59	0.3%	1.0%
	3:00 - 3:59	0.1%	0.6%
	4:00 - 4:59	0.2%	0.9%
	5:00 - 5:59	0.5%	0.5%
	6:00 - 6:59	0.9%	1.0%
	Nighttime Sub-Total	**21.6%**	**12.5%**
Total		**100.0%**	**100.0%**

Note: Total may not equal 100% due to rounding.
Sources: CRAA ANOMS flight tracking data; Landrum & Brown.

Table 7-3   Average Annual Day Hourly Distributions (Departures)

Time Period	Hour	Passenger Operations	General Aviation / Other Operations
Daytime	7:00 - 7:59	8.8%	6.2%
	8:00 - 8:59	5.6%	7.4%
	9:00 - 9:59	6.2%	6.8%
	10:00 - 10:59	5.6%	6.8%
	11:00 - 11:59	5.8%	5.8%
	12:00 - 12:59	6.5%	6.4%
	13:00 - 13:59	3.8%	6.4%
	14:00 - 14:59	5.3%	7.6%
	15:00 - 15:59	5.4%	8.1%
	16:00 - 16:59	5.6%	7.6%
	17:00 - 17:59	5.7%	6.2%
	18:00 - 18:59	8.2%	5.4%
	19:00 - 19:59	5.8%	4.0%
	20:00 - 20:59	3.8%	3.6%
	21:00 - 21:59	1.7%	2.0%
	Daytime Sub-Total	83.9%	90.5%
Nighttime	22:00 - 22:59	0.8%	1.2%
	23:00 - 23:59	0.4%	2.2%
	0:00 - 0:59	0.1%	0.7%
	1:00 - 1:59	0.1%	0.3%
	2:00 - 2:59	0.0%	0.3%
	3:00 - 3:59	0.0%	0.2%
	4:00 - 4:59	0.0%	0.4%
	5:00 - 5:59	2.9%	1.0%
	6:00 - 6:59	11.8%	3.1%
	Nighttime Sub-Total	16.1%	9.5%
Total		100.0%	100.0%

Note: Total may not equal 100% due to rounding.
Sources: CRAA ANOMS flight tracking data; Landrum & Brown.

8   Comparison to the TAF

The FAA publishes its own forecast annually for each U.S. airport, including CMH. The Terminal Area Forecast (TAF) is "prepared to assist the FAA in meeting its planning, budgeting, and staffing requirements. In addition, state aviation authorities and other aviation planners use the TAF as a basis for planning airport improvements." The most recent release is the 2018 TAF which was issued in early 2019.

If the independent airport forecast (Sponsor Forecast) is used for FAA decision-making, such as key environmental issues, noise capability planning, airport layout plan, and initial financial decisions, the FAA requires that the Sponsor Forecast is compared to the most recent TAF to determine if they are consistent. For all classes of airports, forecasts for total passenger enplanements and total aircraft operations are considered consistent with the TAF if they meet the following criterion:[7]

- Forecasts differ by less than 10% in the five-year forecast period
- Forecasts differ by less than 15% in the ten-year forecast period

If the Sponsor Forecast is not consistent with the TAF, differences must be resolved before proceeding.

The TAF is prepared on a U.S. Government Fiscal Year (FY) basis (October through September) rather than a calendar year. The forecast presented herein was developed on a calendar year basis. When an airport's traffic is growing rapidly, a timing difference between the FY base year and the calendar base year can be significant. This timing difference distorts a straight future year comparison between the two forecasts. The true comparison that needs to be made is between the projected growth rate of the TAF and the projected growth rate of the Sponsor forecast.

The 2018 TAF includes historical information on aircraft operations from FY1990 through FY2017 and forecasts for FY2018[8] to FY2045. At airports with FAA towers like CMH, historical aircraft operations data is provided by FAA air traffic controllers, which count landings and take-offs. These aircraft operations are recorded as either air carrier, commuter & air taxi, GA, or military. Air carrier is defined as an aircraft with seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation. Commuter & air taxi aircraft are designed to have a maximum seating capacity of 60 seats or a maximum payload capacity of 18,000 pounds carrying passengers or cargo for hire or compensation.

According to the 2018 TAF, aircraft operations at CMH have increased from 127,172 in FY2013 to 132,941 in FY2018, representing an AAGR of 0.9%. The 2018 TAF projects that aircraft operations at CMH will increase from 132,941 in FY2018 to 144,876 in FY2028, representing an AAGR of 0.9%.

The enplaned passenger information in the 2018 TAF includes historical values from FY1990 through FY2017, estimated enplaned passenger figures for FY2018, and forecasts from FY2019 to FY2045. Historical enplaned passenger data is obtained through the U.S. Department of Transportation T-100 Reports.

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[7]   Federal Aviation Administration, Review and Approval of Aviation Forecasts, June 2008.
[8]   Operations data for FAA towers and Federal contract towers for FY2018 are actual.

According to the 2018 TAF, enplaned passengers at CMH increased from 3.1 million in FY2013 to an estimated 3.9 million in FY2018, representing an AAGR of 4.9%. During this span, enplaned passengers provided in the 2018 TAF have been on average within 2.5% of the Airport's records. There are two reasons for this difference. The data provided in the TAF is on a fiscal year basis. Additionally, the enplaned passengers provided in the TAF exclude non-revenue passengers and military charter passengers. In CY2018, there were 4.1 million enplaned passengers at CMH, which is nearly 5.0% higher than the 3.9 million estimated for FY2018 in the 2018 TAF. The 2018 TAF projects that enplaned passengers will increase from an estimated 3.9 million in FY2018 to 5.6 million in FY2039, representing an AAGR of 1.8%.

Enplanements comparison figures have been adjusted to account for non-revenue enplaned passengers at CMH which are not included in the TAF.

In order to compare the forecast presented herein to the 2018 TAF, Appendix B and C templates from the FAA Office of Aviation Policy and Plans (APO) document, Forecasting Aviation Activity by Airport, have been completed and are provided in **Table 8-1,** *FAA TAF Forecast Comparison-Appendix B*, and **Table 8-2***, FAA TAF Forecast Comparison-Appendix C*, respectively.

Table 8-1 FAA TAF Forecast Comparison – Appendix B

	Base Year 2018	Base Year + 1 year 2019	Base Year + 5 yrs 2023	Base Year + 10 yrs 2028	Base Year + 15 yrs 2033	Base Year to + 1 year 2018-2019	Base Year to + 5 yrs 2018-2023	Base Year to + 10 yrs 2018-2028	Base Year to + 15 yrs 2018-2033
Passenger Enplanements						Compound Annual Growth Rates			
Air Carrier	2,463,886	2,760,800	3,134,600	3,578,900	4,041,400	12.1%	4.9%	3.8%	3.4%
Commuter	1,420,731	1,494,590	1,547,060	1,621,170	1,662,160	5.2%	1.7%	1.3%	1.1%
TOTAL ENPLANEMENTS	3,884,617	4,255,390	4,681,660	5,200,070	5,703,560	9.5%	3.8%	3.0%	2.6%
Operations									
Itinerant						Compound Annual Growth Rates			
Air Carrier	43,104	46,710	51,910	57,910	63,810	8.4%	3.8%	3.0%	2.6%
Commuter/Air Taxi	70,116	70,230	72,780	76,380	79,080	0.2%	0.7%	0.9%	0.8%
Total Commercial Operations	113,220	116,940	124,690	134,290	142,890	3.3%	1.9%	1.7%	1.6%
General Aviation	20,930	20,930	20,930	20,930	20,930	0.0%	0.0%	0.0%	0.0%
Military	632	630	630	630	630	-0.3%	-0.1%	0.0%	0.0%
Local									
General Aviation	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Military	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
TOTAL OPERATIONS	134,782	138,500	146,250	155,850	164,450	2.8%	1.6%	1.5%	1.3%

	Base Year 2018	Base Year + 1 year 2019	Base Year + 5 yrs 2023	Base Year + 10 yrs 2028	Base Year + 15 yrs 2033
Average aircraft size (seats)					
Air carrier	150.6	152.7	154.1	156.0	158.6
Commuter	65.3	67.4	68.5	70.1	71.6
Average enplaning load factor					
Air carrier	81.1%	80.1%	80.7%	81.5%	82.2%
Commuter	77.5%	80.1%	80.7%	81.5%	82.2%

Note: Commuter Passenger operations at CMH as prepared in the Part 150 Aviation Demand Forecast include large regional jets with more than 50 seats. Air carrier operations were limited in the forecast to traditional narrowbody aircraft manufacturers definitions.

Total Commercial Operations includes **all** Air Taxi operations for comparison to FAA TAF.

Sources: Airport Records, FAA; Landrum & Brown.

**Table 8-2**   **FAA TAF Forecast Comparison – Appendix C**

Segment	Forecast Year	Sponsor Forecast	2018 FAA TAF	%Variance Sponsor vs 2018 TAF	
Passenger Enplanements					
Base year	2018	3,884,617	3,884,617	0.0%	2/
Base year + 5 years	2023	4,681,660	4,519,899	3.6%	
Base year + 10 years	2028	5,200,070	4,837,744	7.5%	
Base year + 15 years	2033	5,703,560	5,198,517	9.7%	
Commercial Operations[1]					
Base year	2018	113,220	111,880	1.2%	3/
Base year + 5 years	2023	124,690	115,955	7.5%	
Base year + 10 years	2028	134,290	123,174	9.0%	
Base year + 15 years	2033	142,890	131,942	8.3%	
Total Operations					
Base year	2018	134,782	132,941	1.4%	3/
Base year + 5 years	2023	146,250	137,447	6.4%	
Base year + 10 years	2028	155,850	144,876	7.6%	
Base year + 15 years	2033	164,450	153,854	6.9%	

Notes: 1/ Forcasted commercial operations in this table include passenger airline operations, all-cargo operations and all air-taxi operations for comparison to the FAA TAF.
2/ Base year 2018 enplanements for the Part 150 Forecast represent the Airport's calendar year total and were adjusted for comparison to the sponsor forecast.
3/ Base year 2018 operations were not adjusted and represent a comparison of Calendar Year to Fiscal Year.
Sources: CRAA; FAA TAF 2018; Landrum & Brown.

Figure 8-1, *Passenger Enplanement Forecast vs. FAA TAF* and **Figure 8-2,** *Total Aircraft Operations Forecast vs. FAA TAF* are presented to graphically illustrate the comparison of the two forecasts.

Figure 8-1   **Passenger Enplanement Forecast vs FAA TAF**
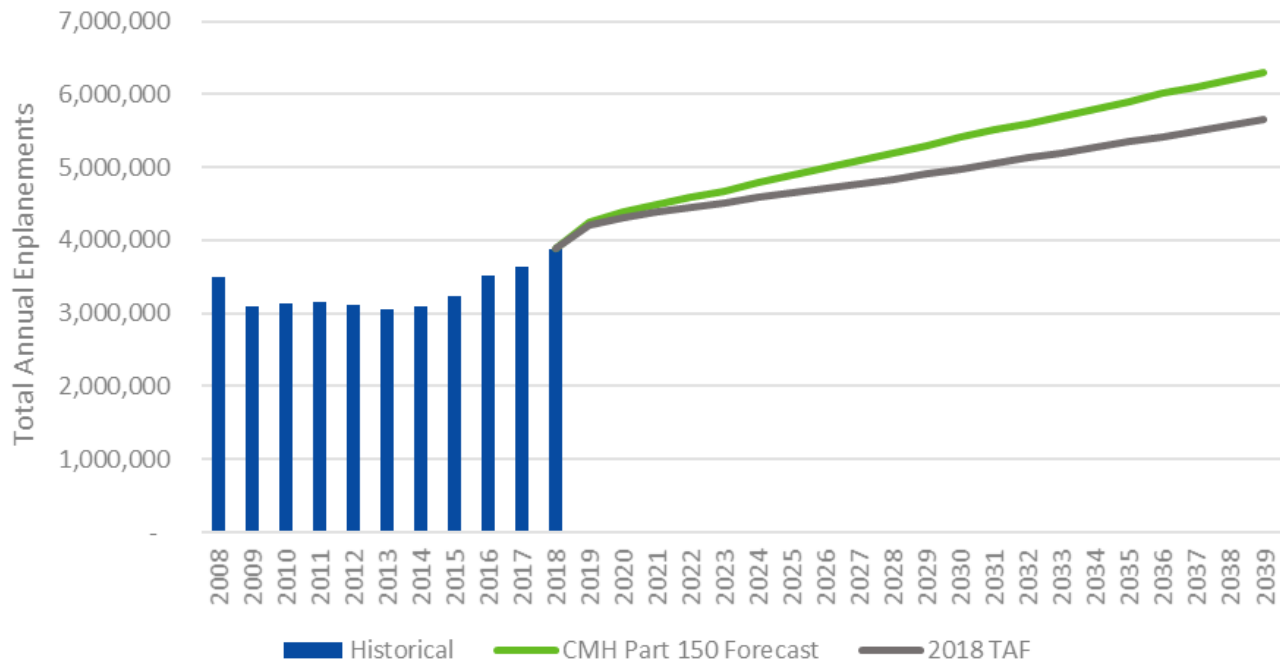
Sources: Airport Records, FAA 2018 TAF, Landrum & Brown analysis.

Figure 8-2   **Total Aircraft Operations Forecast vs FAA TAF**
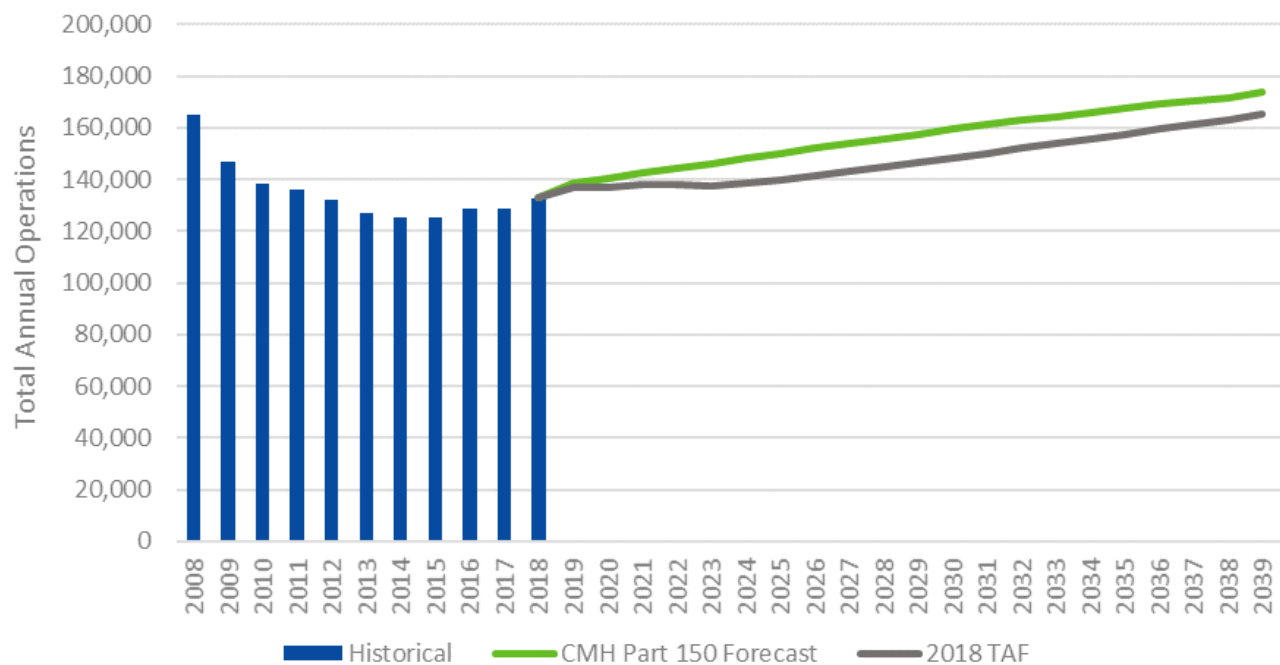
Sources: Airport Records, FAA 2018 TAF, Landrum & Brown analysis.

FAA Approval Letter
March 3, 2020

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**U.S. Department
of Transportation**

**Federal Aviation
Administration**

Detroit Airports District Office
Metro Airport Center
11677 South Wayne Road, Ste. 107
Romulus, MI 48174

March 3, 2020

Mr. Tom McCarthy, Chief of Planning and Engineering
Columbus Regional Airport Authority
John Glenn International Airprot
4600 International Gateway
Columbus, OH 43219

FAA Review & Approval for Part 150 Study at John Glenn International Airport
(CMH) – AIP Grant # 3-39-0025-0090-2019

Dear Mr. McCarthy:

The Federal Aviation Administration (FAA) Detroit Airports District Office (DET
ADO) has completed a review of the John Glenn Columbus International Airport
– Part 150 Study and ALP Update Aviation Activity Forecast, received by this
office via email on January 14, 2020 from Justin Anderson.

The forecasts were developed for the preparation of the Part 150 Noise Study
being undertaken by the sponsor. These forecasts will also be used in the
development of the airports Airport Layout Plan (being funded locally without
Airport Improvement Program funding). The FAA approves these forecasts for
planning purposes, including the development of the Noise Exposure Maps
(NEMs) and ALP. The FAA approval is based on Table 8-2, *FAA TAF Forecast
Comparison – Appendix C.* Based on our approval we also offer the following:

→ The comparison of the airport sponsor forecast and the FAA Terminal
   Area Forecast (TAF) are within the 10 percent and 15 percent allowance
   for the 5- and 10-year planning horizons. This is based on both the TAF
   January 2019 (airport calculated) and TAF January 2020 (FAA
   calculated). A copy of both the 2019 and 2020 TAF should be included
   with the final documents.
→ The forecasts are based on current data and appropriate methodologies.

The approval of the forecast does not automatically constitute a commitment on
the part of the United States to participate in any development recommended in
the Part 150 Study or shown on the Airport Layout Plan. All future development
must be justified by current activity levels at the time of proposed implementation.

Further, the approved forecasts may be subject to additional analysis or the FAA may request a sensitivity analysis if at time of submittal of the Noise Exposure Maps (NEMs) there have been any significant changes at the airports (increase or decline) prior to the FAA's processing and acceptance of the NEMs and approval of the Noise Compatibility Program (NCP).

If you have any questions about this forecast approval, please contact me at (734)229-2958.

Sincerely,

Katherine S. Delaney
Community Planner

Attachment:
2019 TAF (CMH)
2020 TAF (CMH)

FAA 2020 Terminal Area Forecast
May 2021

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APO TERMINAL AREA FORECAST DETAIL REPORT
Forecast Issued May 2021

CMH

Fiscal Year	Enplanements			Itinerant Operations					Local Operations			Total Ops	Total Tracon Ops	Based Aircraft
	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total			

AIRCRAFT OPERATIONS

REGION:AGL   **STATE:**OH   **LOCID:**CMH
CITY:COLUMBUS   **AIRPORT:**John Glenn Columbus International

Fiscal Year	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total	Total Ops	Total Tracon Ops	Based Aircraft
2019	2,752,180	1,372,075	4,124,255	88,343	26,019	20,219	738	135,319	0	0	0	135,319	335,346	73
2020*	1,505,365	777,465	2,282,830	63,164	17,478	14,900	408	95,950	28	0	28	95,978	271,912	73
2021*	1,315,837	660,956	1,976,793	55,814	14,863	15,658	408	86,743	0	0	0	86,743	263,266	73
2022*	1,745,899	874,184	2,620,083	65,407	13,885	18,527	408	98,227	0	0	0	98,227	284,628	73
2023*	2,218,872	1,114,016	3,332,888	80,993	11,907	21,815	408	115,123	0	0	0	115,123	313,869	74
2024*	2,634,791	1,328,571	3,963,362	92,097	11,645	21,858	408	126,008	0	0	0	126,008	331,816	74
2025*	2,889,628	1,462,875	4,352,503	100,693	11,948	21,901	408	134,950	0	0	0	134,950	346,632	74
2026*	3,032,786	1,538,017	4,570,803	105,793	12,075	21,945	408	140,221	0	0	0	140,221	355,512	74
2027*	3,101,732	1,574,430	4,676,162	108,239	12,198	21,988	408	142,833	0	0	0	142,833	360,133	74
2028*	3,154,465	1,601,831	4,756,296	110,055	12,321	22,032	408	144,816	0	0	0	144,816	363,649	74
2029*	3,208,643	1,629,799	4,838,442	111,927	12,445	22,075	408	146,855	0	0	0	146,855	367,219	74
2030*	3,263,500	1,658,099	4,921,599	113,808	12,571	22,119	408	148,906	0	0	0	148,906	370,803	74

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