Appendix B – Projections of Aviation Demand

U.S. Department
of Transportation
**Federal Aviation
Administration**

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

December 7, 2020

Mr. Craig Williams, AAE
Airport Director
Kalamazoo/Battle Creek International Airport
5235 Portage Road
Kalamazoo, MI 49002

Kalamazoo/Battle Creek International Airport (AZO)
FAA Review & Approval of the Aviation Forecasts

Dear Mr. Williams:

The Detroit Airports District Office has reviewed the revised "Aviation Activity Forecasts," received September 24, 2020. This revision included updates based on FAA's previous comments. FAA is providing this review and approval so the Airport can use the approved forecasts to continue work on the Environmental Assessment for the Runway 17/35 Extension, Runway Incursion Mitigation improvement project, and removal of the Noise Abatement Curfew (pre-ANCA).

This forecast was prepared at the same time as the evolving impacts of the COVID-19 public health emergency. Forecast approval is based on the methodology, data, and conclusions at the time the document was prepared. However, consideration of the impacts of the COVID-19 public health emergency on aviation activity is warranted to acknowledge the reduced confidence in growth projections using currently available data.

Accordingly, FAA approval of this forecast does not constitute justification for future projects. Justification for future projects will be made based on activity levels at the time the project is requested for development. Documentation of actual activity levels meeting planning activity levels will be necessary to justify AIP funding for eligible projects.

We have reviewed the *Projections of Aviation Demand* and *Appendix A, Impacts of COVID-19 on Projections.* The FAA approves Table 25, *Federal Aviation Administration Template – Forecast Levels and Growth Rates*, as AZO's preferred forecast. This preferred forecast is compared to the FAA's Terminal Area Forecast (TAF) in Table 26. <u>The aviation forecasts are approved for use in development of the remaining Environmental Assessment.</u>

Table 25: Federal Aviation Administration Template – Forecast Levels and Growth Rates

A. Forecast Levels and Growth Rates

	Specify base year: 2019					Average CAGR			
	2019	2024	2029	2034	2039				
	Base Yr. Level	Base Yr. + 5yr.	Base Yr. + 10yrs.	Base Yr. + 15yrs.	Base Yr. + 20yrs.	Base Yr. + 5yr.	Base Yr. + 10yrs.	Base Yr. + 15yrs.	Base Yr. + 20yrs.
Passenger Enplanements									
TOTAL Air Carrier & Commuter	151,254	160,671	169,554	176,667	183,068	1.2%	1.1%	1.0%	1.0%
Operations									
Itinerant									
Air carrier	1,537	4,202	5,016	5,096	5,142	22.3%	12.6%	8.3%	6.2%
Commuter/air taxi	6,842	3,553	1,379	1,464	982	-12.3%	-14.8%	-9.8%	-9.3%
Total Commercial Operations	8,379	7,755	6,395	6,560	6,124	-1.5%	-2.7%	-1.6%	-1.6%
General aviation	17,985	18,175	18,419	18,671	18,930	0.2%	0.2%	0.2%	0.3%
Military	155	155	155	155	155	0.0%	0.0%	0.0%	0.0%
Local									
General aviation	12,762	15,370	15,287	15,245	15,308	3.8%	1.8%	1.2%	0.9%
Military	5	5	5	5	5	0.0%	0.0%	0.0%	0.0%
TOTAL OPERATIONS	39,286	41,460	40,261	40,636	40,521	1.1%	0.2%	0.2%	0.2%
Instrument Operations	17,059	16,780	16,062	16,330	16,216	-0.3%	-0.6%	-0.3%	-0.3%
Based Aircraft									
Single Engine (Nonjet)	90	87	86	86	85	-0.6%	-0.5%	-0.3%	-0.3%
Multi Engine (Nonjet)	13	14	14	14	14	2.0%	1.0%	0.6%	0.5%
Jet Engine	8	9	10	10	11	2.0%	2.2%	1.4%	1.6%
Helicopter	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Other	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
TOTAL	111	111	110	110	110	-0.1%	-0.1%	-0.1%	0.0%

B. Operational Factors

	2019	2024	2029	2034	2039
	Base Yr. Level	Base Yr. + 5yr.	Base Yr. + 10yrs.	Base Yr. + 15yrs.	Base Yr. + 20yrs.
Average aircraft size (seats)					
Air carrier & Commuter	54.1	62.0	78.0	78.0	89.0
Average enplaning load factor					
Air carrier & Commuter	72.7%	74.0%	78.0%	80.0%	80.0%
GA operations per based aircraft	277	303	306	309	311

CAGR = Compound Annual Growth Rate

If you have any questions about this forecast approval, please contact me at (734) 229-2958 or Katherine.S.Delaney@faa.gov.

Sincerely,

Katherine S Delaney

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Katherine S. Delaney
Community Planner

Cc:
Mead & Hunt, Lansing Office

Projections of Aviation Demand

This report contains aviation activity forecasts for the Kalamazoo/Battle Creek International Airport (AZO or Airport) over a 20-year planning horizon. Aviation demand forecasts are an important step in the planning process. Ultimately, they form the basis for future demand-driven improvements at the Airport, provide data from which to estimate future off-airport impacts, such as noise and traffic, and are incorporated by reference into other studies and policy decisions. This report, which presents aviation activity forecasts through 2038, is organized as follows:

1. Forecasting Approach
2. Enplaned Passengers
3. Based Aircraft
4. Based Aircraft Fleet Mix
5. Commercial Aircraft Operations
6. General Aviation Operations
7. Military Operations
8. Instrument Operations
9. Operational Fleet Mix
10. Forecasts Summary and FAA TAF Comparison

The Federal Aviation Administration (FAA) projects future aviation activity through its Terminal Area Forecasts (TAF) which were used to compare projections prepared for this environmental assessment. Forecasts that are developed for airport studies and/or federal grants must be approved by the FAA. It is the FAA's policy, listed in Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, that FAA approval of forecasts should be consistent with the TAF. Forecasts for operations, based aircraft and enplanements at other commercial service airports as defined in the National Plan of Integrated Airport Systems (NPIAS) are consistent with the TAF if they meet the following criteria:

- Forecasts differ by less than ten percent in the five-year forecast and 15 percent in the ten-year period, or
- Forecasts do not affect the timing or scale of an airport project, or
- Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.3, *Field Formulation of the National Plan of Integrated Airport Systems*.

If the forecast is not consistent with the TAF, differences must be resolved prior to using the forecast in FAA decision-making. This may involve revisions to the airport sponsor's submitted forecasts, adjustments to the TAF, or both. FAA decision-making includes key environmental issues (e.g., purpose and need, air quality, noise, land use), noise compatibility planning (14 CFR Part 150), approval of development on an airport layout plan, and initial financial decisions.

This report examines data that pertains to aviation activities and describes the projections of aviation demand. It should be noted that projections of aviation demand are based on data through the year 2018, as this was the most recent calendar year for which a full 12 months of historical data was available at the time these forecasts were developed in November 2019.

1. Forecasting Approach

Several forecasting techniques that range from subjective judgment to sophisticated mathematical modeling may be used to project aviation activity. These forecasts incorporate local and national industry trends in assessing current and future demand. Socio-economic factors such as local population, retail sales, and employment have also been analyzed for the effect they may have had on historical and may have on future levels of activity. The comparison of the relationships among these various indicators provided the initial step in the development of realistic forecasts for future aviation demand.

The following sections provide an assessment of historical trends of aviation activity data at the local and national level. Aviation activity statistics on such items as passenger enplanements, aircraft operations and based aircraft have been collected, reviewed and analyzed. Since many variables affect a facility plan, it is important that each one be considered in the context of its context and use.

In statistical analysis, correlation (often measured as a correlation coefficient) indicates the strength of a linear relationship between two independent variables. In this analysis, a correlation coefficient is calculated for some methodologies. The closer the correlation coefficient is to 1.0, the stronger the correlation between the variables. Methodologies used to develop forecasts described in this section include:

- Time-series methodologies
- Market share methodologies
- Socio-economic methodologies

1.a Time-Series Methodologies

Historical trend lines and linear extrapolation are widely used methods of forecasting. These techniques utilize time-series types of data and are most useful for a pattern of demand that demonstrates a historical relationship with time. Trend line analyses used in this report are linearly extrapolated using the least squares method to known historical data. Growth rate analyses used in this report examined the historical compounded annual growth rates (CAGR) and extrapolated future data values by assuming a similar CAGR for the future.

1.b *Market Share Methodologies*

Market share, ratio, or top-down methodologies compare local levels of activity with a larger entity. Such methodologies imply that the proportion of activity that can be assigned to the local level is a regular and predictable quantity. This method has been used extensively in the aviation industry to develop forecasts at the local level. Historical data is most commonly used to determine the share of total national traffic activity that will be captured by a region or airport. The FAA develops national forecasts annually in its FAA

Aerospace Forecasts document, the latest edition of which is the FAA Aerospace Forecasts Fiscal Year (FY) 2019-2039.

1.c Socio-economic Methodologies

Though trend line extrapolation and market share analyses may provide mathematical and formulaic justification for demand projections, there are many factors beyond historical levels of activity that may identify trends in aviation and its impact on local aviation demand. Socio-economic or correlation analyses examine the direct relationship between two or more sets of historical data. Local market conditions examined in this report include population, total employment, total retail sales, and per capita income for Kalamazoo County. Historical and forecasted socio-economic statistics for this service area were obtained from the economic forecasting firm Woods & Poole Economics, Inc. Based upon the observed and projected correlation between historical aviation activity and the socio-economic data sets, future aviation activity projections were developed. **Table 1** presents forecasts of socio-economic indicators that are used in various locations of this report.

Table 1: Projected Socio-Economic Indicators

Year	Population	Employment	Total Retail Sales (mil, 2009$)	Per Capita Personal Income (2009$)
Historical:				
2000	239,008	151,291	3,605.50	34,522
2001	240,080	148,417	3,551.12	35,963
2002	241,937	147,646	3,519.98	36,249
2003	243,834	146,722	3,482.13	36,288
2004	242,505	147,819	3,452.36	36,052
2005	243,259	149,025	3,428.00	35,668
2006	244,178	149,547	3,372.10	36,183
2007	245,431	151,259	3,264.13	36,269
2008	246,862	148,889	3,143.52	36,921
2009	249,023	143,776	2,933.07	35,662
2010	250,748	140,806	3,056.61	35,551
2011	252,480	141,505	3,217.38	36,888
2012	255,251	143,218	3,342.90	36,892
2013	257,162	145,593	3,416.01	37,402
2014	258,994	147,755	3,504.45	37,751
2015	259,966	150,165	3,567.83	39,775
2016	261,654	153,199	3,633.78	40,373
2017	262,719	156,083	3,705.28	41,175
2018	263,974	157,952	3,747.69	41,870
CAGR (2000-2018)	*0.55%*	*0.24%*	*0.22%*	*1.08%*
Projected:				
2023	270,259	163,836	3,926.83	44,590
2028	276,362	169,151	4,077.22	47,132
2033	281,769	173,777	4,201.75	49,219
2038	285,864	177,458	4,312.19	51,082
CAGR (2018-2038)	*0.40%*	*0.58%*	*0.70%*	*1.00%*

Note: Data for Kalamazoo County, MI; CAGR = Compound Annual Growth Rate
Source: Woods & Poole Economics Inc.

2. Enplaned Passengers

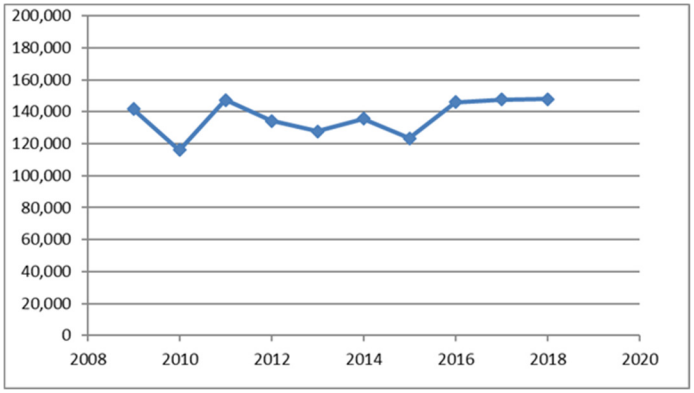
Enplanements are defined as the activity of passengers boarding commercial service aircraft that depart an airport and include both revenue and non-revenue passengers on scheduled commercial service aircraft or unscheduled charter aircraft. Passenger enplanement data is provided to Airport management and the FAA by commercial passenger service carriers, who maintain counts on the number of people that are transported to and from an airport. This section examines the passenger enplanement data and describes future passenger projections.

2.a Enplanement History

Between 2009 and 2018, passenger enplanements at the Airport have fluctuated between a low of 116,148 in 2010 and a high of 147,857 in 2018. From 2009 through 2018, enplanements have increased from 141,572 to147,857, at a CAGR of 0.48 percent. **Table 2** presents the historical enplanements at the Airport since 2009.

Table 2: Historical Enplanements

Year	AZO Enplanements
2009	141,572
2010	116,148
2011	147,361
2012	134,299
2013	127,802
2014	135,576
2015	123,487
2016	145,909
2017	147,644
2018	147,857
CAGR (2009-2018)	*0.48%*



Notes: CAGR = Compounded Annual Growth Rate
Source: Historical Enplanements - FAA ACAIS

2.b Federal Aviation Administration Forecast

The FAA records passenger enplanements for all commercial service airports and releases an updated version of the TAF every year. It should be noted that annual TAF data is based on the federal fiscal year rather than the calendar year, so historical figures differ slightly from the Airport's records. The FAA's historical records and projections of passenger enplanements are shown in **Table 3**.

Table 3: Enplanement Forecast – Terminal Area Forecast

Year	FAA TAF Enplanements
Historical:	
2009	141,572
2010	116,148
2011	147,361
2012	134,299
2013	127,802
2014	135,576
2015	123,487
2016	145,909
2017	147,644
2018	147,857
Projected:	
2023	160,621
2028	171,104
2033	182,865
2038	195,253
CAGR (2018-2038)	*1.40%*

Source: FAA Terminal Area Forecast

As illustrated, the FAA projects a 1.40 percent CAGR in enplanements for the Airport through 2038.

2.c Enplanement Forecast

Five methodologies were evaluated to develop projections for passenger enplanements. These methodologies are described in the following sections and include trend line, growth rate, market share, and socio-economic methodologies. The results of the trend line and growth rate forecasting methodologies are presented in **Table 4**. There is a correlation coefficient of 0.40 between the year and passenger enplanements between 2009 and 2018.

Trend Line Methodology – The trend line methodology assumes that future trends will continue to mimic those of the selected time period and that factors that affect those trends will continue to influence demand levels in a similar fashion. The establishment of a linear trend line using historical data through the least squares method typically serves as a baseline projection to which other methodologies are compared.

Airport records for passenger enplanements from 2009 to 2018 were reviewed as a part of this methodology. Applying the least squares method, the trend line methodology projects passenger enplanements will increase to 150,878 in 2023 and continue to increase linearly through 2038 to 173,161.

Growth Rate Methodology – The growth rate methodology examines the percent change in activity between two points in time and assumes that future activity will change at this rate throughout the forecasting period. Between 2009 and 2018, there was a 0.48 percent CAGR in passenger activity. Applying this CAGR, passenger enplanements are forecasted to grow to 151,468 in 2023; 155,168 in 2028; 158,958 in 2033; and 162,841 in 2038.

Table 4: Enplanement Forecasts – Trend Line & Growth Rate Methodologies

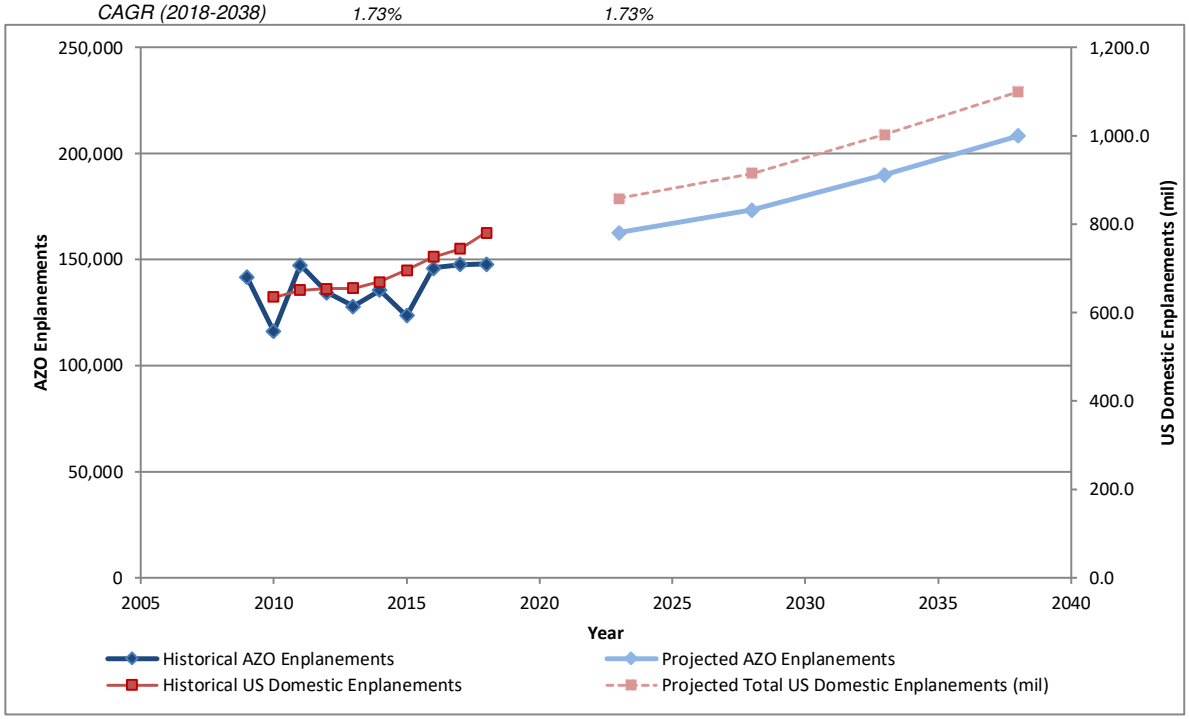
Year	Growth Rate Enplanements	Trend Line Enplanements
Historical:		
2009	141,572	141,572
2010	116,148	116,148
2011	147,361	147,361
2012	134,299	134,299
2013	127,802	127,802
2014	135,576	135,576
2015	123,487	123,487
2016	145,909	145,909
2017	147,644	147,644
2018	147,857	147,857
CAGR (2009-2018)	*0.48%*	*0.48%*
Projected:		
2023	151,468	150,878
2028	155,168	158,306
2033	158,958	165,734
2038	162,841	173,161
CAGR (2018-2038)	*0.48%*	*0.79%*

Sources: Historical Enplanements - FAA ACAIS
Projections - Mead & Hunt, Inc.

Market Share Methodology – A market share methodology compares activity levels at an airport to a larger geographical region over a given length of time. For the purposes of this environmental assessment, a market share methodology forecast has been developed that compares activity at the Airport with total U.S. domestic enplanements. Domestic U.S. and AZO enplanement data dating back to 2009 were examined. The results of this projection methodology are presented in **Table 5**. There is a correlation coefficient of 0.63 between U.S. domestic enplanements and AZO enplanements.

Table 5: Enplanement Forecast – Market Share Methodology

Year	AZO Enplanements	Total US Domestic Enplanements (mil)	AZO Market Share
Historical:			
2009	141,572		
2010	116,148	634.8	0.0183%
2011	147,361	650.1	0.0227%
2012	134,299	653.8	0.0205%
2013	127,802	654.4	0.0195%
2014	135,576	669.0	0.0203%
2015	123,487	696.3	0.0177%
2016	145,909	726.2	0.0201%
2017	147,644	743.9	0.0198%
2018	147,857	780.8	0.0189%
CAGR (2009-2018)	*0.48%*	*2.62%*	
		Average (2009-2018)	*0.0198%*
Projected:			
2023	162,488	858.1	0.0189%
2028	173,192	914.6	0.0189%
2033	189,809	1,002.4	0.0189%
2038	208,192	1,099.5	0.0189%
CAGR (2018-2038)	*1.73%*	*1.73%*	



Notes: CAGR = Compounded Annual Growth Rate
Sources: Historical Enplanements - FAA ACAIS
Total US Domestic Enplanements - FAA Aerospace Forecasts FY 2019-2039
Projections - Mead & Hunt, Inc.

This market share methodology uses the projections of total U.S. domestic enplanements described in the FAA Aerospace Forecasts FY 2019-2039. The FAA develops their commercial aviation forecasts from econometric models that explain and incorporate emerging trends for the different segments of the industry along with the world and U.S. economies. The FAA has developed its forecasts for the U.S. domestic market with a model based upon real disposable personal income, believing that aviation demand is a derived demand – that is, aviation demand depends upon the level of business and leisure activity in the

economy. The market share methodology assumes that the Airport's 2018 market share of U.S. domestic enplanements of 0.0189 percent will continue through the year 2038. The market share methodology projects 162,488 passenger enplanements in 2023; 173,192 in 2028; 189,809 in 2033; and 208,192 in 2038. This represents a CAGR of 1.73 percent.

Socio-economic Methodology – Socio-economic, or correlation, methodologies examine the direct relationship between two or more sets of historical data. To conduct forecasts using this method, local conditions were examined including population and per capita income for Kalamazoo County. Historical and forecasted socio-economic statistics for Kalamazoo County were obtained from the economic forecasting firm Woods & Poole Economics, Inc. Based upon the observed and projected correlation between historical aviation activity and the socio-economic data sets, future aviation activity projections were developed. The results of these methodologies are presented in **Table 6**.

Socio-economic Methodology – Population Variable – Local population can be a strong indicator for the demand of commercial aviation, particularly at small hub and non-hub airports; however, at the Airport, the correlation coefficient between the population of Kalamazoo County and AZO enplanements is only 0.35. The socio-economic population variable methodology compares historical population figures to passenger enplanements. Between 2009 and 2018, the population of Kalamazoo County increased from 249,023 to 263,974. In 2018, the number of annual enplanements per capita was 0.560. This figure was applied to population projections to forecast 151,377 passenger enplanements in 2023; 154,796 in 2028; 157,824 in 2033; and 160,118 in 2038.

Socio-economic Methodology – Per Capita Income Variable – Because local economic conditions can impact levels of passenger activity, another socio-economic factor that was examined was per capita income. Between 2009 and 2018, per capita income (in 2009$) in Kalamazoo County increased from $35,662 to $41,870, a CAGR of 1.8 percent. There is a correlation coefficient of 0.48 between per capita income for Kalamazoo County and AZO enplanements. It is projected that per capita income for the county through 2038 will increase to $51,082, a CAGR of 1.0 percent. The number of enplanements per $1 of income was 3.531 in 2018. Applying this figure to the per capita income projections by Woods & Poole Economics, Inc., forecasts illustrate that 157,462 passengers will be enplaned in 2023; 166,439 in 2028; 173,809 in 2033; and 180,388 in 2038.

Table 6: Enplanement Forecasts – Socio-economic Methodologies

	Socio-Economic Methodology - Population Variable			Socio-Economic Methodology - Per Capita Income Variable		
Year	Enplanements	Kalamazoo CO Population	Enplanements Per Capita	Enplanements	Kalamazoo CO Per Capita Income (2009$)	Enplanements Per $1 Income
Historical:						
2009	141,572	249,023	0.569	141,572	35,662	3.970
2010	116,148	250,748	0.463	116,148	35,551	3.267
2011	147,361	252,480	0.584	147,361	36,888	3.995
2012	134,299	255,251	0.526	134,299	36,892	3.640
2013	127,802	257,162	0.497	127,802	37,402	3.417
2014	135,576	258,994	0.523	135,576	37,751	3.591
2015	123,487	259,966	0.475	123,487	39,775	3.105
2016	145,909	261,654	0.558	145,909	40,373	3.614
2017	147,644	262,719	0.562	147,644	41,175	3.586
2018	147,857	263,974	0.560	147,857	41,870	3.531
CAGR (2009-2018)	*0.48%*	*0.65%*		*0.48%*	*1.80%*	
Projected:						
2023	151,377	270,259	0.560	157,462	44,590	3.531
2028	154,796	276,362	0.560	166,439	47,132	3.531
2033	157,824	281,769	0.560	173,809	49,219	3.531
2038	160,118	285,864	0.560	180,388	51,082	3.531
CAGR (2018-2038)	*0.40%*	*0.40%*		*1.00%*	*1.00%*	

Sources: Historical Enplanements - FAA ACAIS
Historical Population & Per Capita Income - Woods & Poole
Projected Population & Per Capita Income - Woods & Poole
Projections - Mead & Hunt, Inc.

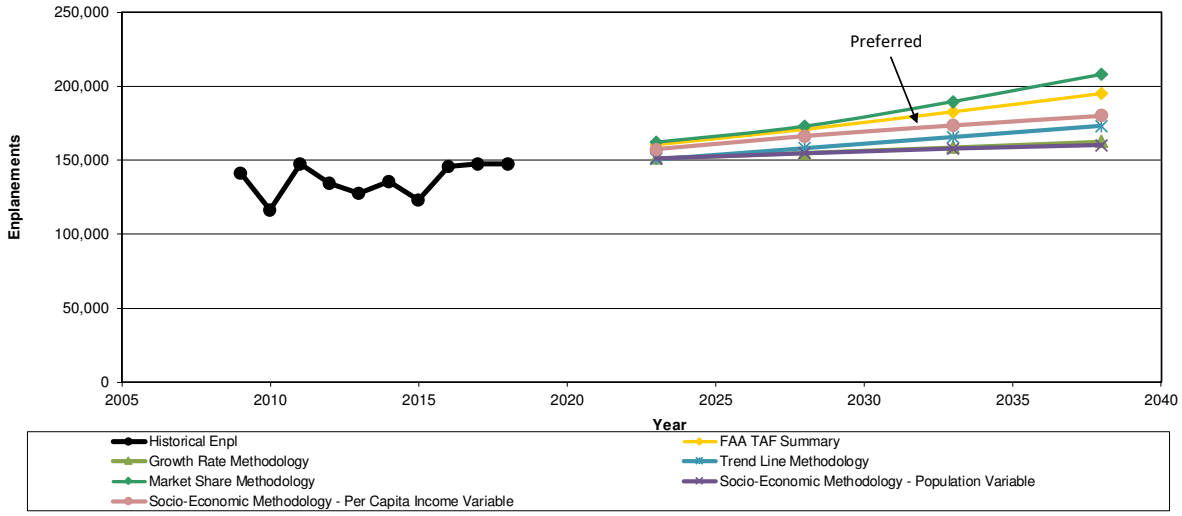
Enplanement Forecasts Comparison and Summary – A comparison of projected enplanements using the methodologies described in this section is presented in **Table 7**. All the methodologies project that there will be an increase in passenger demand over the next 20 years.

The FAA's TAF and the market share methodology forecast CAGRs of 1.40 and 1.73 percent, respectively, from 2018 to 2038, which is considered too aggressive based on the Airport's historic CAGR of 0.48 percent. Of the time-series methodologies, only the trend line projection forecasts growth at a higher CAGR (0.79 percent) than historic growth, but this growth is considered too conservative for AZO over the planning period. The socio-economic methodology using the population variable projects growth at a CAGR of 0.40 percent, which is less than the historic CAGR. This leaves the socio-economic methodology using the per capita income variable, which forecasts growth at a CAGR of 1.00 percent from 2018 to 2038, which is considered growth that can be reasonably expected at the Airport. This methodology also has the highest correlation coefficient (0.48) of all the methodologies other than market share.

The socio-economic methodology using the per capita income variable has therefore been selected as the preferred enplanement projection.

Table 7: Enplanement Forecasts Summary

Year	Historical Enpl	FAA TAF Summary	Growth Rate Methodology	Trend Line Methodology	Market Share Methodology	Socio-Economic Methodology - Population Variable	*Preferred* Socio-Economic Methodology - Per Capita Income Variable
Historical:							
2009	141,572						
2010	116,148						
2011	147,361						
2012	134,299						
2013	127,802						
2014	135,576						
2015	123,487						
2016	145,909						
2017	147,644						
2018	147,857						
CAGR (2009-2018)	*0.48%*						
Correlation Coefficient		*NA*	*0.40*	*0.40*	*0.63*	*0.35*	*0.48*
Projected:							
2023		160,621	151,468	150,878	162,488	151,377	157,462
2028		171,104	155,168	158,306	173,192	154,796	166,439
2033		182,865	158,958	165,734	189,809	157,824	173,809
2038		195,253	162,841	173,161	208,192	160,118	180,388
CAGR (2018-2038)		*1.40%*	*0.48%*	*0.79%*	*1.73%*	*0.40%*	*1.00%*



Sources: Historical Enplanements - FAA ACAIS
Projections - Mead & Hunt, Inc., except FAA TAF Summary which are from the FAA Terminal Area Forecast

3. Based Aircraft

The FAA defines a based aircraft at an airport as an aircraft that is "operational & air worthy" and which is typically based at the airport for most of the year. The current FAA 5010 Airport Master Record notes an inspection date of July 2, 2019 and notes the following based aircraft at the Airport: 90 single-engine aircraft, 13 multi-engine aircraft, and 8 jets, for a total of 111 aircraft.

There are several factors that affect the number of based aircraft at an airport. Recently, increasing costs to own and operate aircraft has been a primary factor that has contributed to a slight decline in the overall U.S. general aviation (GA) fleet since 2007. The Airport has likewise experienced a decrease in the number of based aircraft since 2009. Several methodologies were evaluated to develop based aircraft projections. The FAA TAF, a time series methodology (growth rate analysis), and a market share methodology are presented in **Table 8**.

Table 8: Based Aircraft Forecasts – Terminal Area Forecast, Growth Rate, and Market Share Methodologies

	FAA TAF Summary	Growth Rate Methodology	Market Share Methodology		
Year	Based Aircraft	Based Aircraft	Based Aircraft	Total U.S. Active GA Aircraft	Market Share
Historical:					
2009	143	143	143		
2010	143	143	143	223,370	0.064%
2011	143	143	143	220,453	0.065%
2012	111	111	111	209,034	0.053%
2013	109	109	109	199,927	0.055%
2014	110	110	110	204,408	0.054%
2015	110	110	110	210,031	0.052%
2016	111	111	111	211,794	0.052%
2017	111	111	111	211,757	0.052%
2018	113	113	113	212,885	0.053%
CAGR (2009-2018)	*-2.58%*	*-2.58%*	*CAGR (2010-2018)*	*-0.60%*	
Projected:					
2023	121	99	113	212,940	0.053%
2028	130	87	112	211,745	0.053%
2033	140	76	112	210,980	0.053%
2038	150	67	112	211,470	0.053%
CAGR (2018-2038)	*1.43%*	*-2.58%*	*-0.033%*	*-0.033%*	

Sources: Historical Based Aircraft - FAA TAF
Projected Based Aircraft - Mead & Hunt, Inc., except FAA TAF Summary which are from the FAA TAF
Total U.S. Active Aircraft (GA & Air Taxi) - FAA Aerospace Forecasts FY2019-2039

The market share methodology compares local based aircraft at the Airport to the total number of general aviation aircraft in the U.S. as reported by the FAA. As illustrated in **Table 8**, the Airport's market share dropped from 2011 to 2012 and has remained consistent since then. In 2018 the number of based aircraft at AZO represented 0.053 percent of total active general aviation aircraft in the U.S. FAA Aerospace Forecasts project based aircraft to decrease slightly and then remain flat over the next 20-years, exhibiting a CAGR of -0.033 percent. Assuming the Airport's 0.053 percent market share of active GA aircraft remains constant through the planning period, based aircraft will stay consistent over the next 20 years between 113 and 112.

Socio-economic (or correlation) forecasting methodologies examine the direct relationship between two or more sets of historical data. Data examined in developing based aircraft forecasts using this methodology included both population and total employment. Total employment was used as an indicator of economic activity occurring within the community with the assumption being that changes in economic activity will impact the number of based aircraft. Population and total employment for Kalamazoo County was examined. Historical and forecasted socio-economic statistics for this service area were obtained from the economic forecasting firm Woods & Poole Economics, Inc. Based upon the observed and projected correlation between historical aviation activity and socio-economic data, based aircraft forecasts were developed. The forecasts that were prepared using these methodologies are presented in **Table 9**. As illustrated in the table, based aircraft at the Airport are projected to increase from 113 aircraft in 2018 to 122 aircraft in 2038 using the socio-economic - population variable methodology. Using the same

methodology but basing the projection on the number of based aircraft per 1,000 jobs in Kalamazoo County, based aircraft at the Airport are projected to increase from 113 aircraft in 2018 to 127 aircraft in 2038.

Table 9: Based Aircraft Forecasts – Socio-economic Methodologies

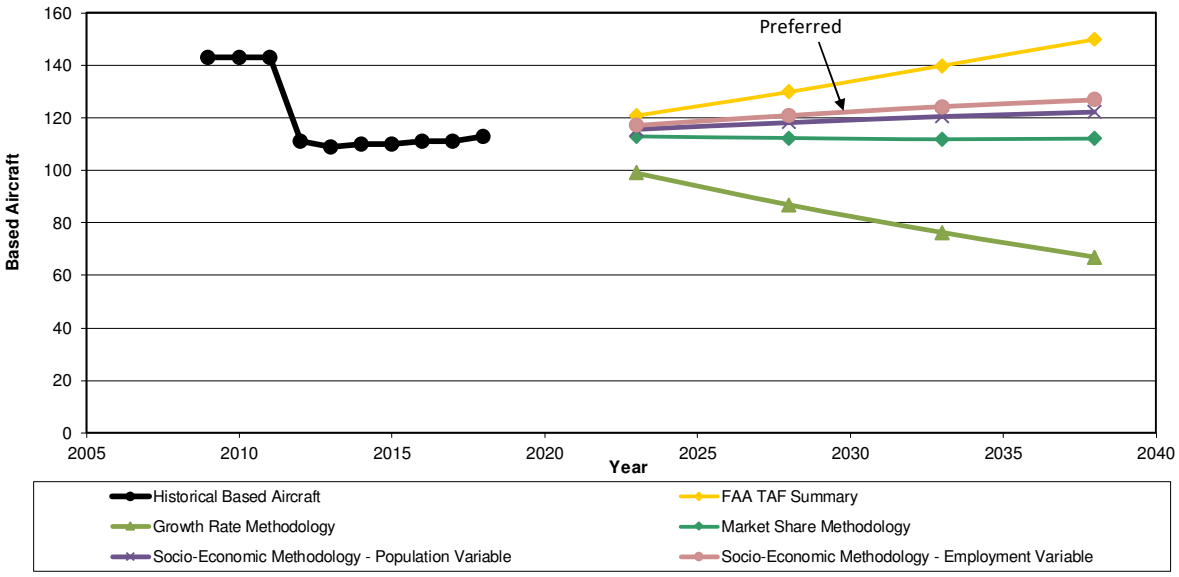
	Socio-Economic Methodology - Population Variable			Socio-Economic Methodology - Total Employment Variable		
Year	Based Aircraft	Kalamazoo County Population	Based Aircraft Per 1,000 Capita	Based Aircraft	Kalamazoo County Employment	Based Aircraft Per 1,000 Jobs
Historical:						
2009	143	249,023	0.574	143	143,776	0.995
2010	143	250,748	0.570	143	140,806	1.016
2011	143	252,480	0.566	143	141,505	1.011
2012	111	255,251	0.435	111	143,218	0.775
2013	109	257,162	0.424	109	145,593	0.749
2014	110	258,994	0.425	110	147,755	0.744
2015	110	259,966	0.423	110	150,165	0.733
2016	111	261,654	0.424	111	153,199	0.725
2017	111	262,719	0.423	111	156,083	0.711
2018	113	263,974	0.428	113	157,952	0.715
CAGR (2009-2018)	*-2.58%*	*0.65%*		*-2.58%*	*1.05%*	
Projected:						
2023	116	270,259	0.428	117	163,836	0.715
2028	118	276,362	0.428	121	169,151	0.715
2033	121	281,769	0.428	124	173,777	0.715
2038	122	285,864	0.428	127	177,458	0.715
CAGR (2018-2038)	*0.40%*	*0.40%*		*0.58%*	*0.58%*	

Sources: Historical Based Aircraft - FAA TAF
Historical Population & Employment - Woods & Poole
Projected Population & Employment - Woods & Poole
Projections - Mead & Hunt, Inc.

A comparison of projected based aircraft at the Airport using the methodologies described in this section is presented in **Table 10**. The methodologies range from declining at a -2.58 percent CAGR to the TAF's projection with a CAGR of 1.43 percent. For the purposes of this environmental assessment, the socio-economic methodology based upon the correlation between based aircraft and employment lies near the middle of the various methodologies and serves as the preferred projection of based aircraft for the next 20 years. This methodology projects based aircraft to increase from 113 in 2018 to 127 in 2038, a CAGR of 0.58 percent.

Table 10: Based Aircraft Forecasts Summary

Year	Historical Based Aircraft	FAA TAF Summary	Growth Rate Methodology	Market Share Methodology	Socio-Economic Methodology - Population Variable	*Preferred* Socio-Economic Methodology - Employment Variable
Historical:						
2009	143					
2010	143					
2011	143					
2012	111					
2013	109					
2014	110					
2015	110					
2016	111					
2017	111					
2018	113					
CAGR (2009-2018)	*-2.58%*					
Projected:						
2023		121	99	113	116	117
2028		130	87	112	118	121
2033		140	76	112	121	124
2038		150	67	112	122	127
CAGR (2018-2038)		*1.43%*	*-2.58%*	*-0.03%*	*0.40%*	*0.58%*



Sources: Historical Based Aircraft - FAA TAF
Projections - Mead & Hunt, Inc., except FAA TAF Summary which are from the FAA Terminal Area Forecast

4. Based Aircraft Fleet Mix

Historical based aircraft by type and projected fleet mix at the Airport is presented in **Table 11**. In 2018, 81 percent of the local fleet was comprised of single-engine aircraft; 12 percent, multi-engine aircraft; and 7 percent, jet aircraft. The FAA Aerospace Forecast FY 2019-2039 projects that turboprop and jet aircraft will see a higher growth rate than other types of aircraft through 2039. The FAA's forecast projects single-engine and multi-engine piston aircraft will see negative growth, with CAGRs of -1.0 percent and -0.4 percent, respectively. A similar trend is also anticipated to occur locally as the number of jet aircraft based at the Airport are expected to increase at a higher growth rate than single-engine and multi-engine piston aircraft types.

Table 11: Based Aircraft Fleet Mix Forecast

	Single Engine		Multi-Engine		Jet		Helicopter		Other		
Year	#	%	#	%	#	%	#	%	#	%	Total
Historical:											
2009	130	91%	11	8%	2	1%	0	0%	0	0%	143
2010	130	91%	11	8%	2	1%	0	0%	0	0%	143
2011	130	91%	11	8%	2	1%	0	0%	0	0%	143
2012	90	81%	13	12%	8	7%	0	0%	0	0%	111
2013	88	81%	13	12%	8	7%	0	0%	0	0%	109
2014	89	81%	13	12%	8	7%	0	0%	0	0%	110
2015	89	81%	13	12%	8	7%	0	0%	0	0%	110
2016	90	81%	13	12%	8	7%	0	0%	0	0%	111
2017	90	81%	13	12%	8	7%	0	0%	0	0%	111
2018	91	81%	14	12%	8	7%	0	0%	0	0%	113
Projected:											
2023	93	79%	15	13%	9	8%	0	0%	0	0%	117
2028	94	78%	16	13%	11	9%	0	0%	0	0%	121
2033	97	78%	16	13%	11	9%	0	0%	0	0%	124
2038	98	77%	17	13%	13	10%	0	0%	0	0%	127
CAGR (2018-2038)	*0.36%*		*0.83%*		*2.34%*		*0.00%*		*0.00%*		*0.58%*

Notes: Numbers may not add due to rounding
Sources: Historical Based Aircraft - FAA TAF
Projections - Mead & Hunt, Inc.

5. Commercial Aircraft Operations

Commercial aircraft operations are either scheduled or unscheduled flights typically operated by a certificated air carrier or are conducted by a charter or air taxi operator. This section summarizes the forecasts that were prepared for commercial aircraft operations.

5.a Scheduled Commercial Passenger Operations Forecasts

The economic recession of 2007-2009 impacted travel behavior and fundamentally changed the commercial airlines' operations and finances. As a result, fewer passengers were enplaned at many airports throughout the U.S., and due to increases in aircraft operating costs, airlines were forced to maximize fleet efficiency to remain profitable.

Generally positive economic conditions in the U.S. and the world as well as airline consolidation have resulted in passenger growth and airline profits since the end of the recession. To remain profitable, air carriers are reducing or retiring older turboprops and less fuel-efficient small regional jet aircraft (typically 50 seats and smaller) in many markets, and if the market can profitably sustain it, replacing them with larger regional jets (typically 70 to 90 seats) and narrow-body jets that have more seats and lower operational costs per passenger. In many markets, the use of larger aircraft is reducing the frequency of particular routes. Due to increasing fuel and operational costs, air carriers must maintain higher passenger load factors to remain profitable. **Table 12** presents the historical and projected seats per departure and load factor at the Airport and for the U.S. regional and mainline carrier fleets.

Table 12: Scheduled Commercial Average Seats/Departure and Load Factor

	Average Seats/Dep (Domestic)			Load Factor % (Domestic)		
Year	AZO	US Regional Carrier Fleet	US Mainline Carrier Fleet	AZO	US Regional Carrier Fleet	US Mainline Carrier Fleet
Historical:						
2016	52.1	61.5	159.9	63.3%	80.0%	85.3%
2017	53.0	63.0	162.3	68.4%	78.9%	85.2%
2018	53.1	63.8	164.2	68.0%	79.7%	85.3%
Projected:						
2023	62.0	67.0	167.2	74.0%	80.6%	86.2%
2028	78.0	69.6	169.8	78.0%	81.0%	86.7%
2033	78.0	72.2	172.0	80.0%	81.2%	87.0%
2038	89.0	74.9	174.1	80.0%	81.3%	87.2%

Sources: AZO Hist Average Seat Data - Airline Schedules, Diio Mio
Historical Load Factor Calculated from Historial Passengers, Historcial Departures, and Historical Avg Seats/Dep
Historical and Projected US Carrier Fleet Avg/Seats & Load Factor - FAA Aerospace Forecasts FY2019-2039
Projections - Mead & Hunt, Inc.

At AZO, the average number of seats per departure and aircraft load factor is projected to increase, similar to the FAA's projected increases in these metrics within the U.S. regional and mainline carrier fleets. At the Airport, the average number of seats per departure is anticipated to increase from 53.1 in 2018, to 62.0 in 2023, 78.0 in 2028, 78.0 in 2033, and 89.0 in 2038. Passenger load factor is also anticipated to increase throughout the projection period, from 68.0 percent in 2018 to 80.0 percent through the forecast period.

In calculating future scheduled commercial operations, the average number of seats per departure at the Airport is multiplied by the passenger load factor. Projected passenger enplanements are then divided by this figure to obtain scheduled commercial passenger departures and departures are multiplied by two to calculate projected scheduled commercial operations (operations being arrivals and departures) as shown in **Table 13**. Through the next 20 years, even though passenger enplanements are projected to increase, increases in aircraft size and load factor are anticipated to result in a decrease in the number of scheduled commercial operations. Scheduled passenger operations are projected to total 6,864 in 2023; 5,471 in 2028; 5,571 in 2023; and 5,067 in 2038, resulting in a decreasing CAGR of -2.37 percent.

Table 13: Scheduled Commercial Operations Forecasts

Year	Scheduled Passenger Enpl	Scheduled Passenger Dep	Average Seats/Dep	Load Factor	Scheduled Passenger Ops
Historical:					
2016	145,909	4,421	52.1	63.3%	8,842
2017	147,644	4,072	53.0	68.4%	8,144
2018	147,857	4,096	53.1	68.0%	8,192
Projected:					
2023	157,462	3,432	62.0	74.0%	6,864
2028	166,439	2,736	78.0	78.0%	5,471
2033	173,809	2,785	78.0	80.0%	5,571
2038	180,388	2,534	89.0	80.0%	5,067
CAGR (2018-2038)	*1.00%*	*-2.37%*	*2.62%*	*0.82%*	*-2.37%*

Sources: Historical Enplanements - FAA TAF
Historical Scheduled Air Carrier Dep's and Avg Seat Data - Airline Schedules, Diio Mi
Projections - Mead & Hunt, Inc.

5.b Air Carrier Fleet Mix

The FAA Aerospace Forecast FY 2019-2039 notes the following regarding the U.S. commercial aircraft fleet:

> *"Between 2018 and 2039 the number of jets in the U.S. mainline carrier fleet is forecast to grow from 4,241 to 5,197, a net average of 51 aircraft a year as carriers continue to remove older, less fuel-efficient narrow body aircraft. The narrow body fleet (including E-series aircraft at JetBlue and A220-series at Delta) is projected to grow 46 aircraft a year as carriers replace the 757 fleet and current technology 737 and A320 family aircraft with the next generation MAX and Neo families. The wide-body fleet grows by an average of 14 aircraft a year as carriers add 777-8/9, 787's, A350's to the fleet while retiring 767- 300 and 777-200 aircraft. In total the U.S. passenger carrier wide-body fleet increases by 3 percent over the forecast period.*
>
> *The regional carrier fleet is forecast to decline from 2,298 aircraft in 2018 to 2,022 in 2039 as the fleet shrinks by 12.0 percent (276 aircraft) between 2018 and 2029. Carriers remove 50 seat regional jets and retire older small turboprop and piston aircraft, while adding 70-90 seat jets, especially the E-2 family after 2020. By 2031 only a handful of 50 seat regional jets remain in the fleet. By 2039, the number of jets in the regional carrier fleet totals 1,877, up from 1,795 in 2018. The turboprop/piston fleet is forecast to shrink by 71% from 503 in 2018 to 145 by 2039. These aircraft account for just 7.2 percent of the fleet in 2039, down from 21.9 percent in 2018."*

The number of commercial passenger aircraft in the U.S. is forecast to grow from 6,539 in 2018 to 7,219 in 2039. The U.S. mainline carrier fleet is projected to shrink initially through 2021 as carriers remove older, less fuel efficient narrow-body and widebody aircraft and then increase through 2039. The narrow-body fleet is anticipated to grow at a CAGR of 1.0 percent overall during the 2019 to 2039 period, particularly as carriers take deliveries of the MAX and Neo replacements from Boeing and Airbus. The wide-body fleet is anticipated to grow at a CAGR of 2.6 percent during this period, particularly as the carriers add Boeing 777-8/9s, Boeing 787s, and Airbus A350s to their fleets.

The regional carrier passenger fleet is forecast to decrease by an average of nearly 25 aircraft per year from 2018 to 2033 as carriers remove 50-seat regional jets and small turboprop and piston aircraft. Growth in 70-90 seat jets doesn't begin to offset these reductions until 2034, when most of the 50-seat regional jets are no longer in service and turboprop and piston aircraft have been reduced to 212 aircraft from their 2018 level of 503 aircraft. Overall during the 2019 to 2039 period, the regional carrier fleet is projected to decrease at a CAGR of -0.4 percent, with jet aircraft growing at a CAGR of 0.4 percent and turboprop and piston aircraft declining at a CAGR of -5.4 percent.

As previously mentioned, in many U.S. markets, air carriers are reducing or retiring older and less fuel-efficient aircraft, particularly 50-seat and smaller regional jets, and replacing them with larger regional (70 to 90 seats) and narrow-bodied jets that have more seats and lower operational costs per passenger. This trend is anticipated to present itself at AZO as the turboprop and small regional jets are retired from air carrier fleets and replaced with larger regional jets.

Table 14 presents the historical and projected fleet of scheduled commercial airline operators at the Airport. Commercial aircraft equipped with 40 to 60 seats and 61 to 99 seats make up all the current scheduled operations fleet mix. As the 40- to 60-seat aircraft are retired by the carriers, they are being replaced with larger regional jets; therefore, it is projected that 40- to 60-seat aircraft will be removed from the market within the 20-year forecast period in favor of 70- to 90-seat regional jets and narrow-bodied jets having up to 150 seats.

Table 14: Scheduled Commercial Operations Fleet Mix Forecast

Seat		Historical Departures			Projected Departures			
Range	**Typical Aircraft**	**2016**	**2017**	**2018**	**2023**	**2028**	**2033**	**2038**
Less than 40	Saab340, ERJ135, DHC-8	0	0	0	0	0	0	0
	Beech1900, EMB120	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
40-60	CRJ200, ERJ140, ERJ145,	3,887	3,455	3,437	1,373	274	279	0
	DHC-8-300	*87.9%*	*84.8%*	*83.9%*	*40.0%*	*10.0%*	*10.0%*	*0.0%*
61-99	CRJ700, CRJ900,	534	617	659	2,059	2,189	2,228	1,900
	EMB170, EMB175	*12.1%*	*15.2%*	*16.1%*	*60.0%*	*80.0%*	*80.0%*	*75.0%*
100-130	B717, DC9, EMB190,	0	0	0	0	137	139	507
	EMB195, A318	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*5.0%*	*5.0%*	*20.0%*
131-150	A319, A320, MD80,	0	0	0	0	137	139	127
	B737-4, B737-5	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*5.0%*	*5.0%*	*5.0%*
151 or more	A319, A320, MD80, B737-8, B7	0	0	0	0	0	0	0
		0.0%	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Total Scheduled Passenger Aircraft Departures		4,421	4,072	4,096	3,432	2,736	2,785	2,534
Average Seats Per Departure		52.1	53.0	53.1	62.0	78.0	78.0	89.0
Total Scheduled Seats		230,214	215,659	217,360	212,787	213,383	217,261	225,485

Note: Numbers may not add due to rounding
Sources: Historical Scheduled Departures and Average Seat Data - Airline Schedules, Diio Mi
Projections - Mead & Hunt, Inc.

6.c Unscheduled Commercial Passenger Operations Forecasts

Unscheduled commercial flights are typically categorized as charters or air taxis. **Table 15** summarizes the number of scheduled commercial operations in comparison to the number of operations conducted by commercial air carrier aircraft over 60 seats and air taxi aircraft 60 seats and under reported by the Airport's ATCT. The difference between the two totals is the number of unscheduled commercial operations.

Table 15: Air Carrier and Air Taxi Operations Forecasts

	Total			Scheduled Operations			Unscheduled / Others[1]	
Year	Air Carrier	Commuter/ Air Taxi	Total Commercial	Scheduled Commercial Departures	Scheduled Commercial Operations	*Percent Scheduled*	Ops	*Percent Unscheduled*
Historical:	***Historical ATCT Reported Operations***			***Scheduled Airline Operations***				
2016	940	8,014	8,954	4,421	8,842	*98.7%*	112	*1.3%*
2017	1,023	7,459	8,482	4,072	8,144	*96.0%*	338	*4.0%*
2018	1,032	7,309	8,341	4,096	8,192	*98.2%*	149	*1.8%*
			FAA Projected Growth Rate in Total Active General Aviation Turbine Fleet[2]				*1.8%*	
Projected:								
2023	4,118	2,909	7,027	3,432	6,864	*97.7%*	163	*2.3%*
2028	4,924	725	5,649	2,736	5,471	*96.8%*	178	*3.2%*
2033	5,014	752	5,766	2,785	5,571	*96.6%*	195	*3.4%*
2038	5,067	213	5,280	2,534	5,067	*96.0%*	213	*4.0%*
CAGR (2018-2038)	*8.28%*	*-16.21%*	*-2.26%*	*-2.37%*	*-2.37%*		*1.8%*	

[1]Others is the difference between the tower reported Commercial Ops and the Scheduled Ops reported by Diio Mi. Others represents the Charter/Air Taxi/Fractional ownership aircraft

[2]FAA Aerospace Forecasts 2019-2039

Sources: Historical Operations - FAA OPSNET
Historical Scheduled Commercial Operations: Airline Schedules obtained from Diio Mi
Projections - Mead & Hunt, Inc.

The overall proportion of unscheduled operations at the Airport was 1.8 percent in 2018. According to the FAA Aerospace Forecast FY 2019-2039, the projected annual growth rate of the total active general aviation turbine fleet between 2019 and 2039 is expected to be 1.8 percent. It is assumed that unscheduled operations at the Airport will reflect this national trend; therefore, applying this projected CAGR to the 149 unscheduled operations conducted in 2018, an increase to 213 unscheduled operations annually can be anticipated by 2038.

6. General Aviation Operations

General aviation is defined as all civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire. This section summarizes the forecasts that were prepared for general aviation operations.

6.a Itinerant General Aviation Operations

As defined by the FAA, itinerant operations are operations performed by an aircraft, either instrument flight rule (IFR), special visual flight rule (SVFR), or visual flight rule (VFR), that lands at an airport arriving from outside the airport area or departs an airport and leaves the airport area.

The itinerant general aviation operations forecasts using the FAA TAF and market share methodologies are presented in **Table 16**. The market share methodology compares the number of itinerant general aviation operations at the Airport to the total number of itinerant general aviation operations in the U.S. as reported by the FAA. As illustrated in **Table 16**, the Airport's market share of these types of operations has fluctuated between 0.11140 percent and 0.1334 percent, and in 2018 the number operations at AZO represented 0.1266 percent of total U.S. itinerant GA operations. FAA Aerospace Forecasts project these types of operations to increase modestly over the next 20-years, exhibiting a CAGR of 0.29 percent.

Maintaining the Airport's 0.1266 percent market share indicates that itinerant GA operations at the Airport will increase slightly over the next 20 years, from 17,889 in 2018 to 18,952 in 2038. As this forecast is based upon the FAA's projections for itinerant GA operations nationwide and accounts for trends occurring within this industry, it serves as the preferred forecast methodology for itinerant GA operations.

Table 16: Itinerant General Aviation Operations Forecasts – Terminal Area Forecast and Market Share Methodologies

			Preferred		
		FAA TAF Summary	**Market Share Methodology**		
Year	**Historical Itin GA Ops**	**Itinerant GA Ops**	**Itinerant GA Ops**	**Total U.S. Itin GA Ops**	**Market Share**
Historical:					
2009	21,522	21,279	21,522		
2010	19,833	20,275	19,833	14,863,856	0.1334%
2011	17,398	17,482	17,398	14,527,903	0.1198%
2012	18,014	18,442	18,014	14,521,656	0.1240%
2013	17,445	17,662	17,445	14,117,424	0.1236%
2014	15,935	16,488	15,935	13,978,996	0.1140%
2015	17,524	16,953	17,524	13,886,711	0.1262%
2016	16,716	16,949	16,716	13,904,397	0.1202%
2017	17,547	17,458	17,547	13,838,029	0.1268%
2018	17,889	17,788	17,889	14,130,495	0.1266%
CAGR (2009-2018)	*-2.03%*	*-1.97%*	*-2.03%*	*-0.63%*	
Projected:					
2023		18,097	18,197	14,373,705	0.1266%
2028		18,097	18,441	14,566,670	0.1266%
2033		18,097	18,693	14,765,472	0.1266%
2038		18,097	18,952	14,970,539	0.1266%
	CAGR (2018-2038)	*0.09%*	*0.29%*	*0.29%*	

Sources: Historical Operations - FAA OPSNET
Total U.S. GA Operations - FAA Aerospace Forecasts FY 2019-2039
Projections - Mead & Hunt, Inc., except FAA TAF

6.b Local General Aviation Operations

As defined by the FAA, local operations are operations performed by aircraft that remain in the local traffic pattern, execute simulated instrument approaches or low passes at the airport, and the operations to or from the airport and a designated practice area within a 20-mile radius of the tower. **Table 17** presents the local general aviation operations forecasts.

Table 17: Local General Aviation Operations Forecasts

		FAA TAF Summary	Operations Per Based Aircraft Methodology			*Preferred* Market Share Methodology		
Year	Local GA Operations	Local GA Ops	Based Acft	Ops per Based Acft	Local GA Ops	Local GA Ops	Total U.S. Local GA Ops	Market Share
Historical:								
2009	18,858	17,947	143	132	18,858	18,858		
2010	20,775	20,219	143	145	20,775	20,775	11,716,274	0.1773%
2011	17,428	19,006	143	122	17,428	17,428	11,437,028	0.1524%
2012	17,641	17,275	111	159	17,641	17,641	11,608,306	0.1520%
2013	17,620	18,036	109	162	17,620	17,620	11,688,301	0.1507%
2014	17,474	18,219	110	159	17,474	17,474	11,675,040	0.1497%
2015	16,181	15,757	110	147	16,181	16,181	11,691,338	0.1384%
2016	13,163	13,965	111	119	13,163	13,163	11,632,078	0.1132%
2017	14,184	13,809	111	128	14,184	14,184	11,731,596	0.1209%
2018	15,690	15,896	113	139	15,690	15,690	12,354,014	0.1270%
CAGR (2009-2018)	*-2.02%*	*-1.34%*	*Average*	*141*	*-2.02%*	*-2.02%*	*0.66%*	
Projected:								
2023		16,189	117	139	16,274	16,292	12,828,338	0.1270%
2028		16,269	121	139	16,802	16,559	13,038,602	0.1270%
2033		16,349	124	139	17,262	16,835	13,255,727	0.1270%
2038		16,432	127	139	17,628	17,120	13,480,101	0.1270%
CAGR (2018-2038)		*0.17%*	*0.58%*		*0.58%*	*0.44%*	*0.44%*	

Sources: Historical Operations - FAA OPSNET
Total U.S. GA Operations - FAA Aerospace Forecasts FY 2019-2039
Projections - Mead & Hunt, Inc., except FAA TAF Summary which are from the FAA Terminal Area Forecast

The operations per based aircraft methodology examines the number of local GA operations that occurred in 2018 per based aircraft. In 2018, the number of local GA operations per based aircraft was 139. Using the projected number of based aircraft for the Airport and assuming this level of operations per based aircraft remains constant throughout the forecasting period, local GA operations will increase from 15,690 in 2018 to 17,628 in 2038.

The market share methodology compares local activity with a larger entity. In 2018, the Airport's 15,690 local GA operations represented 0.1270 percent of the total U.S. local GA operations. Using the FAA's forecasts of total U.S. local GA operations, and assuming the 2018 market share of 0.1270 percent remains constant through the forecasting period, the market share methodology projects GA operations will increase slightly from 15,690 in 2018 to 17,120 in 2038. Like the itinerant general aviation operations forecasts, this forecast serves as the preferred forecast methodology for local GA operations because it is based upon the FAA's projections for local GA operations nationwide and accounts for trends occurring within this industry. It is also the preferred methodology because it produces projections that are in the middle of the methodologies examined.

6.c General Aviation Operations Summary

Using the itinerant and local GA operations forecasts presented in the previous sections, a summary of the general aviation operations forecast is presented in **Table 18.**

Table 18: General Aviation Operations Forecast Summary

	Itinerant GA		Local GA		Total GA
Year	Operations	Percent	Operations	Percent	Operations
Historical:					
2009	21,522	53%	18,858	47%	40,380
2010	19,833	49%	20,775	51%	40,608
2011	17,398	50%	17,428	50%	34,826
2012	18,014	51%	17,641	49%	35,655
2013	17,445	50%	17,620	50%	35,065
2014	15,935	48%	17,474	52%	33,409
2015	17,524	52%	16,181	48%	33,705
2016	16,716	56%	13,163	44%	29,879
2017	17,547	55%	14,184	45%	31,731
2018	17,889	53%	15,690	47%	33,579
CAGR (2009-2018)	*-2.03%*		*-2.02%*		*-2.03%*
Projected:					
2023	18,197	53%	16,292	47%	34,489
2028	18,441	53%	16,559	47%	35,001
2033	18,693	53%	16,835	47%	35,528
2038	18,952	53%	17,120	47%	36,073
CAGR (2018-2038)	*0.29%*		*0.44%*		*0.36%*

Sources: Historical Operations - FAA OPSNET
Projections - Mead & Hunt, Inc.

7. Military Operations

In 2018 the number of annual military operations conducted at the Airport was 143. Military operations are driven more by national security policy decisions than by economic factors; therefore, it is logical to project military operations will remain consistent with the number conducted in 2018. **Table 19** presents the military operations projections.

Table 19: Military Operations Forecast

	Military Itinerant		Military Local		Total
Year	Ops	%	Ops	%	Military Ops
Historical:					
2009	80	91%	8	9%	88
2010	121	58%	86	42%	207
2011	165	85%	28	15%	193
2012	281	92%	26	8%	307
2013	127	94%	8	6%	135
2014	111	85%	20	15%	131
2015	204	87%	30	13%	234
2016	132	99%	1	1%	133
2017	134	100%	0	0%	134
2018	141	99%	2	1%	143
Projected:					
2023	141	99%	2	1%	143
2028	141	99%	2	1%	143
2033	141	99%	2	1%	143
2038	141	99%	2	1%	143
CAGR (2018-2038)	*0.00%*		*0.00%*		

Sources: Historical Operations - FAA OPSNET
Projections - Mead & Hunt, Inc.

8. Instrument Operations

Instrument operations are those conducted by properly equipped aircraft that can utilize radio and global positioning system (GPS) signals emitted by navigational equipment for a pilot to conduct a landing with limited visual cues. Most instrument operations are conducted by commercial aircraft, GA aircraft filing instrument flight plans, and essentially all aircraft operations conducted in IFR weather. In 2018, 63 percent of all aircraft operations conducted at the Airport were instrument operations (see **Table 20**). Assuming this percentage remains constant throughout the forecasting period, instrument operations are projected to decrease from 16,591 in 2018 to 15,334 in 2038.

Table 20: Instrument Operations Forecast

	Itinerant	Instrument Operations		Visual Operations	
Year	Operations	Ops	%	Ops	%
Historical:					
2009	31,660	18,488	58%	13,172	42%
2010	30,567	18,952	62%	11,615	38%
2011	28,277	17,887	63%	10,390	37%
2012	27,704	16,585	60%	11,119	40%
2013	26,323	16,308	62%	10,015	38%
2014	24,366	15,614	64%	8,752	36%
2015	24,721	15,079	61%	9,642	39%
2016	25,802	16,593	64%	9,209	36%
2017	26,163	15,480	59%	10,683	41%
2018	26,371	16,591	63%	9,780	37%
CAGR (2009-2018)	*-2.01%*	*-1.20%*		*-3.25%*	
Projected:					
2023	25,365	15,958	63%	9,407	37%
2028	24,232	15,245	63%	8,987	37%
2033	24,599	15,476	63%	9,123	37%
2038	24,373	15,334	63%	9,039	37%
CAGR (2018-2038)	*-0.39%*	*-0.39%*		*-0.39%*	

Sources: Historical Operations - FAA OPSNET
Projections - Mead & Hunt, Inc.

9. Operational Fleet Mix

Of interest for this environmental assessment is the fleet mix of operations occurring at AZO. For this summary, it is assumed that all jet and turboprop operations are conducted as instrument operations with an IFR (Instrument Flight Rules) flight plan. **Tables 21**, **22**, and **23** summarize the number of operations by Type (Jet, Turbine, Piston, Helicopter) and Weight Class. Aircraft types within each Weight Class were prorated into the most prevalent aircraft types for summarization purposes. The fleet mix for IFR operations was obtained from the FAA Traffic Flow Management System Counts (TFMSC) database. Assuming this fleet mix for instrument operations remains relatively constant thought the planning period (except for instrument operations conducted by large equipment, the fleet mix for which is projected to follow **Table 14**) and utilizing the forecast number of instrument operations for the Airport, the forecast number of operations by representative aircraft type is presented in the tables.

Table 21: Operational Fleet Mix (Historical 2018 and Projected 2023)

					Historical					Projected		
	Weight		2018 Fleet Mix %		2018 Repr. Ops			2023 Fleet Mix %		2023 Repr. Ops		
Type	Class	Aircraft	IFR	VFR	IFR	VFR	Total	IFR	VFR	IFR	VFR	Total
Jet	Heavy	B763 - Boeing 767-300	0.03%	0.00%	5	0	5	0.03%	0.00%	5	0	5
Jet	Heavy	A332 - Airbus A330-200	0.01%	0.00%	1	0	1	0.01%	0.00%	1	0	1
		Subtotal Heavy Equipment	**0.04%**	**0.00%**	**6**	**0**	**6**	**0.04%**	**0.00%**	**6**	**0**	**6**
Jet	Large	CRJ2 - Bombardier CRJ-200	36.76%	0.00%	6,099	0	6,099	17.92%	0.00%	2,860	0	2,860
Jet	Large	E145 - Embraer ERJ-145	12.08%	0.00%	2,003	0	2,003	5.89%	0.00%	939	0	939
Jet	Large	CRJ7 - Bombardier CRJ-700	9.05%	0.00%	1,501	0	1,501	34.44%	0.00%	5,496	0	5,496
Jet	Large	J328 - Fairchild Dornier 328 Jet	0.94%	0.00%	155	0	155	0.00%	0.00%	0	0	0
Jet	Large	CRJ9 - Bombardier CRJ-900	0.33%	0.00%	55	0	55	1.27%	0.00%	203	0	203
Jet	Large	E120 - Embraer Brasilia EMB 120	0.16%	0.00%	26	0	26	0.00%	0.00%	0	0	0
Jet	Large	B737 - Boeing 737-700	0.10%	0.00%	17	0	17	0.00%	0.00%	0	0	0
Jet	Large	E135 - Embraer ERJ 135/140/Legacy	0.10%	0.00%	17	0	17	0.00%	0.00%	0	0	0
		Subtotal Large Equipment	**59.52%**	**0.00%**	**9,873**	**0**	**9,873**	**59.52%**	**0.00%**	**9,498**	**0**	**9,498**
Jet	Medium	F2TH - Dassault Falcon 2000	3.19%	0.00%	529	0	529	3.19%	0.00%	509	0	509
Jet	Medium	C56X - Cessna Excel/XLS	2.05%	0.00%	341	0	341	2.05%	0.00%	328	0	328
Jet	Medium	C510 - Cessna Citation Mustang	2.00%	0.00%	331	0	331	2.00%	0.00%	319	0	319
Jet	Medium	C650 - Cessna III/VI/VII	1.66%	0.00%	275	0	275	1.66%	0.00%	264	0	264
Jet	Medium	H25B - BAe HS 125/700-800/Hawker 800	1.64%	0.00%	272	0	272	1.64%	0.00%	261	0	261
Jet	Medium	C750 - Cessna Citation X	1.45%	0.00%	240	0	240	1.45%	0.00%	231	0	231
Jet	Medium	GL5T - Bombardier BD-700 Global 5000	1.32%	0.00%	218	0	218	1.32%	0.00%	210	0	210
Jet	Medium	BE40 - Raytheon/Beech Beechjet 400/T-1	1.21%	0.00%	201	0	201	1.21%	0.00%	193	0	193
Jet	Medium	F900 - Dassault Falcon 900	1.14%	0.00%	190	0	190	1.14%	0.00%	183	0	183
Jet	Medium	CL30 - Bombardier (Canadair) Challenger 300	1.10%	0.00%	182	0	182	1.10%	0.00%	175	0	175
		Subtotal Medium Equipment	**16.75%**	**0.00%**	**2,779**	**0**	**2,779**	**16.75%**	**0.00%**	**2,673**	**0**	**2,673**
Turbine	Small Eqpt	B350 - Beech Super King Air 350	4.24%	0.00%	703	0	703	4.24%	0.00%	676	0	676
Turbine	Small Eqpt	BE20 - Beech 200 Super King	4.16%	0.00%	690	0	690	4.16%	0.00%	664	0	664
Piston	Small Eqpt	SR22 - Cirrus SR 22	2.49%	24.69%	414	6,288	6,702	2.49%	24.69%	398	6,345	6,743
Piston	Small Eqpt	C421 - Cessna Golden Eagle 421	2.33%	23.10%	387	5,885	6,272	2.33%	23.10%	372	5,938	6,310
Piston	Small Eqpt	C172 - Cessna Skyhawk 172/Cutlass	2.28%	22.57%	378	5,750	6,128	2.28%	22.57%	364	5,802	6,166
Turbine	Small Eqpt	BE9L - Beech King Air 90	2.16%	0.00%	358	0	358	2.16%	0.00%	345	0	345
Turbine	Small Eqpt	C208 - Cessna 208 Caravan	1.53%	0.00%	254	0	254	1.53%	0.00%	245	0	245
Piston	Small Eqpt	C340 - Cessna 340	1.53%	15.18%	254	3,867	4,121	1.53%	15.18%	245	3,902	4,147
Turbine	Small Eqpt	PAY1 - Piper Cheyenne 1	1.51%	0.00%	250	0	250	1.51%	0.00%	240	0	240
Piston	Small Eqpt	P28A - Piper Cherokee	1.37%	13.60%	228	3,464	3,692	1.37%	13.60%	219	3,495	3,714
		Subtotal Small Equipment	**23.61%**	**99.14%**	**3,916**	**25,254**	**29,170**	**23.61%**	**99.14%**	**3,768**	**25,482**	**29,250**
Copter	Other	H60 - Sikorsky SH-60 Seahawk	0.05%	0.49%	8	125	133	0.05%	0.49%	8	126	134
Copter	Other	EC55 - Eurocopter EC-155	0.04%	0.37%	6	93	99	0.04%	0.37%	6	94	100
		Subtotal Other/Copters	**0.09%**	**0.86%**	**14**	**218**	**232**	**0.09%**	**0.86%**	**14**	**220**	**234**
		Grand Total	**100.00%**	**100.00%**	**16,591**	**25,472**	**42,063**	**100.00%**	**100.00%**	**15,958**	**25,701**	**41,659**

Source: FAA TFMSC; Mead & Hunt

Table 22: Operational Fleet Mix (Projected 2028 and 2033)

Type	Weight Class	Aircraft	2028 Fleet Mix %		Projected 2028 Repr. Ops			2033 Fleet Mix %		Projected 2033 Repr. Ops		
			IFR	VFR	IFR	VFR	Total	IFR	VFR	IFR	VFR	Total
Jet	Heavy	B763 - Boeing 767-300	0.03%	0.00%	4	0	4	0.03%	0.00%	4	0	4
Jet	Heavy	A332 - Airbus A330-200	0.01%	0.00%	1	0	1	0.01%	0.00%	1	0	1
		Subtotal Heavy Equipment	**0.04%**	**0.00%**	**5**	**0**	**5**	**0.04%**	**0.00%**	**5**	**0**	**5**
Jet	Large	CRJ2 - Bombardier CRJ-200	4.72%	0.00%	719	0	719	4.72%	0.00%	730	0	730
Jet	Large	E145 - Embraer ERJ-145	1.55%	0.00%	236	0	236	1.55%	0.00%	240	0	240
Jet	Large	CRJ7 - Bombardier CRJ-700	48.34%	0.00%	7,369	0	7,369	48.34%	0.00%	7,481	0	7,481
Jet	Large	J328 - Fairchild Dornier 328 Jet	0.00%	0.00%	0	0	0	0.00%	0.00%	0	0	0
Jet	Large	CRJ9 - Bombardier CRJ-900	1.78%	0.00%	272	0	272	1.78%	0.00%	276	0	276
Jet	Large	E120 - Embraer Brasilia EMB 120	0.00%	0.00%	0	0	0	0.00%	0.00%	0	0	0
Jet	Large	B737 - Boeing 737-700	3.13%	0.00%	478	0	478	3.13%	0.00%	485	0	485
Jet	Large	E135 - Embraer ERJ 135/140/Legacy	0.00%	0.00%	0	0	0	0.00%	0.00%	0	0	0
		Subtotal Large Equipment	**59.52%**	**0.00%**	**9,074**	**0**	**9,074**	**59.52%**	**0.00%**	**9,212**	**0**	**9,212**
Jet	Medium	F2TH - Dassault Falcon 2000	3.19%	0.00%	486	0	486	3.19%	0.00%	494	0	494
Jet	Medium	C56X - Cessna Excel/XLS	2.05%	0.00%	313	0	313	2.05%	0.00%	318	0	318
Jet	Medium	C510 - Cessna Citation Mustang	2.00%	0.00%	304	0	304	2.00%	0.00%	309	0	309
Jet	Medium	C650 - Cessna III/VI/VII	1.66%	0.00%	252	0	252	1.66%	0.00%	256	0	256
Jet	Medium	H25B - BAe HS 125/700-800/Hawker 800	1.64%	0.00%	250	0	250	1.64%	0.00%	253	0	253
Jet	Medium	C750 - Cessna Citation X	1.45%	0.00%	221	0	221	1.45%	0.00%	224	0	224
Jet	Medium	GL5T - Bombardier BD-700 Global 5000	1.32%	0.00%	201	0	201	1.32%	0.00%	204	0	204
Jet	Medium	BE40 - Raytheon/Beech Beechjet 400/T-1	1.21%	0.00%	185	0	185	1.21%	0.00%	187	0	187
Jet	Medium	F900 - Dassault Falcon 900	1.14%	0.00%	175	0	175	1.14%	0.00%	177	0	177
Jet	Medium	CL30 - Bombardier (Canadair) Challenger 300	1.10%	0.00%	167	0	167	1.10%	0.00%	170	0	170
		Subtotal Medium Equipment	**16.75%**	**0.00%**	**2,554**	**0**	**2,554**	**16.75%**	**0.00%**	**2,592**	**0**	**2,592**
Turbine	Small Eqpt	B350 - Beech Super King Air 350	4.24%	0.00%	646	0	646	4.24%	0.00%	656	0	656
Turbine	Small Eqpt	BE20 - Beech 200 Super King	4.16%	0.00%	634	0	634	4.16%	0.00%	644	0	644
Piston	Small Eqpt	SR22 - Cirrus SR 22	2.49%	24.69%	380	6,307	6,687	2.49%	24.69%	386	6,409	6,795
Piston	Small Eqpt	C421 - Cessna Golden Eagle 421	2.33%	23.10%	356	5,902	6,258	2.33%	23.10%	361	5,998	6,359
Piston	Small Eqpt	C172 - Cessna Skyhawk 172/Cutlass	2.28%	22.57%	348	5,767	6,115	2.28%	22.57%	353	5,860	6,213
Turbine	Small Eqpt	BE9L - Beech King Air 90	2.16%	0.00%	329	0	329	2.16%	0.00%	334	0	334
Turbine	Small Eqpt	C208 - Cessna 208 Caravan	1.53%	0.00%	234	0	234	1.53%	0.00%	237	0	237
Piston	Small Eqpt	C340 - Cessna 340	1.53%	15.18%	234	3,879	4,113	1.53%	15.18%	237	3,941	4,178
Turbine	Small Eqpt	PAY1 - Piper Cheyenne 1	1.51%	0.00%	230	0	230	1.51%	0.00%	233	0	233
Piston	Small Eqpt	P28A - Piper Cherokee	1.37%	13.60%	209	3,474	3,683	1.37%	13.60%	213	3,530	3,743
		Subtotal Small Equipment	**23.61%**	**99.14%**	**3,600**	**25,329**	**28,929**	**23.61%**	**99.14%**	**3,654**	**25,738**	**29,392**
Copter	Other	H60 - Sikorsky SH-60 Seahawk	0.05%	0.49%	8	125	133	0.05%	0.49%	8	127	135
Copter	Other	EC55 - Eurocopter EC-155	0.04%	0.37%	6	94	100	0.04%	0.37%	6	95	101
		Subtotal Other/Copters	**0.09%**	**0.86%**	**14**	**219**	**233**	**0.09%**	**0.86%**	**14**	**222**	**236**
		Grand Total	**100.00%**	**100.00%**	**15,245**	**25,548**	**40,793**	**100.00%**	**100.00%**	**15,476**	**25,960**	**41,437**

Table 23: Operational Fleet Mix (Projected 2038)

Type	Weight Class	Aircraft	2038 Fleet Mix % IFR	2038 Fleet Mix % VFR	Projected 2038 Repr. Ops IFR	Projected 2038 Repr. Ops VFR	Projected 2038 Repr. Ops Total
Jet	Heavy	B763 - Boeing 767-300	0.03%	0.00%	4	0	4
Jet	Heavy	A332 - Airbus A330-200	0.01%	0.00%	1	0	1
		Subtotal Heavy Equipment	**0.04%**	**0.00%**	**5**	**0**	**5**
Jet	Large	CRJ2 - Bombardier CRJ-200	0.00%	0.00%	0	0	0
Jet	Large	E145 - Embraer ERJ-145	0.00%	0.00%	0	0	0
Jet	Large	CRJ7 - Bombardier CRJ-700	45.32%	0.00%	6,949	0	6,949
Jet	Large	J328 - Fairchild Dornier 328 Jet	0.00%	0.00%	0	0	0
Jet	Large	CRJ9 - Bombardier CRJ-900	1.67%	0.00%	256	0	256
Jet	Large	E120 - Embraer Brasilia EMB 120	0.00%	0.00%	0	0	0
Jet	Large	B737 - Boeing 737-700	12.53%	0.00%	1,921	0	1,921
Jet	Large	E135 - Embraer ERJ 135/140/Legacy	0.00%	0.00%	0	0	0
		Subtotal Large Equipment	**59.52%**	**0.00%**	**9,126**	**0**	**9,126**
Jet	Medium	F2TH - Dassault Falcon 2000	3.19%	0.00%	489	0	489
Jet	Medium	C56X - Cessna Excel/XLS	2.05%	0.00%	315	0	315
Jet	Medium	C510 - Cessna Citation Mustang	2.00%	0.00%	306	0	306
Jet	Medium	C650 - Cessna III/VI/VII	1.66%	0.00%	254	0	254
Jet	Medium	H25B - BAe HS 125/700-800/Hawker 800	1.64%	0.00%	251	0	251
Jet	Medium	C750 - Cessna Citation X	1.45%	0.00%	222	0	222
Jet	Medium	GL5T - Bombardier BD-700 Global 5000	1.32%	0.00%	202	0	202
Jet	Medium	BE40 - Raytheon/Beech Beechjet 400/T-1	1.21%	0.00%	186	0	186
Jet	Medium	F900 - Dassault Falcon 900	1.14%	0.00%	176	0	176
Jet	Medium	CL30 - Bombardier (Canadair) Challenger 300	1.10%	0.00%	168	0	168
		Subtotal Medium Equipment	**16.75%**	**0.00%**	**2,569**	**0**	**2,569**
Turbine	Small Eqpt	B350 - Beech Super King Air 350	4.24%	0.00%	650	0	650
Turbine	Small Eqpt	BE20 - Beech 200 Super King	4.16%	0.00%	638	0	638
Piston	Small Eqpt	SR22 - Cirrus SR 22	2.49%	24.69%	382	6,458	6,840
Piston	Small Eqpt	C421 - Cessna Golden Eagle 421	2.33%	23.10%	358	6,044	6,402
Piston	Small Eqpt	C172 - Cessna Skyhawk 172/Cutlass	2.28%	22.57%	350	5,906	6,256
Turbine	Small Eqpt	BE9L - Beech King Air 90	2.16%	0.00%	331	0	331
Turbine	Small Eqpt	C208 - Cessna 208 Caravan	1.53%	0.00%	235	0	235
Piston	Small Eqpt	C340 - Cessna 340	1.53%	15.18%	235	3,972	4,207
Turbine	Small Eqpt	PAY1 - Piper Cheyenne 1	1.51%	0.00%	231	0	231
Piston	Small Eqpt	P28A - Piper Cherokee	1.37%	13.60%	211	3,557	3,768
		Subtotal Small Equipment	**23.61%**	**99.14%**	**3,621**	**25,937**	**29,558**
Copter	Other	H60 - Sikorsky SH-60 Seahawk	0.05%	0.49%	8	128	136
Copter	Other	EC55 - Eurocopter EC-155	0.04%	0.37%	6	96	102
		Subtotal Other/Copters	**0.09%**	**0.86%**	**14**	**224**	**238**
		Grand Total	**100.00%**	**100.00%**	**15,334**	**26,161**	**41,496**

Source: FAA TFMSC; Mead & Hunt

10. Forecasts Summary and Terminal Area Forecast Comparison

Passenger and aircraft activity at the Airport have fluctuated in recent history. This is not uncommon in comparison to many U.S. airports as economic uncertainty and increased travel costs have impacted travel behavior. Despite fluctuations in fuel cost, airline bankruptcies, airline mergers, system-wide route restructuring, and aircraft fleet overhauls, the forecasts developed for this environmental assessment suggest passenger enplanements and based aircraft will grow at the Airport over the next 20 years, but total aircraft operations will decrease. A summary of these projections is presented in **Table 24**. A summary of these forecasts is also presented in specific FAA required tabular formats in **Table 25** and **Table 26**.

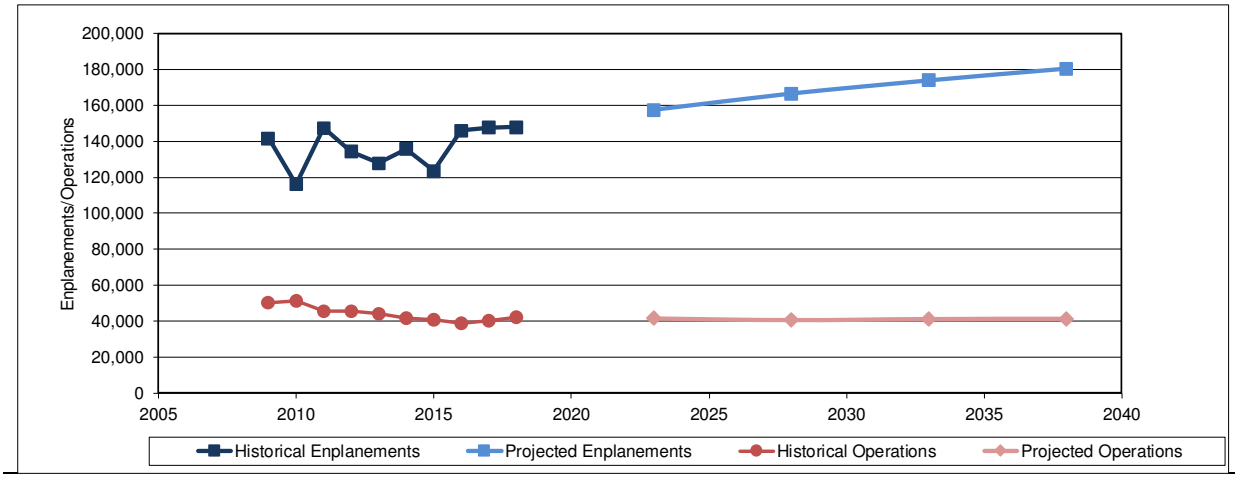
As was noted earlier, forecasts that differ from the FAA TAF projections by more than 15 percent are considered inconsistent with the TAF and require FAA HQ review. As shown in **Table 26**, the enplanement and total operations projections prepared for this environmental assessment are both within 10 percent of the current FAA TAF projection.

The 20-year commercial operations projection is 65.2 percent above the FAA TAF projection. The commercial aircraft operations forecast for this environmental assessment projects that retirements of 50-seat regional jets and turboprop aircraft will result in increasing numbers of larger 70- to 90-seat regional jets operating at the Airport as well as the initiation of narrow body service with 130 to 150 seats during the planning period. Although this will result in a decrease in the number of operations through the planning period, the higher operations projection (compared to the TAF) is based on the following:

- Load factors and average seats per departure from the FAA Aerospace Forecasts Fiscal Year (FY) 2019-2039
- Preferred enplanement projection that is lower than the TAF throughout the planning period

Table 24: Projections Summary

		Itinerant Operations				Local Operations			
Year	Enplanements	Air Carrier	Air Taxi	General Aviation	Military	General Aviation	Military	Total Operations	Based Aircraft
Historical:									
2009	141,572	868	9,190	21,522	80	18,858	8	50,526	143
2010	116,148	390	10,223	19,833	121	20,775	86	51,428	143
2011	147,361	495	10,219	17,398	165	17,428	28	45,733	143
2012	134,299	193	9,216	18,014	281	17,641	26	45,371	111
2013	127,802	34	8,717	17,445	127	17,620	8	43,951	109
2014	135,576	96	8,224	15,935	111	17,474	20	41,860	110
2015	123,487	942	6,051	17,524	204	16,181	30	40,932	110
2016	145,909	940	8,014	16,716	132	13,163	1	38,966	111
2017	147,644	1,023	7,459	17,547	134	14,184	0	40,347	111
2018	147,857	1,032	7,309	17,889	141	15,690	2	42,063	113
CAGR (2009-2018)	*0.48%*	*1.94%*	*-2.51%*	*-2.03%*	*6.50%*	*-2.02%*	*-14.28%*	*-2.02%*	*-2.58%*
Projected:									
2023	157,462	4,118	2,909	18,197	141	16,292	2	41,659	117
2028	166,439	4,924	725	18,441	141	16,559	2	40,793	121
2033	173,809	5,014	752	18,693	141	16,835	2	41,437	124
2038	180,388	5,067	213	18,952	141	17,120	2	41,496	127
CAGR (2018-2038)	*1.00%*	*8.28%*	*-16.21%*	*0.29%*	*0.00%*	*0.44%*	*0.00%*	*-0.07%*	*0.58%*



Source: Historical Operations - FAA OPSNET
Historical Based Aircraft - FAA TAF
Projections - Mead & Hunt, Inc.

Table 25: Federal Aviation Administration Template – Forecast Levels and Growth Rates

A. Forecast Levels and Growth Rates

	Specify base year: 2018								
	2018	**2023**	**2028**	**2033**	**2038**	**Average CAGR**			
	Base Yr. Level	**Base Yr. + 5yr.**	**Base Yr. + 10yrs.**	**Base Yr. + 15yrs.**	**Base Yr. + 20yrs.**	**Base Yr. + 5yr.**	**Base Yr. + 10yrs.**	**Base Yr. + 15yrs.**	**Base Yr. + 20yrs.**
Passenger Enplanements									
TOTAL Air Carrier & Commuter	147,857	157,462	166,439	173,809	180,388	1.3%	1.2%	1.1%	1.0%
Operations									
Itinerant									
Air carrier	1,032	4,118	4,924	5,014	5,067	31.9%	16.9%	11.1%	8.3%
Commuter/air taxi	7,309	2,909	725	752	213	-16.8%	-20.6%	-14.1%	-16.2%
Total Commercial Operations	8,341	7,027	5,649	5,766	5,280	-3.4%	-3.8%	-2.4%	-2.3%
General aviation	17,889	18,197	18,441	18,693	18,952	0.3%	0.3%	0.3%	0.3%
Military	141	141	141	141	141	0.0%	0.0%	0.0%	0.0%
Local									
General aviation	15,690	16,292	16,559	16,835	17,120	0.8%	0.5%	0.5%	0.4%
Military	2	2	2	2	2	0.0%	0.0%	0.0%	0.0%
TOTAL OPERATIONS	42,063	41,659	40,793	41,437	41,496	-0.2%	-0.3%	-0.1%	-0.1%
Instrument Operations	16,591	15,958	15,245	15,476	15,334	-0.8%	-0.8%	-0.5%	-0.4%
Based Aircraft									
Single Engine (Nonjet)	91	93	94	97	98	0.3%	0.4%	0.4%	0.4%
Multi Engine (Nonjet)	14	15	16	16	17	1.7%	1.2%	1.0%	0.8%
Jet Engine	8	9	11	11	13	3.2%	3.1%	2.3%	2.3%
Helicopter	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Other	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
TOTAL	113	117	121	124	127	0.7%	0.7%	0.6%	0.6%

B. Operational Factors

	2018	**2023**	**2028**	**2033**	**2038**
	Base Yr. Level	**Base Yr. + 5yr.**	**Base Yr. + 10yrs.**	**Base Yr. + 15yrs.**	**Base Yr. + 20yrs.**
Average aircraft size (seats)					
Air carrier & Commuter	53.1	62.0	78.0	78.0	89.0
Average enplaning load factor					
Air carrier & Commuter	68.0%	74.0%	78.0%	80.0%	80.0%
GA operations per based aircraft	297	294	289	286	284

CAGR = Compound Annual Growth Rate

Table 26: Federal Aviation Administration Template – Forecast Levels and Growth Rates

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
Base Yr. Level	2018	147,857	147,857	0.0%
Base Yr. + 5yr.	2023	157,462	160,621	-2.0%
Base Yr. + 10yrs.	2028	166,439	171,104	-2.7%
Base Yr. + 15yrs.	2033	173,809	182,865	-5.0%
Base Yr. + 20yrs.	2038	180,388	195,253	-7.6%
Commercial Operations				
Base Yr. Level	2018	8,341	8,230	1.3%
Base Yr. + 5yr.	2023	7,027	3,060	129.6%
Base Yr. + 10yrs.	2028	5,649	2,815	100.7%
Base Yr. + 15yrs.	2033	5,766	2,998	92.3%
Base Yr. + 20yrs.	2038	5,280	3,196	65.2%
Total Operations				
Base Yr. Level	2018	42,063	42,051	0.0%
Base Yr. + 5yr.	2023	41,659	37,483	11.1%
Base Yr. + 10yrs.	2028	40,793	37,318	9.3%
Base Yr. + 15yrs.	2033	41,437	37,581	10.3%
Base Yr. + 20yrs.	2038	41,496	37,862	9.6%

NOTES: TAF data is on a U.S. Government fiscal year basis (October through September).
Airport Forecast is on a calendar year basis.

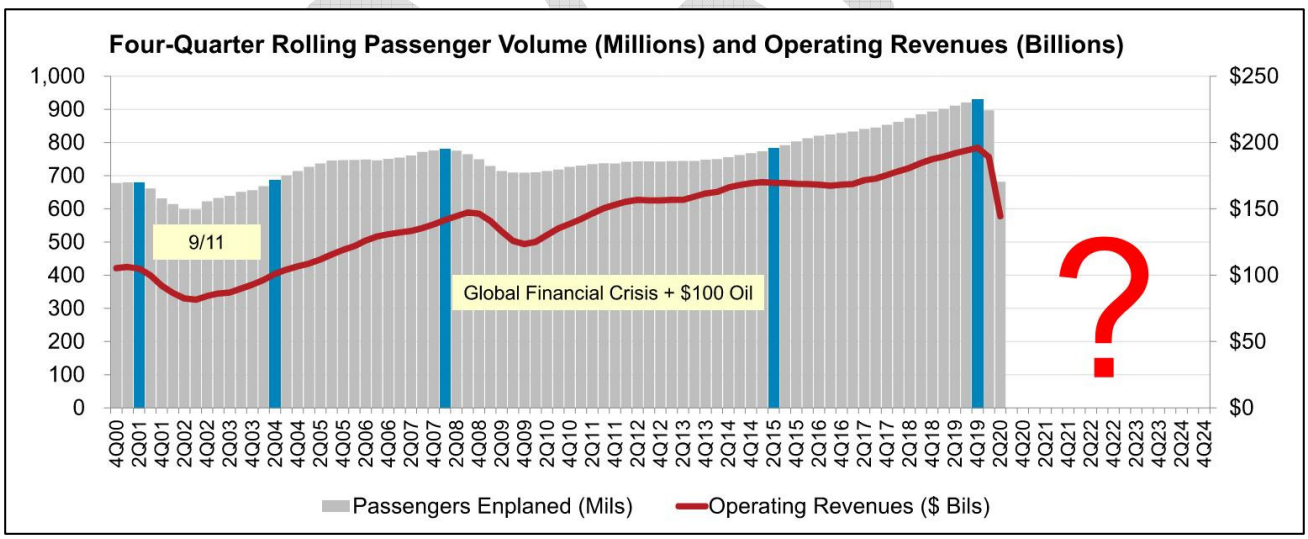
Appendix A

Impacts of COVID-19 on Projections

As previously explained, this report contains aviation activity forecasts for the Kalamazoo/Battle Creek International Airport (AZO or Airport) over a 20-year planning horizon. It should be noted that projections of aviation demand are based on data through the year 2019, as this was the most recent calendar year for which a full 12 months of historical data was available at the time these forecasts were developed in November 2019 and revised to address FAA review comments in September 2020.

When these forecasts were prepared, the commercial aviation industry was experiencing a period of strong growth as it recovered from the economic recession of 2007-2009. Referred to by some industry analysts as the "Golden Age," this period saw passengers enplaned systemwide on U.S. airlines in scheduled and nonscheduled services grow from approximately 700 million passengers in the fourth quarter of 2009 to more than 900 million passengers in the fourth quarter of 2019, according to data from Airlines for America (see **Figure A-1**). Concurrently, airline operating revenues in the U.S. grew from just under $125 billion in the fourth quarter of 2009 to nearly $200 billion in the fourth quarter of 2019.

Figure A-1: U.S. Airline Passenger Volume and Operating Revenues, 2000 to 2020



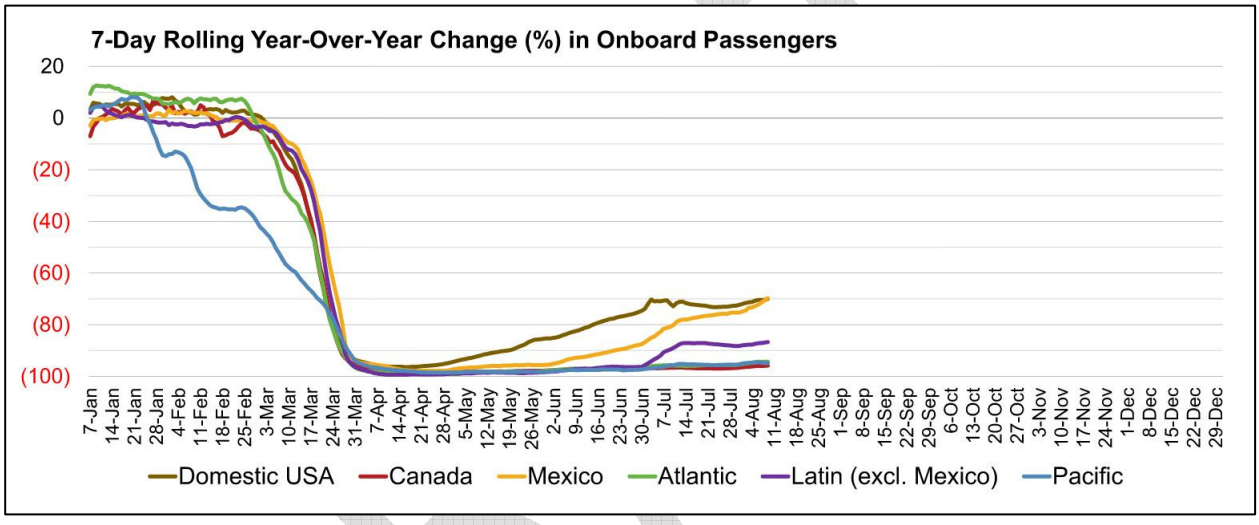
Source: Airlines for America, August 2020

In 2019, U.S. airlines were transporting an average of 2.5 million passengers each day, and air travel between the U.S. and foreign countries reached an all-time high with nearly 80 million foreign visitors coming to the U.S. In addition, the Transportation Security Administration (TSA) set three records in 2019 in terms of the number of passengers and crew screened in a single day, with the latest record set on Thanksgiving Day when nearly 2.9 million travelers were screened.[1]

[1] https://www.airlines.org/wp-content/uploads/2020/05/A4A-CST-Testimony-Final.pdf

In the first quarter of 2020, however, the COVID-19 pandemic hit, causing the bottom to fall out of the aviation industry. Over the course of only a few months, government- and business-imposed travel restrictions compounded by public concern decimated demand for air travel. As shown in Figure A-1, the airlines' previous position of strong growth in passenger volumes and operating revenues deteriorated at an unprecedented pace, falling below 700 million passengers and $150 billion in operating revenues in the second quarter of 2020. Since the bottom in passenger volumes was reached in April, there has been some growth (see **Figure A-2**), but as of August 2020, U.S. volumes remain 73 percent below the levels they were in August 2019.[2]

Figure A-2: Commercial Airlines Passenger Volumes by World Region, 2020



Source: Airlines for America, August 2020

General aviation has also been severely impacted by the pandemic. According to data from ARGUS International, an aviation company that provides aviation training, audits, software, safety, and consulting services, daily general aviation flights during the first quarter of 2020 reached a high of approximately 8,000 flights before falling precipitously in March to a low of fewer than 2,000 flights in April. Fractional flights, which ARGUS International breaks out separately from general aviation, experienced a similar drop-off, falling from a range of 1,000 to 1,500 daily flights in January and February 2020 to well below 500 daily flights beginning in March and continuing through April. The ARGUS International data shows that both daily general aviation and fractional flights have been increasing since April but are still below 2019 levels, with general aviation operations growing to between 5,000 and 7,000 daily flights and fractional operations increasing to approximately 1,000 daily flights in August.[3]

Given the steep decline in passenger demand and flights, the public's ongoing concern regarding the COVID-19 virus, and the uncertain timeframe for development and approval of a vaccine or effective drug treatment, the aviation industry is going through an unprecedented time that is very different from the period

[2] https://www.airlines.org/dataset/impact-of-covid19-data-updates/#
[3] https://www.argus.aero/covid-19-impact-business-aviation-activity/

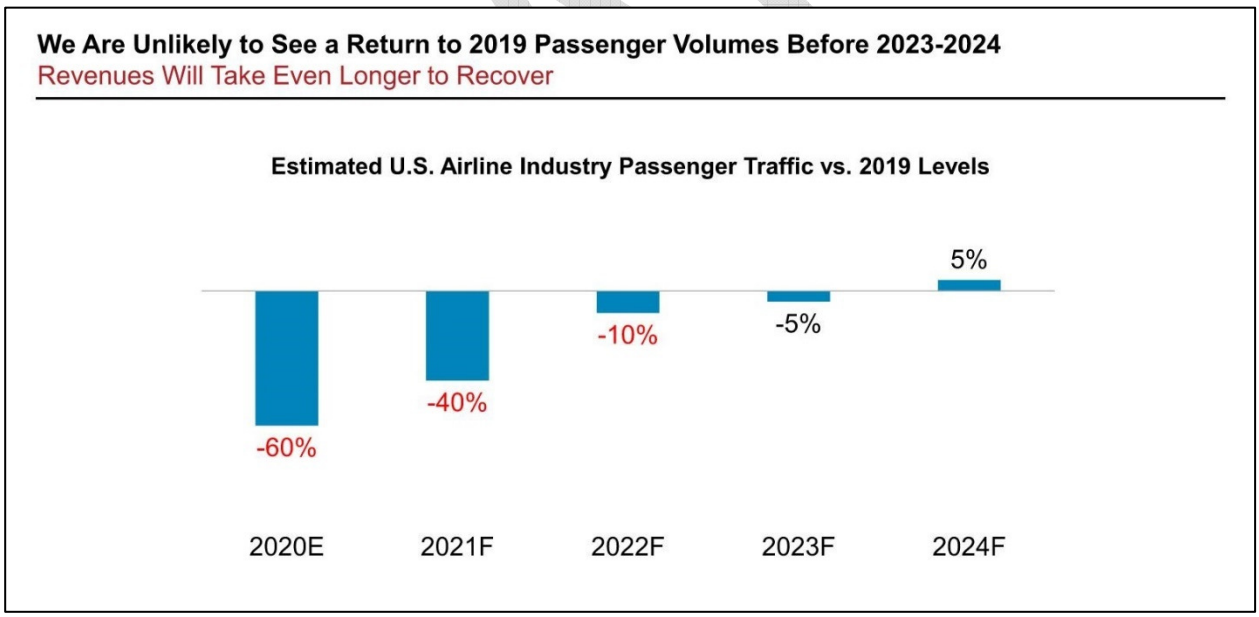
when AZO's forecasts were prepared. It is therefore necessary to revisit the AZO forecasts to make any needed adjustments.

To determine how the forecasts may need to be revised, it is important to gain an understanding of when demand for aviation services can be expected to return to pre-2020 levels. Various businesses and organizations have prepared projections that shed light on this issue. A few of these projections are summarized in the sections below. Given the importance of passenger airlines to global economic activity due to their facilitation of tourism spending, outsourcing of many services, significant employment rolls, and consumption of refined petroleum, the projections focus on the timing of the return of airline passenger demand to pre-2020 levels. These projections can assist in determining how the previously prepared forecasts for AZO may need to be adjusted in the new COVID-19 era.

1. Airlines for America Projection

As illustrated in **Figure A-3**, Airlines for America forecasts U.S. airline passenger volumes to return to 2019 levels in the 2023 to 2024 timeframe. Passenger traffic is expected to be down 60 percent in 2020 compared to 2019 levels, with passenger volumes projected to take four years to rise 5 percent above 2019 levels.

Figure A-3: Airlines for America Projection



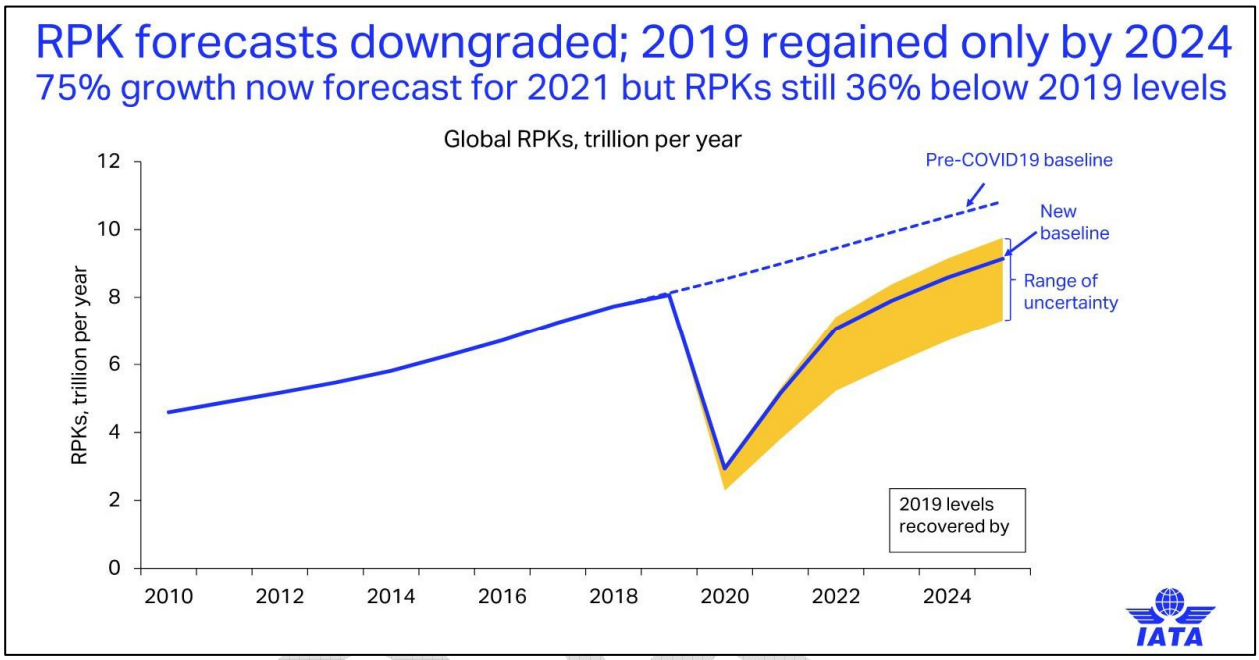
Source: Airlines for America, August 2020

2. International Air Transport Association (IATA) Projection

In July 2020, the International Air Transport Association (IATA) released its updated forecast of when it sees a return to the pre-pandemic level of passenger demand. As shown in **Figure A-4**, IATA expects a long period of recovery, with a return to pre-COVID 19 revenue passenger kilometer (RPK) levels not occurring before 2024. This long recovery is anticipated due to IATA's pessimism about the return of

business (in particular) and leisure travel. IATA's forecast includes a "range of uncertainty" (shaded in yellow in Figure A-4) and shows that the risks around their projection lean heavily toward the downside.[4]

Figure A-4: IATA Projection



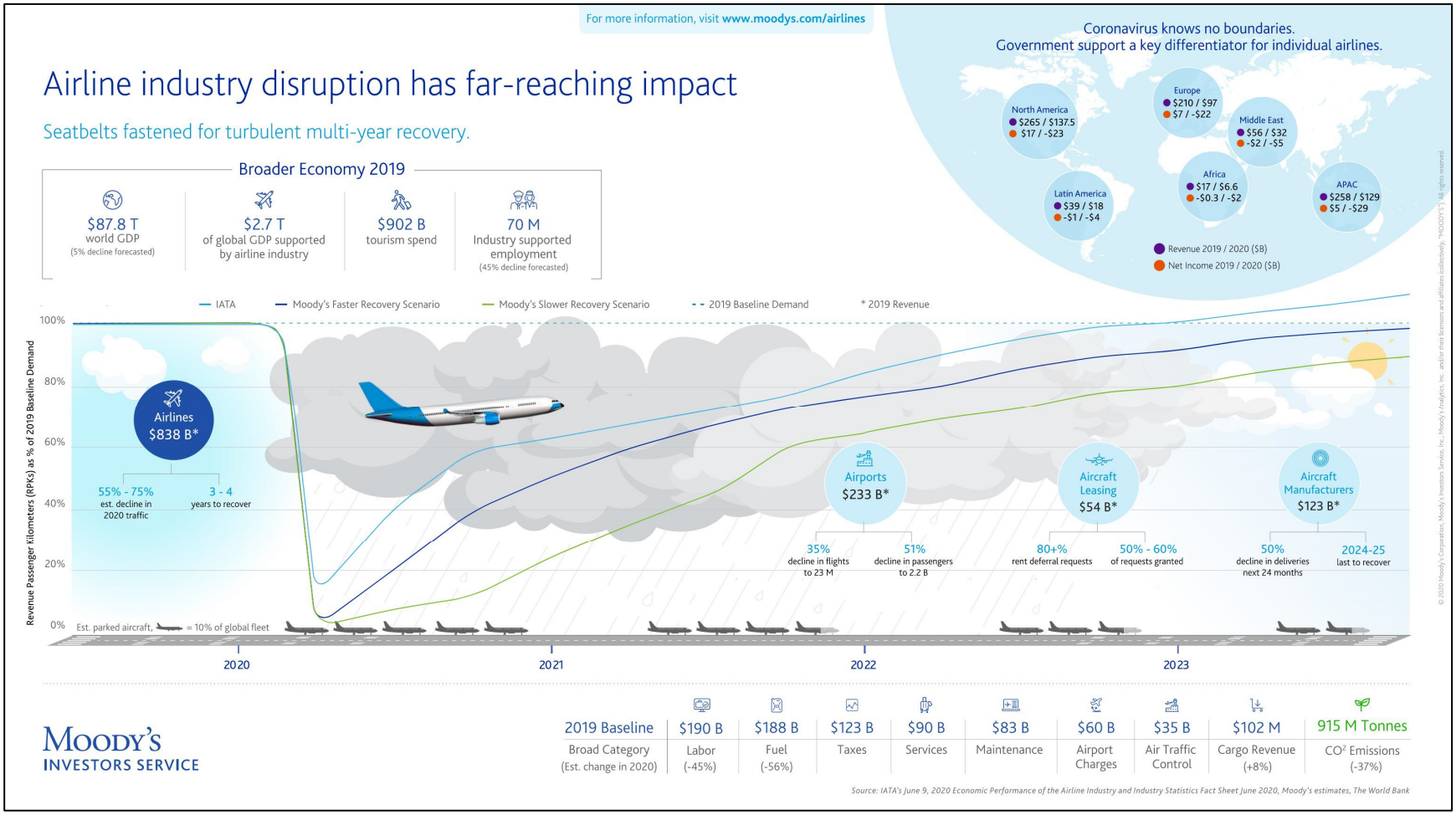
Source: IATA, July 2020

3. Moody's Investors Service Projection

Moody's Investors Service, the bond credit rating and research business of Moody's Corporation, also released a forecast of passenger demand's return to pre-COVID-19 levels in July 2020. In their forecast, presented in **Figure A-5**, Moody's includes a faster recovery scenario in which passenger demand returns close to 2019 levels by the end of 2023, once the concerns related to personal health and safety are relieved. A slower recovery scenario is also included, in which demand does not recover until some point after 2023, reflecting the recent increasing rates of COVID-19 infections in the U.S. that followed loosening of social distancing and quarantine protocols. Moody's cautions that recovery could take even longer if governments enforce social distancing and reinstate quarantine protocols due to the increasing infection rates.[5]

[4] https://www.iata.org/en/iata-repository/publications/economic-reports/Five-years-to-return-to-the-pre-pandemic-level-of-passenger-demand/
[5] https://www.moodys.com/research/Moodys-Coronavirus-related-disruptions-to-airline-industry-affect-broad-swath--PBC_1237929?showPdf=true

Figure A-5: Moody's Investors Service Projection



Source: Moody's Investors Service, July 2020

4. Oliver Wyman Projection

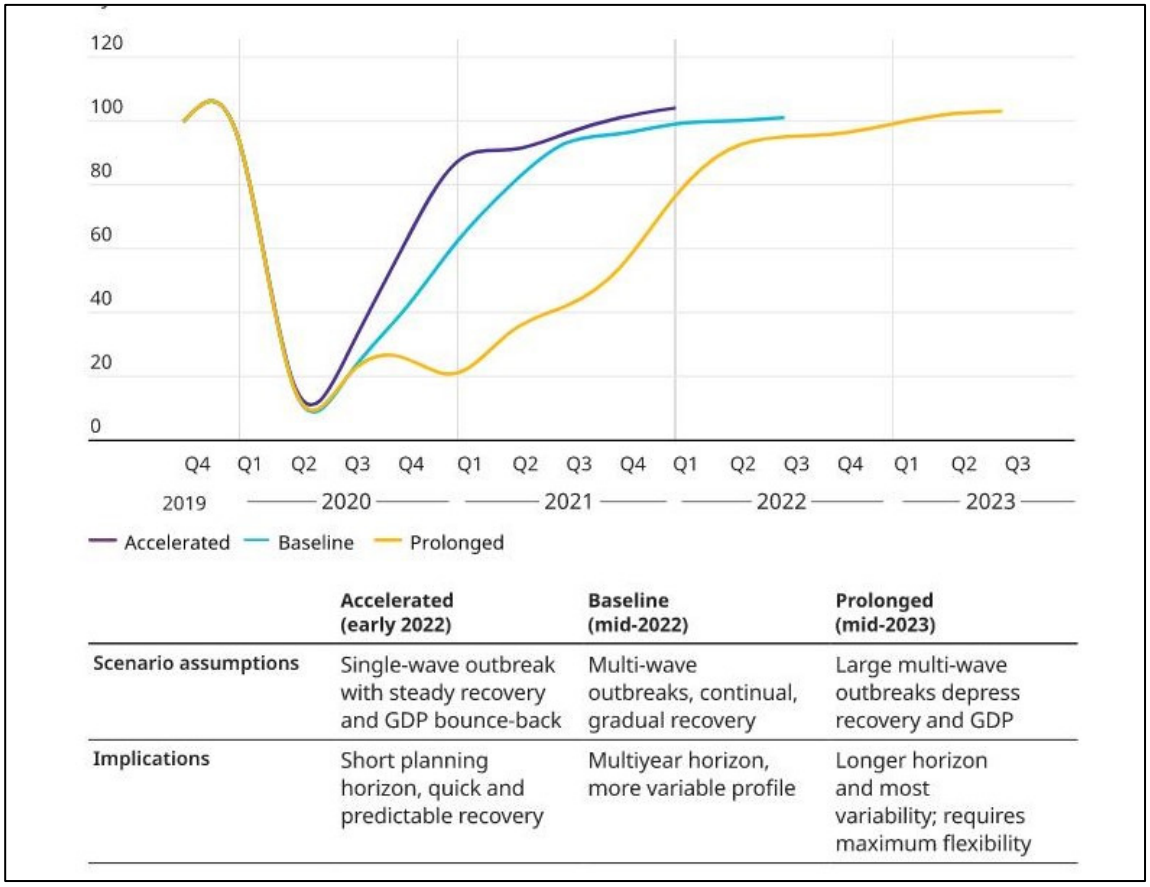
Oliver Wyman, a leading international management consulting firm, released a report in July 2020 that examined the impact of the COVID-19 pandemic on the global demand for maintenance, repair, and overhaul (MRO). In their report, Oliver Wyman included three scenarios of global passenger demand recovery. In their baseline forecast, which represents a moderate view of what may transpire in the industry, domestic travel begins its recovery in late summer of 2020 and reaches 40 percent of pre-COVID-19 levels by late fall when demand plateaus due to increasing infection rates. Growth is not expected to resume until a vaccine is developed, which would occur in the second half of 2021. Global domestic passenger demand in the baseline forecast recovers to 2019 levels in the second half of 2022, while international travel recovers in 2023.[6]

In the accelerated scenario, which Oliver Wyman now considers to be highly unlikely due to the inability of many large economies to contain the virus, global passenger demand would recover to pre-2020 levels by the end of 2021.

Finally, in the prolonged scenario, recovery is much more gradual and involves multiple waves of infection and delayed vaccine development. This scenario also assumes an extended global recession. Passenger demand in the prolonged scenario does not reach pre-COVID-19 levels until sometime in 2023.

[6] https://www.oliverwyman.com/content/dam/oliver wyman/v2/media/July_Update_Impact_of_COVID19_on_Commercial_MRO_2020.pdf

Figure A-6: Oliver Wyman Projection



	Accelerated (early 2022)	Baseline (mid-2022)	Prolonged (mid-2023)
Scenario assumptions	Single-wave outbreak with steady recovery and GDP bounce-back	Multi-wave outbreaks, continual, gradual recovery	Large multi-wave outbreaks depress recovery and GDP
Implications	Short planning horizon, quick and predictable recovery	Multiyear horizon, more variable profile	Longer horizon and most variability; requires maximum flexibility

Source: Oliver Wyman, July 2020

5. AZO Recovery Scenarios

As the primary driver of the need for the runway extension at AZO is the scheduled commercial aircraft, the recovery scenarios focus on the passenger enplanement demand at the airport. It is anticipated that commercial aircraft operations will be closely tied to passenger demand, for instance a 10% decline in enplanements from the 2019 Baseline Forecast, would be anticipated to result in a 10% decline in commercial operations from the 2019 Baseline Forecast of commercial operations. Therefore, the recovery scenarios will generally be presented as a percentage of the 2019 activity level and/or percentage of the baseline 2019 Baseline Forecast activity level occurring.

Transportation Security Administration (TSA) passenger screening counts are being tracked daily to monitor and track the change in passenger levels from 2019 to 2020. **Table A-1** presents the TSA Screening Counts for 2019 and 2020 for the months of April through August. As shown below, AZO's slight recovery from COVID-19 is closely aligned and just slightly above the national numbers, therefore we anticipate AZO's recovery will align closely with the nation's aviation system recovery. The US passenger level in August 2020 was 28.8% of the 2019 passenger level, and AZO's was 29.1%.

Table A-1: TSA Screening Counts

	US			AZO		
	2019	**2020**	**%**	**2019**	**2020**	**%**
April	70,124,591	3,287,008	4.7%	13,710	662	4.8%
May	71,883,502	6,922,053	9.6%	15,060	957	6.4%
June	76,629,500	14,571,801	19.0%	13,230	1,910	14.4%
July	79,061,968	20,740,781	26.2%	14,512	3,748	25.8%
August	74,446,491	21,465,238	28.8%	13,795	4,015	29.1%
Total	372,148,071	66,988,901	18.0%	72,326	13,312	18.4%

Source: TSA and AZO Airport

Based upon the review of the various recovery scenarios presented in this Appendix two recovery scenarios have been prepared for AZO.

5.a Scenario 1 – Full Recovery

This scenario assumes a COVID-19 vaccine is available in early 2021 which allows the modest recovery of domestic travel occurring in late summer of 2020 to continue to build through 2021 and 2022. This scenario is similar to the Oliver Wyman projections with a full recovery in late 2022 or before. With a full recovery occurring near the end of 2022, activity levels in 2023 would be recovered to their 2019 levels and activity levels in 2024 and beyond would be back on track with the 2019 Baseline Forecast. This scenario includes the following traffic assumptions:

- 2020 30% of 2019 Traffic
- 2021 65% of 2019 Traffic
- 2022 85% of 2019 Traffic
- 2023 100% of 2019 Traffic

- 2024 Recovered to 2019 Baseline Forecast

5.b Scenario 2 – New Baseline

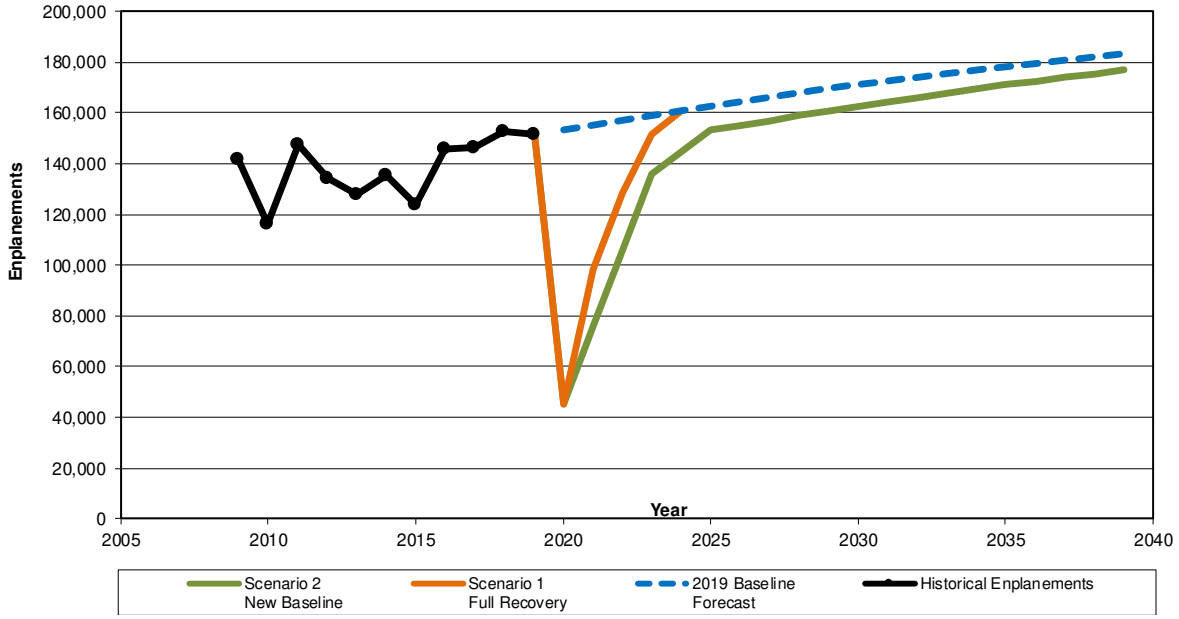
This scenario is similar to the IATA projections and expects a long period of recovery, with a return to pre-COVID 19 levels not occurring before 2024. It also assumes that a new delayed baseline will be expected with traffic levels recovering to approximately 95% of 2019 Baseline Forecast. In the case of AZO a recovery to approximately 95% of the 2019 Baseline Forecast indicates that traffic levels and the new baseline are delayed about 5 years from 2019 Baseline Forecast. This scenario includes the following traffic assumptions:

- 2020 30% of 2019 Traffic
- 2021 50% of 2019 Traffic
- 2022 70% of 2019 Traffic
- 2023 90% of 2019 Traffic
- 2024 90% of the 2019 Baseline Forecast
- 2025 New Baseline established (delayed approximately 5 years)

Table A-2 presents AZO passenger enplanement recovery scenarios.

Table A-2: AZO Enplanement Recovery Scenarios

Year	Historical Enplanements	2019 Baseline Forecast	Scenario 1 Full Recovery	Scenario 2 New Baseline
2009	141,572			
2010	116,148			
2011	147,361			
2012	134,299			
2013	127,802			
2014	135,576			
2015	123,487			
2016	145,909			
2017	146,314			
2018	152,845			
2019	151,254	151,254	151,254	151,254
2024		160,671	160,671	144,604
2029		169,554	169,554	160,671
2034		176,667	176,667	169,554
2039		183,068	183,068	176,667



Sources: Projections - Mead & Hunt, Inc.