

KANSAS CITY
Aviation

Airport Master Plan

KANSAS CITY DOWNTOWN AIRPORT – WHEELER FIELD

Chapter 2

Forecasts



The definition of demand that may reasonably be expected to occur during the useful life of an airport's key components (e.g., runways, taxiways, terminal buildings, etc.) is an important factor in facility planning. In airport forecasting, this involves projecting potential aviation activity for a 20-year timeframe. Aviation demand forecasting for the Kansas City Downtown Airport – Wheeler Field (MKC) will primarily consider based aircraft, aircraft operations, and peak activity periods. In addition, MKC receives numerous charter operations; therefore, charter passenger levels will also be considered.

The Federal Aviation Administration (FAA) has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. FAA will review individual airport forecasts with the objective of comparing them to its *Terminal Area Forecast* (TAF) and the *National Plan of Integrated Airport Systems* (NPIAS). While the TAF forecasts are a point of comparison for airport forecasts, they primarily serve other purposes, such as asset allocation by the FAA.

When reviewing a sponsor's airport forecast, the FAA must ensure that the forecast is based on reasonable planning assumptions, uses current data, and is developed using appropriate forecast methods. As stated in FAA Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems* (NPIAS) *and Airports Capital Improvement Plan* (ACIP), forecasts should be:

- Realistic;
- Based on the latest available data;
- Reflective of current conditions at the airport (as a baseline);
- Supported by information in the study; and
- Able to provide adequate justification for airport planning and development.

The forecast process for an airport planning study consists of basic steps that vary in complexity depending upon the issues addressed and the level of effort required. The steps include a review of previous forecasts, determination of data needs (i.e., socioeconomic, air traffic activity, etc.), identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and evaluation and documentation of the results. FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, outlines seven standard steps involved in the forecast process for master plans, ALP updates, and other airport forecasting efforts:

1) **Identify Aviation Activity Measures**: This involves the levels and types of aviation activities likely to impact facility needs. For general aviation, this typically includes based aircraft and operations. Because MKC is also a Part 139 certificated airport, passenger levels as measured by enplanements (boardings) will also be considered.
2) **Review Previous Airport Forecasts**: This may include the FAA *Terminal Area Forecast*, state or regional system plans, and previous planning studies.
3) **Gather Data**: Determine what data are required to prepare the forecasts, identify data sources, and collect historical and forecast data.
4) **Select Forecast Methods**: There are several appropriate methodologies and techniques available, including regression analysis, trend analysis, market share or ratio analysis, exponential smoothing, econometric modeling, comparison with other airports, survey techniques, cohort analysis, choice and distribution models, range projections, and professional judgment.
5) **Apply Forecast Methods and Evaluate Results**: Prepare the actual forecasts and evaluate for reasonableness.
6) **Summarize and Document Results**: Provide supporting text and data tables as necessary.
7) **Compare Forecast Results with FAA's TAF**: For airports, such as MKC, forecasts for based aircraft, enplanements, and total operations are considered consistent with the TAF if they meet the following criteria:
    - Forecasts differ by less than 10 percent in the 5-year forecast period and 15 percent in the 10-year forecast 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 5090.5, Formulation of the NPIAS and ACIP.

Aviation activity can be affected by many influences on the local, regional, and national levels, making it virtually impossible to predict year-to-year fluctuations of activity over 20 years with any certainty. Therefore, it is important to remember that forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to a range of unforeseen developments.

The following forecast analysis for MKC was produced following these basic guidelines. Existing forecasts are examined and compared against current and historic activity. The historical aviation activity is then examined, along with other factors and trends that can affect demand. The intent is to provide an updated set of aviation demand projections for MKC that will permit airport management to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

A common measure of growth is the compound annual growth rate (CAGR). The CAGR results in a growth percentage that is compounded year over year for a defined number of years. Figure 2-1 shows the CAGR formula that is used throughout this chapter. This is an important measure of the reasonableness of any individual forecast as it can be compared to historical trends readily.

The forecasts for this study utilize a base year of 2022, with a long-range forecast year of 2042.

$$CAGR = \left(\left(\frac{EV}{BV} \right)^{\frac{1}{n}} - 1 \right) \times 100$$

where:

EV = Ending value

BV = Beginning value

n = Number of years

Figure 2-1: Formula for Compound Annual Growth Rate

AIRPORT SERVICE AREA

The initial step in determining the aviation demand for an airport is to define its generalized service area for various segments of aviation the airport can accommodate. The airport service area is determined primarily by evaluating the location of competing airports, their capabilities, their services, and their relative attraction and convenience. In determining the aviation demand for an airport, it is necessary to identify the role of that airport, as well as the specific areas of aviation demand the airport is intended to serve. The primary role of MKC is to relieve congestion at Kansas City International Airport (MCI) and to serve general aviation demand in the area.

The airport service area is a geographical area where there is a potential market for airport services. Access to general aviation airports and transportation networks enter the equation to determine the size of a service area. Subjective criteria, such as the services and amenities available, are also to be factored.

Defining a service area for an airport is an important factor in the forecasting process. Once a general service area is identified, various statistical comparisons can be made for projecting aviation demand. For example, in rural areas, where there may be one general aviation airport in each county, the service area could reasonably be defined as the entire county. This would facilitate comparisons to county population and other factors pertaining to that county for forecasting purposes.

In urban areas, where there are many general aviation airports, the definition of a service area is not as simple. Aircraft owners in urban areas have many more choices when it comes to basing their aircraft. The number one reason aircraft owners select an airport at which to base their aircraft is convenience to home or work. Other reasons may include the capability of the runway system, services available, availability of hangar space and airport congestion.

The service area will generally represent where most, but not all, based aircraft will come from. It is not unusual for some based aircraft to be registered outside the region or even outside the state. Particularly in urban areas, airport service areas will likely overlap to some extent as well.

The service area of an airport can be generalized by its proximity to other airports providing similar levels of service. MKC is one of six airports serving general aviation needs within 25 miles of downtown Kansas City. **Table 2A** summarizes available facilities at airports in proximity to MKC. There are varying levels of service offered at each airport.

Kansas City International Airport (MCI) has been the area's commercial passenger service airport since opening in 1972. All scheduled air passenger service was transferred to MCI from MKC at this time. The airport can accommodate most large transport aircraft. It has the lowest instrument approach visibility minimums in the region with a CAT II/III approach, which allows pilots to land when visibility is not lower than 100-feet. MCI does not have a large general aviation presence, as general aviation traffic generally utilizes other area airports.

TABLE 2A | Area Public Airports with Paved Runways

Identifier	Airport	Nautical Miles/Direction from MKC	FAA Service Level[1]	Based Aircraft	Annual Operations	Longest Runway (ft.)	Lowest Visibility Minimum
MKC	**Kansas City Downtown Airport – Wheeler Field**	**NA**	**Reliever/ National GA**	**198**	**114,000**	**6,827**	**¾-mile**
MCI	Kansas City International Airport	12nm/NNW	Commercial	2	105,000	10,801	CAT II/III (100')
LXT	Lee's Summit Municipal Airport	14nm/SE	Reliever/ Regional GA	132	53,000	5,501	¾-mile
OJC	Johnson County Executive Airport	18nm/SSW	Reliever/ Regional GA	136	39,000	4,097	¾-mile
GPH	Midwest National Air Center Airport	18nm/NE	Regional GA	98	44,500	5,502	¾-mile
3GV	East Kansas City Airport	19nm/ESE	NA	201	40,000	4,507	1-mile
FLV	Sherman Army Airfield	21nm/NW	NA	32	10,000	5,318	1-mile
IXD	New Century Air Center	22nm/SW	Reliever/ National GA	140	54,000	7,339	½-mile

Source: www.airnav.com; [1]NPIAS

Lee's Summit Municipal Airport (LXT) is a reliever regional general aviation airport with a 5,501-foot-long runway. The airport provides full fixed-base operator (FBO) services. There are approximately 132 aircraft based at LXT, which includes six business jets. This airport primarily serves the general aviation needs south of Kansas City. The lowest visibility minimum is ¾-mile.

Johnson County Executive Airport (OJC) is a reliever regional general aviation airport with a 4,097-foot-long runway. This airport has 136 based aircraft and two full service FBOs. This airport primarily serves the needs of south Johnson County, Kansas (along with IXD). The lowest instrument approach visibility minimum available is 1-mile.

Midwest National Air Center Airport (GPH) is a regional general aviation airport primarily serving the northeast Kansas City area. The runway is 5,502 feet long and there are approximately 98 based aircraft, which includes four business jets. The airport has FBO services. The lowest instrument approach visibility minimum is ¾-mile.

East Kansas City Airport (3GV) is not classified by FAA, but it does serve the general aviation needs of the area southeast of the Kansas City metro. This airport has a 4,507-foot-long runway and has instrument approach visibility minimums of 1-mile. FBO services are available.

Sherman Army Airfield (FLV) is located on Fort Leavenworth, but it is open to the public. This airport is not classified by the FAA, thus providing limited general aviation availability. The runway is 5,318 feet long and visibility minimums not lower than one mile are available. There are limited services available and no on-site FBO.

New Century Air Center (IXD) is located in south Johnson County, Kansas, and it is listed by FAA as a national reliever general aviation airport, the same classification as MKC. The longest runway is 7,339 feet long and Runway 36 has an instrument landing system (ILS) that has ½-mile visibility minimums. Full FBO services are available.

An examination of the FAA aircraft registration information for aircraft owners who base at MKC was also conducted to further define the airport service area. **Exhibit 2A** shows the zip code location of the 196 aircraft based at MKC. As can be seen, the registration address of aircraft owners who base at MKC are spread across the region. On the Kansas side, there are 59 owners whose aircraft are registered in Johnson County, four in Wyandotte, and two in Leavenworth. On the Missouri side, there are 40 registered aircraft owners in Clay County, 27 in Jackson County, and 16 in Platte County. There are no based aircraft owners who register their aircraft in any other immediately adjacent county; rather, the remaining aircraft are registered in more distant counties or out of state (likely corporate aircraft).

MKC serves the entire greater Kansas City area. It provides close and immediate access to downtown where numerous businesses that use private aviation are located. It also is attractive to local pilots in the region, as evidenced by the fact that all the general aviation hangars are currently full of tenants. For purposes of this study and forecasting effort to follow, the service area for MKC is defined by the following counties: Jackson, Clay, Cass, and Platte, in Missouri; and Johnson, Wyandotte, and Leavenworth in Kansas.

SOCIOECONOMIC FORECASTS

Socioeconomic conditions provide an important baseline for preparing aviation demand forecasts. Local socioeconomic variables, such as population and employment, are indicators for understanding the dynamics of the community and can relate to local trends in aviation activity. Analysis of the demographics of the airport service area will give a more comprehensive understanding of the socioeconomic situations influencing the region which supports MKC. The following is a summary of the demographic and socioeconomic data presented in Chapter One, as well as forecasts of those socioeconomic characteristics.

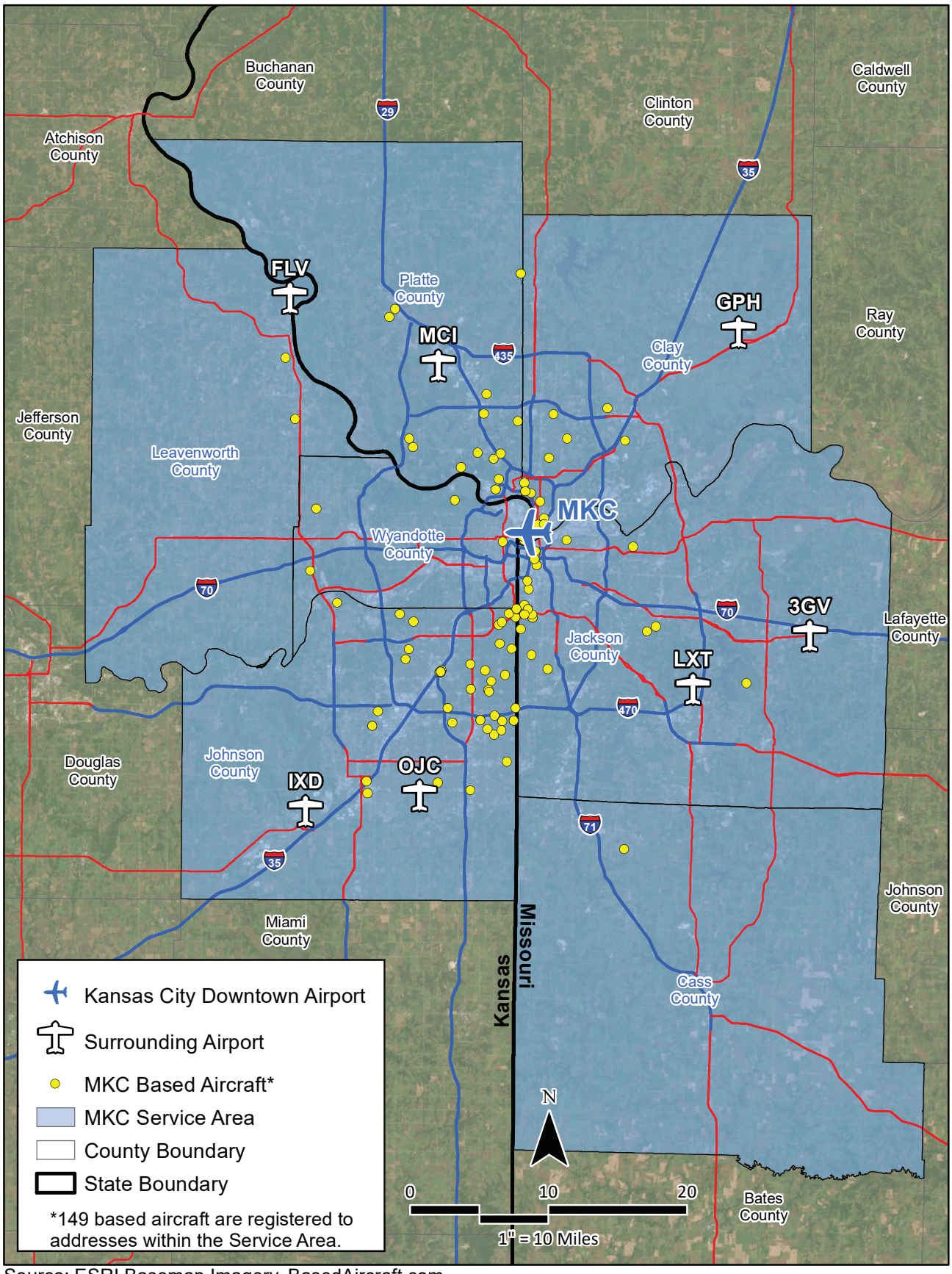
Table 2B summarizes historical and forecast population, employment, and income estimates for the seven-county airport service area.

TABLE 2B | Socioeconomic History and Forecasts for the Service Area

	HISTORY			FORECAST			
Socioeconomic Parameter	2013	2022	CAGR 2013-2022	2027	2032	2042	CAGR 2022-2042
Population	1,916,512	2,068,912	0.77%	2,145,474	2,218,033	2,346,964	0.63%
Employment	1,232,457	1,391,779	1.22%	1,494,285	1,578,194	1,730,517	1.10%
Income (PCPI)	$44,661	$49,066	0.95%	$52,839	$56,713	$64,795	1.40%

CAGR: Compound annual growth rate
PCPI: Per capita personal income ($2012)

Source: Woods & Poole - Complete Economic and Demographic Data Source (CEEDS) 2022



Source: ESRI Basemap Imagery, BasedAircraft.com.

NATIONAL AVIATION TRENDS AND FORECASTS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet the budget and planning needs of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition used in preparation of this study was FAA *Aerospace Forecasts – Fiscal Years 2023-2043*, published in March 2023. The FAA primarily uses the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets. The following discussion is summarized from the FAA Aerospace Forecasts.

FAA GENERAL AVIATION FORECASTS

The FAA forecasts the fleet mix and hours flown for single engine piston aircraft, multi-engine piston aircraft, turboprops, business jets, piston and turbine helicopters, light sport, experimental, and others (gliders and balloons). The FAA forecasts "active aircraft," not total aircraft. An active aircraft is one that is flown at least one hour during the year. As previously mentioned, from 2010 through 2013, the FAA undertook an effort to have all aircraft owners re-register their aircraft. This effort resulted in a 10.5 percent decrease in the number of active general aviation aircraft, mostly in the piston category.

The COVID-19 pandemic of 2020-2021 also had a significant impact on the aviation industry; however, the impact was less acute in the general aviation sector as more people began to see private aviation as a viable alternative to commercial airlines, which were severely impacted. In fact, some sectors of general aviation saw increases in activity, such as charters and fractional use aircraft.

The long-term outlook for general aviation is relatively stable, as growth at the high-end offsets continuing retirements at the traditional low end of the segment. The active general aviation fleet is forecast to grow between 2023 and 2043. While steady growth in both gross domestic product (GDP) and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet – fixed-wing piston aircraft – continues to decline over the forecast period. Against the growing fleet, the number of general aviation hours flown is projected to increase by an average of 0.91 percent per year during the same period, as growth in turbine, rotorcraft, and experimental hours more than offset a decline in fixed-wing piston hours. Following declining numbers of pilots from 2010-2016, growth in pilots has returned and is forecast to grow by 0.27 percent through 2043. **Table 2C** shows the primary general aviation demand indicators as forecast by the FAA.

Exhibit 2B presents the historical and FAA forecast of the U.S. active general aviation aircraft fleet and operations.

TABLE 2C | FAA National General Aviation Forecast

Demand Indicator	2022	2042	CAGR 2023-2043
Total General Aviation Fleet	**209,140**	**215,390**	**0.15%**
Total Fixed-Wing Piston	137,465	119,350	-0.70%
Total Fixed-Wing Turbine	26,145	38,980	2.02%
Total Helicopters	10,175	13,680	1.49%
Total Other (experimental, light sport, etc.)	35,335	43,380	1.03%
Total General Aviation Operations	**28,664,223**	**32,222,776**	**0.74%**
Local	14,029,412	16,562,635	0.83%
Itinerant	14,634,811	16,660,141	0.65%
Total General Aviation Hours Flown[1]	**26,299,170**	**30,527,780**	**0.75%**
Total Pistons	14,627,822	12,706,492	-0.70%
Total Turbine	10,002,179	15,426,555	2.19%
Total General Aviation Pilots[2]	**476,346**	**509,525**	**0.27%**

[1]Excludes Experimental, Light Sport, and Others (gliders, balloons, etc.)
[2]Excludes student pilots
CAGR: compound annual growth rate

Source: FAA Aerospace Forecast - Fiscal Years 2023-2043

UNMANNED AIRCRAFT SYSTEMS (UAS)

UAS are commonly referred to as drones, which have been experiencing healthy growth in the U.S. and around the world the past few years. According to the FAA *Aerospace Forecasts Fiscal Years 2022-2042*:

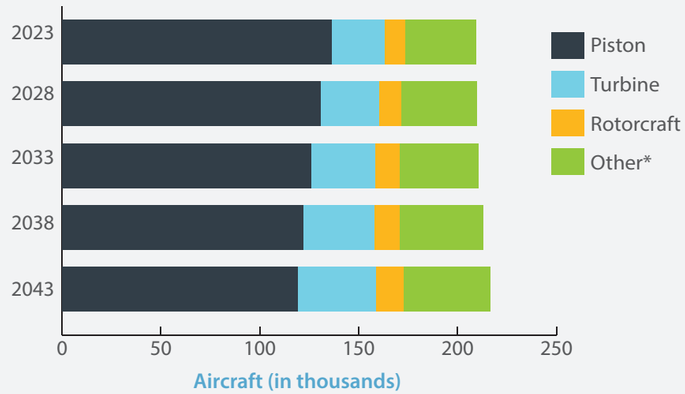
> "A drone consists of a remotely piloted aircraft and its associated elements – including the control station and the associated communication links – that are required for the safe and efficient operation in the national airspace system (NAS). The introduction of drones in the NAS has opened up numerous possibilities, especially from a commercial perspective. This has also brought challenges including drones' safe and secure integration into the NAS. Despite these challenges, the drone sector holds enormous promise; potential uses range from individuals flying solely for recreational purposes to large companies delivering commercial packages and delivering medical supplies. Public service uses, such as conducting search and rescue support missions following natural disasters, are proving promising as well."

On December 21, 2015, the FAA launched an online registration system for recreational/model small drones. This required all drones weighing more than 0.55 pounds (or 250 grams) and fewer than 55 pounds (or 25 kilograms) to be registered. The registration system captures the number of registered pilots but does not capture individual drone aircraft. Nevertheless, the registration information does provide a basic understanding of the growth in drone activity from which the FAA has made a growth forecast for the next five years.

Trends in Recreational/Model Aircraft

Through an examination of the drone aircraft registrations and renewals, the FAA estimated that there were as many as 1.68 million small drones in the national fleet. FAA developed three forecasts, which are presented in **Table 2D**. By 2026, FAA is forecasting as many as 1.89 million small drones.

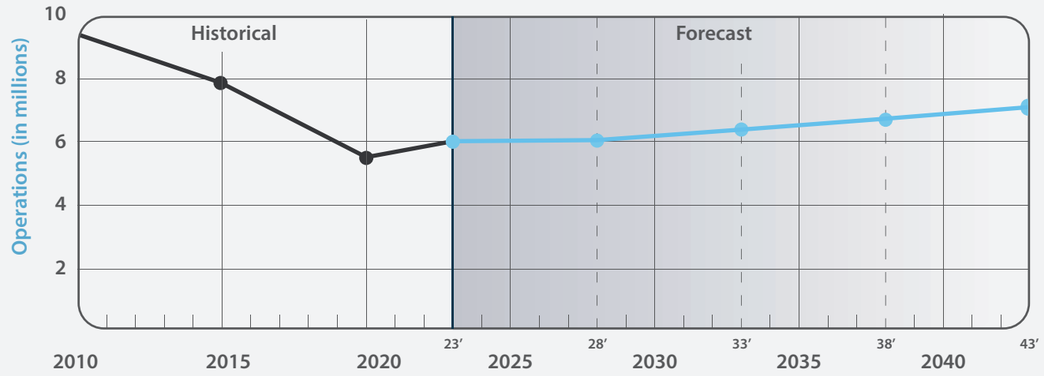
U.S. Active General Aviation Aircraft



*Other includes Experimental and LSA aircraft

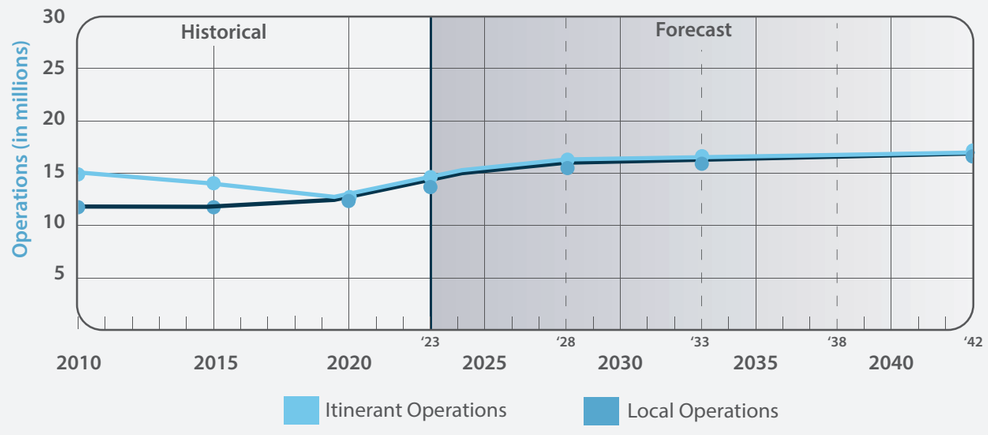


U.S. Air Taxi Operations





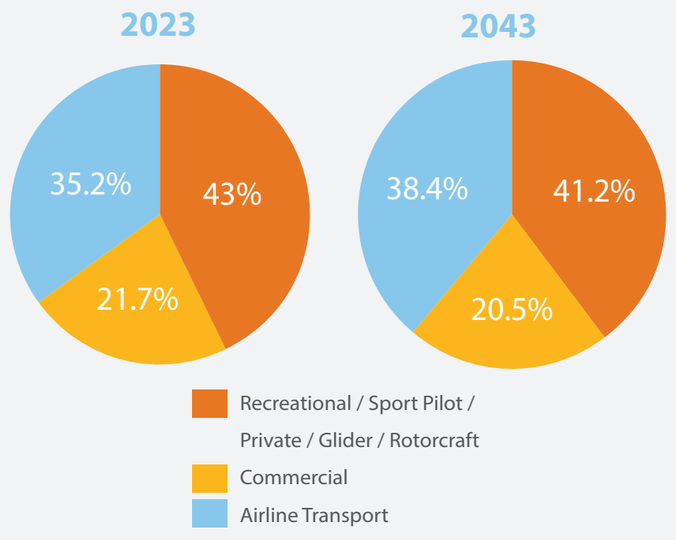
U.S. General Aviation Operations



Source: FAA Aerospace Forecasts FY2023-2043

Active Pilots By Certificate

Total Active Pilots: **482,025*** Total Active Pilots: **510,670**



*Excludes Student Pilot Certificates



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TABLE 2D | Total Recreational/Model Fleet

Fiscal Year	Low*	Base**	High**
2022	612,200	1,688,500	1,688,500
Forecast			
2023	620,500	1,750,200	1,762,200
2024	639,300	1,785,400	1,815,800
2025	654,800	1,803,500	1,852,000
2026	663,400	1,814,900	1,875,700
2027	668,500	1,823,400	1,891,800
CAGR	1.78%	1.55%	2.30%

CAGR: Compound annual growth rate
*Effective/Active fleet counts combined with multiplicity of aircraft ownership.
**New registration counts combined with multiplicity of aircraft ownership

Source: FAA Aerospace Forecasts FY 2023-2043

Trends in Commercial/Non-Model UAS Aircraft

Online registration for commercial/non-model small drones went into effect on April 1, 2016. These are commercial drones weighing less than 55 pounds. Unlike recreational/model ownership, each aircraft must be registered individually. Registrations of commercial/non-model UAS aircraft have been increasing year-after-year, according to the FAA. **Table 2E** shows the FAA forecast for this category of UAS. It is estimated that there were up to 727,000 commercial/non-model UAS in 2022, which is forecast to increase to as many as 1,015,000 by 2026.

TABLE 2E | Total Commercial/Non-Model Fleet

Fiscal Year	Low*	Base**	High**
2022	328,000	727,000	727,000
Forecast			
2023	349,000	805,000	807,000
2024	364,000	862,000	867,000
2025	373,000	904,000	915,000
2026	378,000	933,000	966,000
2027	382,000	955,000	1,015,000
CAGR	3.10%	5.61%	6.90%

CAGR: Compound annual growth rate
*Effective/Active fleet counts combined with multiplicity of aircraft ownership.
**New registration counts combined with multiplicity of aircraft ownership

Source: FAA Aerospace Forecasts FY 2023-2043

Advanced Air Mobility (AAM)

The AAM segment has some cross-over with the functions of drone. AAM is defined as "a safe and efficient system for air passenger and cargo transportation, inclusive of small package delivery and other urban drone services, which support a mix of onboard/ground-piloted and increasingly autonomous operations."

AAM technology presents considerable opportunities for economic growth over the coming decades. The FAA forecasts indicate that package delivery is likely to experience economic growth over the next

decade. Passenger service, on the other hand, promises larger markets for AAM services, but safety challenges, infrastructure, public acceptance, and evolving technology may slow full integration in the short term. Nevertheless, flight testing continues with numerous commercial companies conducting test flights. An example is the advancements that Joby Aviation has made with its Electric Vertical Takeoff and Landing Aircraft (eVTOL), which is expected to receive FAA certification in 2023 or 2024. Currently, this aircraft can fly over 150 miles on one battery charge and can carry four passengers.

One of the major challenges of eVTOL entering the marketplace is infrastructure. A system of vertiports for AAM services appears to be the preferred method of operation. Joby Aviation and Archer have partnered with parking garage operator REEF Technology with the goal of using parking garage rooftops as vertiports. Other options may include establishing vertiports at existing airports. For example, there could be an eVTOL air taxi service from MKC or MCI to area locations in the future. Future infrastructure planning for both airports should consider establishing vertiports to take advantage of the emerging AAM market.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth; however, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast. The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line/ time-series projections, correlation/regression analysis, and market share analysis. The forecast analyst may decide to employ one or all these methods to arrive at a reasonable single forecast. The following is a description of those methodologies utilized to develop the forecasts of aviation demand.

Trend Line/Time-Series Projections: Trend line/time-series projections are probably the simplest and most familiar of the forecasting techniques. By fitting growth curves to historical data, and then extending them into the future, a basic trend line projection is produced. An assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past. As broad as this assumption may be, the trend line projection does serve as a reliable benchmark for comparing other projections.

Ratio Projection: The ratio projection methodology examines the historical relationship between two variables as a ratio. A common example in aviation demand forecasting is to consider the number of based aircraft as a ratio of the service area population where there may be 1.8 aircraft per 1,000 people. This ratio can then be carried to future years in comparison to projections of population.

Market Share Analysis: Market share analysis involves a historical review of the airport activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined, providing an expected market share for the future. These shares are then multiplied by the forecasts for the larger geographical area to produce a market share projection. This method has

the same limitations as trend line projections but can provide a useful check on the validity of other forecasting techniques.

Regression Analysis: This methodology measures the statistical relationship between dependent and independent variables, yielding a "correlation coefficient". The correlation coefficient (Pearson's "r") measures the association between changes in a dependent variable and independent variable(s). The resulting r^2 value is between -1 and 1 and it is a measure of the linear correlation of the variables. If all the variable data points form a perfect increasing line, then the r^2 value would be 1. Generally, the predictive value of regression models is higher with a higher r^2 value, however, because of the consideration of all the data points, some of which may be somewhat spread out, ultimately the data analyst must interpret the data for reasonableness. Therefore, it is not uncommon for a regression forecast with a lower r^2 value compared to others, to be a better choice for predictive value. Note: **Appendix B** shows the detailed regression analysis reports for each demand indicator for which regression analysis was done.

Professional Judgement: Once one or more forecasting methodologies have been applied, the forecast analyst must select a single forecast for each aviation demand indicator (i.e., based aircraft, operations). The selected forecast can be one of the several developed or it can be a blended forecast. Any single forecast selected must be reasonable, logical, and defensible.

The FAA indicates that a 20-year forecast be developed for long-range airport planning. Facility and financial planning usually require at least a 10-year view because it often takes more than five years to complete a major facility development program. However, it is important to use forecasts that do not overestimate revenue-generating capabilities or understate demand for facilities required to meet public (user) needs.

A wide range of factors are known to influence the aviation industry and can have significant impacts on the extent and nature of aviation activity in both the local and national markets. Historically, the nature and trends of the national economy have had direct impacts on the level of aviation activity. Recessionary periods have been closely followed by declines in aviation activity. Nevertheless, over time, trends emerge and provide the basis for airport planning.

Future facility requirements, such as hangar and apron needs, are derived from projections of various aviation demand indicators. Using a broad spectrum of local, regional, and national socioeconomic and aviation information, and analyzing the most current aviation trends, forecasts are presented for the following aviation demand indicators:

- Passenger Enplanements
- Based Aircraft
- Based Aircraft Fleet Mix
- General Aviation Operations
- Air Taxi and Military Operations
- Operational Peaks

This forecasting effort was completed in March 2023, with a base year of 2022. The negative impacts of the COVID-19 pandemic appear to have largely passed and were not as impactful to certain general aviation airports, especially reliever type airports like MKC.

EXISTING FORECASTS

Consideration is given to any forecasts of aviation demand that have been completed in the recent past. These are typically sourced from the FAA TAF, previous airport planning studies, and state or regional aviation plans. Since the most recent completed master plan is from 2004, it is considered to be out of date and is not referenced in this study.

FAA *TERMINAL AREA FORECAST* (TAF 2022 – Published February 2023)

FAA publishes the TAF for each airport included in the NPIAS. The TAF is a generalized forecast of airport activity used by FAA primarily for internal planning purposes. It is available to airports and consultants to use as a point of comparison while developing local forecasts. The TAF was published in February 2023 and is based on the federal fiscal year (October-September).

Table 2F presents the 2022 TAF for MKC. The FAA TAF estimates that there are 176 based aircraft and 111,392 annual operations. The TAF forecast for based aircraft estimates a 0.03 percent annual growth rate with a 2042 based aircraft figure of only 177, the addition of one based aircraft over the next 20 years. Operations are projected to grow modestly at 0.34 percent annually, which has a 2042 estimate of 119,316 annual operations. Notably, the TAF local operations forecast is a flatline for the next 20 years, meaning it is a placeholder and not an actual forecast.

TABLE 2F | 2022 FAA *Terminal Area Forecast*

	2022	2027	2032	2042	CAGR
ENPLANEMENTS					
Air Carrier	4,682	5,021	5,390	6,211	**1.42%**
Commuter	67	67	67	67	**0.00%**
Total Enplanements	**4,749**	**5,088**	**5,457**	**6,278**	**1.41%**
ANNUAL OPERATIONS					
Itinerant					
Air Carrier	338	356	386	446	**1.40%**
Air Taxi & Commuter	21,613	22,710	23,862	26,346	**1.00%**
General Aviation	49,872	50,626	51,390	52,955	**0.30%**
Military	984	984	984	984	**0.00%**
Total Itinerant	**72,807**	**74,676**	**76,622**	**80,731**	**0.52%**
Local					
General Aviation	38,538	38,538	38,538	38,538	**0.00%**
Military	47	47	47	47	**0.00%**
Total Local	**38,585**	**38,585**	**38,585**	**38,585**	**0.00%**
Total Operations	**111,392**	**113,261**	**115,207**	**119,316**	**0.34%**
Based Aircraft	**176**	**177**	**177**	**177**	**0.03%**

CAGR: Compound annual growth rate

Source: FAA Terminal Area Forecast (February 2023)

AVIATION FORECASTS

To determine the types and sizes of facilities that should be planned to accommodate aviation activity, certain elements of this activity must be forecast. These indicators of aviation demand include based aircraft, aircraft fleet mix, operations, and peak periods.

The number of based aircraft is the most basic indicator of aviation demand for general aviation airports. By first developing a forecast of based aircraft for MKC, other demand indicators can be projected. The process of developing forecasts of based aircraft begins with an analysis of aircraft ownership in the primary service area through a review of historical aircraft registrations. An initial forecast of service area registered aircraft is developed and will be used as one data point to arrive at a based aircraft forecast for MKC.

Because of the numerous variables known to influence aviation demand, several separate forecasts are developed for each aviation demand indicator. Each of the forecasts is then examined for reasonableness and any outliers are discarded or given less weight. A single planning forecast is then selected for use in developing facility needs for the airport. The selected forecast can be one of the forecasts developed or, based on the experience and judgment of the forecaster, it can be a blend of the several forecasts.

ADDITIONAL FORECASTING FACTORS

Traditional aviation demand forecasting relies heavily on historical trends. The forecasts considered here will follow those traditional models as well. However, other factors should influence the forecasting analyst when making a selected forecast for each aviation demand indicator. For example, nearby airport closure, and/or national or global conditions may affect the forecasts.

In the Kansas City region, no airports are planned to be closed; however, there are significant development plans for MKC that should be considered when projecting future demand. As noted in Chapter One – Existing Conditions, the Taxiway L extension project was completed in 2024, which has immediate impact of opening the west development area for aeronautical development. This will make available approximately 21 acres of land for hangar development and it has been many years since the airport has had any developable land. Such a circumstance may be considered when projecting future demand, however a “build-it-and-they-may-come” scenario is not to be justification as a selected forecast.

The Kansas City Aviation Department (KCAD) has taken positive steps toward developing the west side of the airport. On May 23, 2023, the office of U.S. Congressman Emanuel Cleaver, submitted an appropriations request for $4.158 million for Pre-Development for the Westside Hangar Complex (MKC) through the subcommittee on Transportation, Housing and Urban Development (THUD). The project will include excavation and grading of the site, replacement of existing storm water infrastructure, and installation of a new utility corridor to the site.

In addition, national demand for private aviation services spiked during the COVID-19 pandemic (2020-2021). While commercial passenger service was significantly and negatively impacted, general aviation services, including charters and fractional aircraft ownership options, increased. To date, that demand has not subsided to a significant degree. Thus, it is necessary for the forecast analyst to recognize that general aviation operations have increased at MKC in recent years.

PASSENGER ENPLANEMENT FORECAST

MKC is a Class IV, Part 139 reliever airport. As noted in Chapter One – Existing Conditions, this class of airport can accept unscheduled large air carrier aircraft, which for MKC, are typically professional and collegiate sports team charters. The passengers departing on those flights are counted as enplanements by FAA, which is an important matrix for any airport because if an airport's enplanements exceed 10,000 in a year, then it becomes eligible for at least $1 million in entitlement funding from FAA to go toward capital improvements. Any other paying passengers, such as helicopter tours or private charters, operating under C.F.R. Part 135, are also counted as enplanements.

Table 2G shows the history of enplanements at MKC as sourced from airport records. The airport has not exceeded the 10,000-enplanement threshold over the last 20+ years; however, in the last few years, enplanements have increased noticeably. In 2022, there were over 5,000 enplanements, which is the highest over the last 20+ years.

TABLE 2G | Historical Passenger Enplanements

Year	Enplanements
2001	1,167
2002	481
2003	917
2004	863
2005	615
2006	2,390
2007	1,586
2008	2,850
2009	2,146
2010	1,169
2011	2,121
2012	2,261
2013	3,065
2014	2,422
2015	2,969
2016	2,907
2017	3,417
2018	3,611
2019	3,296
2020	2,236
2021	4,301
2022	5,055

Source: Airport records

The airport requires any charter aircraft with more than 30 passenger seats to request prior permission to operate at the airport so that ARFF services can be made available. In 2022, there were 320 such operations. The Boeing 737 accounted for 240 of those operations and the Boeing 757 accounted for 38. Other aircraft with over 30 seats have included the MD-81/83, A320/321, and several models of ERJs.

Most of these charter flights were to transport sports teams to and from Kansas City. Sporting Kansas City (MLS) and the Royals (MLB), use MKC. A number of visiting teams also use MKC. During basketball season, many collegiate visiting teams use MKC.

Since enplanements are accounted for primarily by charter activity, traditional methods of forecasting enplanements, such as comparing historical records with national FAA enplanements forecasts, are not a good fit at MKC. Instead, the forecast analyst needs to be aware of any planned changes to the charter activity and/or any plans to provide scheduled passenger service (of which there are no plans).

There is no indication that any of the sports teams that currently utilize MKC are planning to change their operating procedures. One new team, the Kansas City Current of the National Women's Soccer League, recently began operating charters out of MKC. Therefore, some growth in enplanements could be expected.

Time Series Regression Analysis

Two enplanement forecasts have been developed utilizing the historical enplanement data and the regression model. **Table 2H** shows the results. The first considered the timeframe from 2001-2022 and resulted in an "r^2" value of 0.74. While this is not a very strong "r^2" value, the results to appear reasonable with enplanements growing to 7,236 within the next 20-years and an annual growth rate of 1.81 percent.

The second time-series regression model considers the last 10 years of data from 2013-2022. This results in an "r^2" value of 0.39 and an annual growth rate of 2.06 percent. By 2042, this model results in 7,598 enplanements.

TABLE 2H | Time-Series Regression Enplanement Forecasts

	r^2	2022	2027	2032	2042	CAGR
Time-Series 2001-2022	0.74	5,055	4,836	5,636	7,236	1.81%
Time-Series 2013-2022	0.39	5,055	4,984	5,855	7,598	2.06%

CAGR: Compound annual growth rate.

Terminal Area Forecast (2022)

The FAA's TAF also presents an enplanement forecast for MKC which has an annual growth rate of 1.41 percent. The 2022 base year for the TAF shows a total of 4,749 enplanements and a 20-year level of 6,278. Since the 2022 base year of the TAF is lower than current levels, a second enplanement forecast that is based on the TAF annual growth rate was developed. For this forecast, the 2022 base year was adjusted to 5,055, which reflects the airport records, and then the TAF annual growth rate of 1.41 percent was applied. This forecast results in a total of 6,689 enplanements by 2042. **Table 2J** summarizes the TAF and the adjusted TAF forecasts.

TABLE 2J | FAA TAF Enplanement Forecasts

	2022	2027	2032	2042	CAGR
FAA TAF	4,749	5,088	5,457	6,278	1.41%
FAA TAF (Adjusted base year) - Selected	***5,055***	***5,422***	***5,815***	***6,689***	***1.41%***

CAGR: Compound annual growth rate.

Source: TAF 2022 (published Feb. 2023)

Consideration of an enplanement forecast that uses the TAF as a benchmark comes with challenges because of the nature of the enplanements at MKC being derived entirely from charter operations. The TAF was developed primarily considering enplanements sourced from regularly scheduled commercial airliners. However, for MKC, the TAF does reflect growth, which has occurred historically. The following is the actual compound annual growth rates in enplanements at MKC over the last five, 10-, and 20-year timeframes:

- Five Year 2018-2022: 6.96%
- 10-Year 2013-2022: 5.13%
- 20-Year 2003-2022: 8.91%

While it is feasible that enplanements at MKC could continue to increase as they have in the past, it is also feasible that the growth will level out because there may be a point in which event charter activity is maximized. Therefore, the modest growth rate of the TAF for enplanements appears reasonable, and in fact, may be a bit conservative.

Enplanement Forecast Summary

Forecasting enplanements for an airport like MKC that does not have scheduled commercial passenger service is inherently challenging. All enplanements at the airport are derived from charter operations, fractional ownership operations, and other "on-demand" private operations. There is no indication of significant changes to the current level of activity by this sector of aviation at the airport (i.e., no new sports teams, no increase of usage by existing operators, etc.).

Two time-series regressions were run based on historical enplanement data. The first considered yearly data from 2001-2022. The "r^2" values for both were lower than ideal but the results were reasonable considering historical trends. One potential concern is that both time-series regressions have a five-year forecast that is slightly lower than the total number of enplanements in 2022.

Two other forecasts were considered, the 2022 TAF and the 2022 TAF growth rate with an adjusted base year. All of these forecasts form a fairly tight planning envelope. Now a single forecast must be identified for planning purposes. The 2022 airport TAF represents the low end of the planning envelope which may be attributable to the fact its 2022 base year is lower than the actual enplanement figure. The selected enplanement forecast the TAF growth rate as applied to the actual base year figure of 5,055. In the long term, this forecast results in 6,689 enplanements with an annual growth rate of 1.41. percent.

Exhibit 2C shows a graph of the forecasts for enplanements.

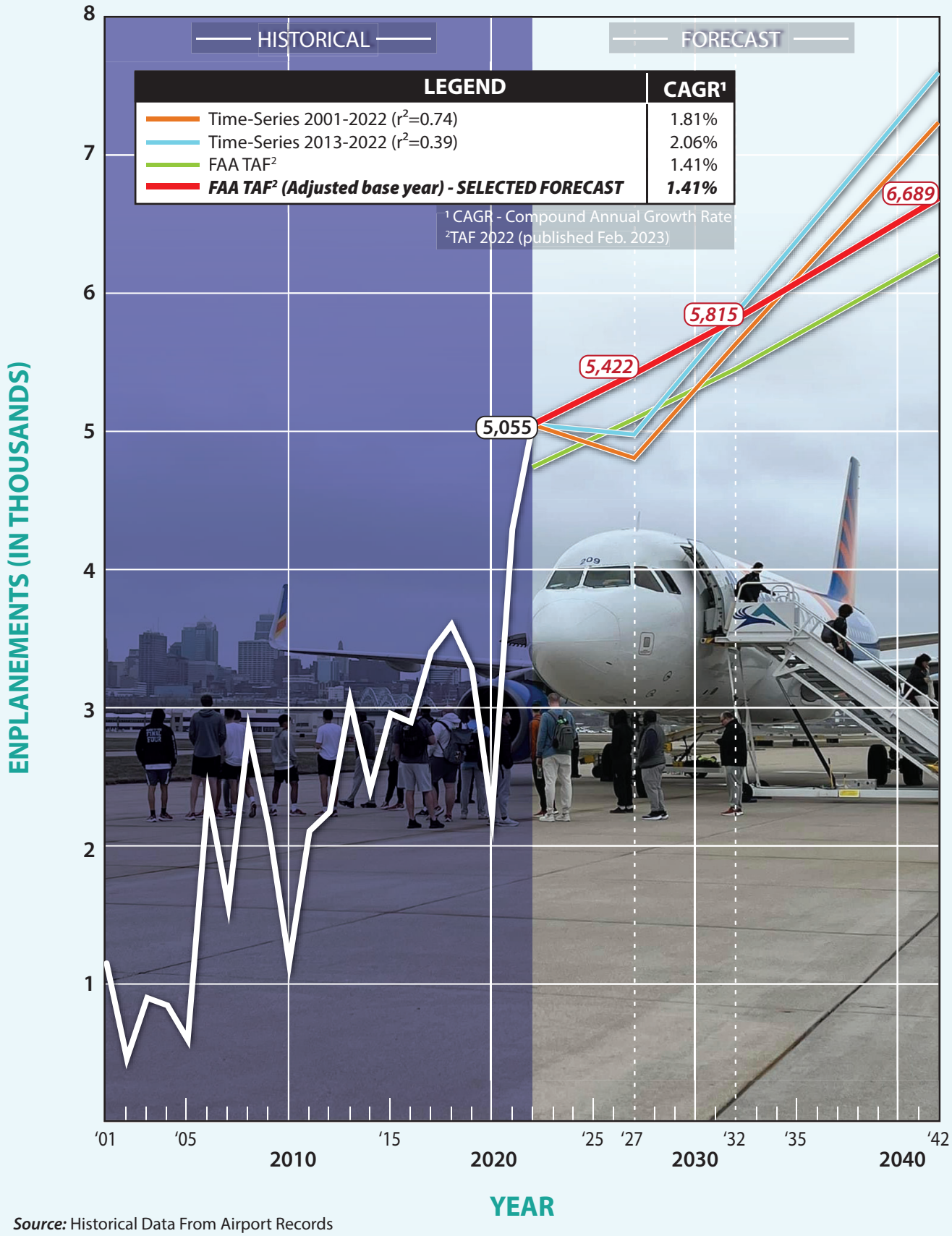
BASED AIRCRAFT FORECAST

Forecasts of based aircraft may directly influence needed facilities and applicable design standards. The needed facilities may include hangars, aprons, taxilanes, etc. Applicable design standards may include separation distances and object clearing surfaces. The size and type of based aircraft are also an important consideration. The addition of numerous small aircraft may have no effect on design standards, while the addition of a few larger business jets can have a substantial impact on design standards.

Based Aircraft Inventory

The FAA has established the National Based Aircraft Inventory Program through which sponsors (owners) of airports are to maintain a based aircraft inventory. This database makes it possible to cross-reference based aircraft claimed by one airport with other airports. This database evolves daily as aircraft are added or removed. It is the responsibility of the sponsor to input the based aircraft information through a dedicated website (www.basedaircraft.com). **Table 2K** summarizes the based aircraft at MKC since 2014.

The basedaircraft.com database has a front-facing summary page available to the public. This front facing page lists each airport in the database and has data columns for Validated Based Aircraft, 5010 Based Aircraft Count, Last Edit Date, and Date Confirmed. The back facing page, which is accessible and editable by the airport sponsor via a password, contains the above data points as well as several



Source: Historical Data From Airport Records

additional data columns. It also contains a based aircraft history and a list of all the aircraft (including N-numbers) claimed by the airport. It is the Validated Based Aircraft column that FAA expects to be used as the base year for any forecasting effort; in some cases, however, the front facing and back facing Validated Based Aircraft counts are not the same. Such is the case for MKC, where the front facing Validated Based Aircraft count as of August 2023 was 196 and the back facing count was 187.

The trend at the airport since 2014 has been generally declining from a high of 231 in 2015 to a low of 160 in 2021. At the beginning of 2023, there were 161 validated based aircraft in the FAA database. Over the course of the next several months, coinciding with this master plan effort, airport management has been updating the database. As of August 15, 2023, there was a total of 196 validated based aircraft. For this forecasting effort, 196 will be used as the base year.

TABLE 2K | Based Aircraft Inventory

Year	Single Engine Piston	Multi-Engine	Jets	Helicopter	Total
1/1/2014	109	55	50	6	220
1/1/2015	112	62	51	6	231
1/1/2016	110	61	46	5	222
1/1/2017	105	59	45	5	214
1/1/2018	83	37	58	8	186
1/1/2019	78	22	59	7	166
1/1/2020	77	21	66	5	169
1/1/2021	72	20	63	5	160
1/1/2022	72	19	68	11	170
1/1/2023	70	18	61	12	161
7/15/2023	82	21	82	11	196

Source: www.basedaircraft.com

Based on interviews with airport staff, there are two primary reasons that the airport had a significant increase in based aircraft reported to the National Based Aircraft Inventory database. First, a new flight school with 10 new based aircraft entered the market in 2021. Second, with the initiation of this master plan, airport staff updated the database. It can be concluded that previous year figures may not be fully formed due to limited administrative counts and/or updates to the registry.

Based Aircraft Regression Analysis

Utilization of a mathematical statistical forecasting methodology, such as regression analysis, can be a powerful tool for predicting future based aircraft levels. However, such models are only as reliable as the data inputs. Single and multi-variable regressions were run for based aircraft. The data inputs are detailed in **Table 2L**.

TABLE 2L | Regression Analysis Variables

Dependent Variable	Independent Variable[2]			
Y1-Based Aircraft[1]	X1-Year	X2-Population	X3-Employment	X4-Income
220	2014	1,934,700	1,257,064	44,600
231	2015	1,953,771	1,285,229	46,048
222	2016	1,977,133	1,309,666	45,186
214	2017	1,999,016	1,327,819	45,557
186	2018	2,018,958	1,348,257	45,909
166	2019	2,034,377	1,353,414	46,655
169	2020	2,047,658	1,299,246	48,057
160	2021	2,053,036	1,360,932	48,330
170	2022	2,068,912	1,391,779	49,066
196	2023	2,084,401	1,422,624	49,804
	Projected Independent Variables			
See TABLE 2M for results and r^2 values	2027	2,145,474	1,494,285	52,839
	2032	2,218,033	1,578,194	56,713
	2042	2,346,964	1,730,517	64,795

[1]FAA National Based Aircraft Inventory database.
[2]Woods & Poole - Complete Economic and Demographic Data Source (CEDDS) 2022

The National Based Aircraft Inventory database (www.basedaircraft.com) has 10 years of data. Ideally, 20 or more years would be available when running regression analysis. The trend line for MKC has large swings from year to year, which naturally leads to lower "r^2" values when running regression analysis. **Table 2M** shows the results of the based aircraft regressions. The top regressions, return an "r^2" value of 0.80. The results of the top regressions project that based aircraft at MKC would decline by 20 in the first five years and by 40 over the next 20 years. This seems implausible for MKC as the declining trend in based aircraft has reversed course over the last two years. For the following reasons, none of the regressions for based aircraft are considered further in this study:

1. There are 112 aircraft owners on the hangar waitlist, indicating the potential for more based aircraft if hangars were available;
2. There is indication from airport staff that the updates to the based aircraft database were irregular, and that the historical data is not reflective of the actual numbers of based aircraft;
3. There is strong interest among developers to build new hangars in the west development area adjacent Taxiway L. This land is the first new land available for development in the last 15 years at MKC.

TABLE 2M | Based Aircraft Regression Analysis

		FORECAST BASED AIRCRAFT		
Variables (2014-2023)	r^2	2027	2032	2042
Year/Employment/Income	0.80	177	170	156
Year/Population/Employment/Income	0.80	176	169	156
Population/Employment/Income	0.78	169	156	144
Year/Population/Employment	0.75	159	140	113
Population/Employment	0.74	155	132	91
Year/Population/Income	0.67	150	129	102
Population/Income	0.67	151	130	102
Year/Population	0.67	148	124	94
Year/Employment	0.66	147	117	52
Population	0.63	139	108	53
Year/Income	0.64	151	131	95
Year - Time Series	0.58	136	103	36
Income	0.42	136	98	20
Employment/Income	0.42	135	97	20
Employment	0.29	148	124	80

Source: Coffman Associates analysis

Constant Ratio of Based Aircraft to Population Forecast

Trends comparing the number of based aircraft with the airport's service area population were analyzed. Over the last 10 years, there has been an average of 0.962 based aircraft per 1,000 people in the airport service area. Typically, this ratio declines over time, however it has increased each of the last two years for MKC. Therefore, a forecast has been developed that takes the average ratio over the last ten years and maintains that as a constant through the 20-year planning horizon. This forecast results in 226 based aircraft by 2042, which is an annual growth rate of 0.75 percent as detailed in **Table 2N**.

TABLE 2N | Based Aircraft Forecast as an Average Constant Share of Population

Year	Service Area Population	Based Aircraft per 1,000 Population	Based Aircraft at MKC
2014	1,934,700	0.1137	220
2015	1,953,771	0.1182	231
2016	1,977,133	0.1123	222
2017	1,999,016	0.1071	214
2018	2,018,958	0.0921	186
2019	2,034,377	0.0816	166
2020	2,047,658	0.0825	169
2021	2,053,036	0.0779	160
2022	2,068,912	0.0822	170
2023	2,084,401	0.0940	196
Constant Average Based Aircraft Per 1,000 Population			
2027	2,145,474	0.0962	206
2032	2,218,033	0.0962	213
2042	2,346,964	0.0962	226
		CAGR	**0.75%**

CAGR = Compound annual growth rate

Source: Coffman Associates analysis

Constant Ratio of Based Aircraft to Employment Forecast

A forecast is developed that considers the ratio of based aircraft at MKC with forecast growth in employment. Employment growth tends to typically align more closely with aviation demand than does population. Over the last ten years, there have been 0.1454 based aircraft per 1,000 people employed in the service area. Over the last two years this ratio has been increasing. For this forecast we apply the 10-year average of 0.1454 based aircraft per 1,000 employed to the plan years to arrive at a forecast. It is reasonable to use the average rather than a declining trend because airport staff have indicated that actual based aircraft were higher than what was reflected in the FAA database and that they are been working to correct the based aircraft database, this the most recent years are more reflecting of what is happening at the airport. This forecast results in 252 based aircraft at MKC by 2042, which is an annual growth rate of 2.09 percent. **Table 2P** outlines the details for this forecast of based aircraft.

TABLE 2P | Based Aircraft Forecast as an Average Constant Share of Employment

Year	Service Area Employment	Based Aircraft per 1,000 Employed	Based Aircraft at MKC
2014	1,257,064	0.1750	220
2015	1,285,229	0.1797	231
2016	1,309,666	0.1695	222
2017	1,327,819	0.1612	214
2018	1,348,257	0.1380	186
2019	1,353,414	0.1227	166
2020	1,299,246	0.1301	169
2021	1,360,932	0.1176	160
2022	1,391,779	0.1221	170
2023	1,422,624	0.1378	196
Constant Average Based Aircraft Per 1,000 Employment			
2027	1,494,285	0.1454	217
2032	1,578,194	0.1454	229
2042	1,730,517	0.1454	252
		CAGR	**2.09%**

CAGR = Compound annual growth rate

Source: Coffman Associates analysis

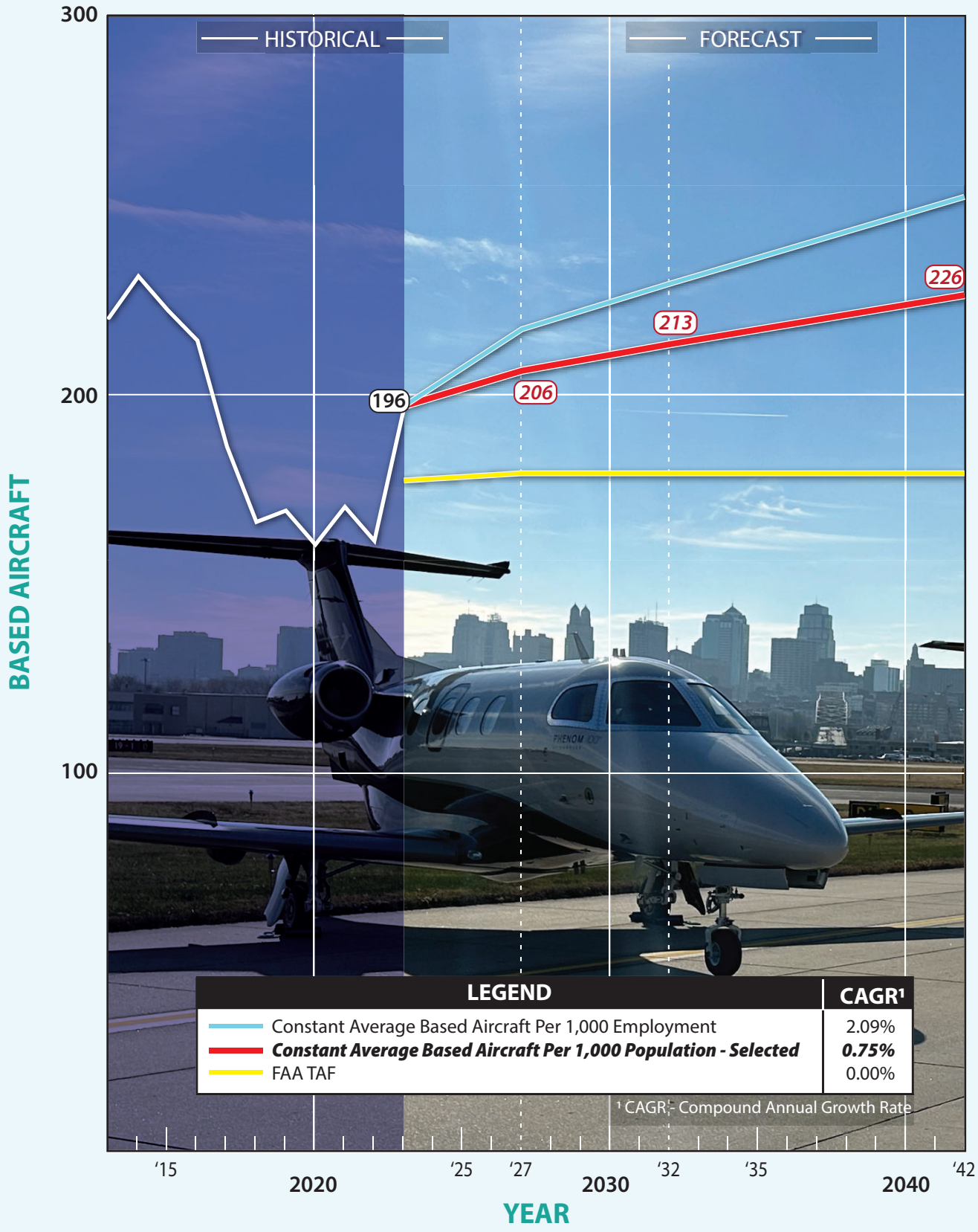
Based Aircraft Forecast Summary

The based aircraft forecasts are graphically summarized on **Exhibit 2D**. The next step is for the forecast analyst to choose a selected forecast to be used to determine future facility needs.

The current TAF projection for MKC has a 2022 based aircraft base line of 176 and a projection over the next 20-years of 177 for each year. In short, the TAF projects zero growth in based aircraft for the foreseeable future at MKC. The FAAs National Based Aircraft Inventory database now shows that there were 196 validated based aircraft as of August 2023. Since the TAF does not reflect the current based aircraft status or provide a reasonable projection in light of strong recent growth (other than a flat line), it is not believed that the TAF projection is reasonable as the selected based aircraft forecast.

Regression analysis was examined to determine if there is a reliable statistical relationship between historical validated based aircraft (dependent variable) and several aviation demand indicators (independent variables of population, employment, income, and time). All of the regressions returned an "r^2" value below the threshold for statistically reliability. While based aircraft at MKC have increased over the last two years, all of the regressions resulted in significant declines in based aircraft. Therefore, none of the regressions were considered further.

Two additional forecasts, which are a function of population and employment in the service area, were developed. These are market share forecasts that more heavily weigh the recent trends where the ratio of based aircraft to both population and employment has increased year-over-year for three years in a row. It is more typical for this ratio to decline over time, as it had from 2014 to 2021. To balance the past history with the most recent three-year trend, the average ratio of based aircraft to both population and employment was applied as a constant ratio to the future plan years.



Source: Historical Data From FAA's National Based Aircraft Inventory Program (basedaircraft.com)

Of these two forecasts, it is the judgement of the forecast analyst, that the ratio of based aircraft to population is the most reasonable forecast. This forecast considers the addition of 30 based aircraft over the next 20 years. The employment ratio forecast appears to be too aggressive with the addition of 56 based aircraft. The population ratio forecast does not specifically consider the potential influx of new based aircraft that may result from the development of the land west of Taxiway L, but it would account for a portion of those if the development does occur as planned. In many cases, considering the potential for future development as a means to justify a based aircraft forecast is not ideal. The "If you build it, they will come" approach is not generally acceptable due to building uncertainty; however, at MKC it is reasonable to consider the fact that strong regional demand for hangar space at MKC exists today and will follow once the new development area is engaged. There has been little development opportunity at MCK due to land constraints, but that has changed with the removal of the VOR and taxiway modifications currently occurring. KCAD indicates that the acreage available is highly desirable as they have had numerous inquiries about building hangars on the soon to be available land. In addition, the airport has 112 aircraft owners on their hangar wait list as of November 2023. The based aircraft forecast to be utilized for planning purposes is:

- 2022 – 196 Based Aircraft
- 2027 – 206 Based Aircraft
- 2032 – 213 Based Aircraft
- 2042 – 226 Based Aircraft

BASED AIRCRAFT FLEET MIX

The fleet mix of based aircraft is oftentimes more important to airport planning and design than the total number of aircraft. For example, the presence of one, or a few, business jets can impact the design standards more than many smaller, single engine piston-powered aircraft.

Knowing the aircraft fleet mix expected to utilize MKC is necessary to properly plan for facilities that will best serve the level of activity and the type of activities occurring at the airport. The existing fleet mix of aircraft based at the airport is comprised of 82 single engine piston aircraft, 12 multi-engine piston aircraft, nine turboprops, 82 jets, and 11 helicopters, for a total of 196 based aircraft.

The history of the based aircraft fleet mix was previously presented in **Table 2K**. It showed that over the last 10-years, piston engine aircraft (single and multi-engine) have declined substantially in numbers from a combined 164 in 2014 to 103 in 2023. Jets and turboprops have conversely increased substantially from a combined 50 in 2014 to 82 in 2023.

The national trends in active general aviation aircraft by engine type was previously presented in **Table 2C** and on **Exhibit 2B**. Those national forecasts project that fixed wing piston aircraft will decline by 0.70 percent annually through 2043, while turbine engine aircraft will increase by 2.02 percent annually through 2043.

MKC is a national general aviation reliever airport. Its historical based aircraft fleet mix has tracked generally with national trends in that piston aircraft have declined and turbine aircraft have increased. In fact, the decline in the number of piston aircraft has been more aggressive (-2.30% annually) from 2014 to 2023, and the increase in turbine aircraft at MKC has been more aggressive (2.50% annually) than the national averages.

Table 2Q summarizes the future based aircraft fleet mix for MKC. This forecast takes into consideration the 10-years of based aircraft history and the FAAs national forecast. Turbine engine aircraft are projected to continue to increase as a percentage of the whole while piston engine aircraft are projected to decline.

TABLE 2Q | Based Aircraft Fleet Mix

	HISTORY				FORECAST					
Aircraft Type	2014	%	2023	%	2027	%	2032	%	2042	%
Single Engine Piston	109	49.5%	82	41.8%	83	40.3%	85	39.9%	88	38.9%
Multi-Engine Piston	55	25.0%	12	6.1%	12	5.8%	11	5.2%	10	4.4%
Turboprop	6	2.7%	9	4.6%	11	5.3%	13	6.1%	15	6.6%
Jet	44	20.0%	82	41.8%	87	42.2%	90	42.3%	96	42.5%
Helicopter	6	2.7%	11	5.6%	13	6.3%	14	6.6%	17	7.5%
Totals	**220**	**100.0%**	**196**	**100.0%**	**206**	**100.0%**	**213**	**100.0%**	**226**	**100.0%**

Source: Airport Records; Coffman Associates Analysis

GENERAL AVIATION ANNUAL OPERATIONS

General aviation operations are classified as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of the airport, or which executes simulated approaches or touch-and-go operations at the airport. Generally, local operations are characterized by training operations. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Typically, itinerant operations increase with business and commercial use, since business aircraft are not typically used for large scale training activities. Local operations include a portion of general aviation and military operations, while itinerant operations include general aviation, military, and air taxi (for-hire operators, such as air cargo, life flight, charters, and fractional users).

Each operational segment is forecast individually, then the segments are combined to arrive at a total operations forecast. **Table 2R** shows total historical operations since 2000. As can be seen, 2022 was the highest operational level since 2003. According to airport staff, the reason for the significant increase in operations in 2021 and 2022 was assumed to be the increase in general aviation usage since the COVID-19 pandemic. These recent operational trends appear to be continuing into 2023. As of the end of July 2023, operations are 6.57 percent higher than from January through July of 2022.

TABLE 2R | Historical Operations

	ITINERANT OPERATIONS					LOCAL OPERATIONS			
Year	Air Carrier	Air Taxi	GA	Mil	Total	GA	Mil	Total	Total
2000	115	13,872	76,432	724	91,143	37,158	265	37,423	128,566
2001	242	17,105	65,618	1,008	83,973	33,200	279	33,479	117,452
2002	82	20,166	66,294	937	87,479	36,785	196	36,981	124,460
2003	34	19,213	61,063	731	81,041	36,371	99	36,470	117,511
2004	102	20,092	56,543	942	77,679	29,931	104	30,035	107,714
2005	16	15,204	55,719	464	71,403	26,986	209	27,195	98,598
2006	24	14,850	44,482	540	59,896	22,202	118	22,320	82,216
2007	99	16,903	49,884	921	67,807	24,916	213	25,129	92,936
2008	134	14,449	42,031	947	57,561	15,976	366	16,342	73,903
2009	159	14,288	38,273	1,007	53,727	17,755	581	18,336	72,063
2010	87	15,851	37,345	921	54,204	16,951	480	17,431	71,635
2011	169	17,801	36,002	1,168	55,140	13,539	399	13,938	69,078
2012	187	15,656	41,321	1,099	58,263	16,108	307	16,415	74,678
2013	176	14,233	39,824	685	54,918	12,984	121	13,105	68,023
2014	203	15,239	39,691	913	56,046	13,221	343	13,564	69,610
2015	189	14,685	39,435	1,068	55,377	15,322	400	15,722	71,099
2016	194	13,433	42,091	1,002	56,720	13,616	267	13,883	70,603
2017	232	15,163	43,335	919	59,649	14,260	86	14,346	73,995
2018	173	15,747	39,981	950	56,851	14,565	179	14,744	71,595
2019	214	16,305	45,515	935	62,969	16,293	262	16,555	79,524
2020	176	15,075	38,525	763	54,539	18,803	137	18,940	73,479
2021	322	19,899	44,210	892	65,323	31,385	108	31,493	96,816
2022	321	21,592	50,661	930	73,504	40,549	41	40,590	114,094

Source: OPSNET - FAA operations count from the MKC control tower

Year-To-Date Operations

This forecasting effort was undertaken in September/October of 2023. Since 2022 is the last full calendar year of data available, 2022 is the base year of the forecasts. However, airport operations data is available for January through August 2023 from the ATCT. This data was examined to see if the recent trends of exceptional optional growth has continued into 2023. The concern being that now that the COVID pandemic has subsided, have general aviation operations slow or reverse trend.

Table 2S summarizes operations data at MKC for the January through August timeframe for 2021, 2022, and 2023. Operations are continuing their upward trend, but it should be noted that air taxi operations are growing at a much higher pace than other categories of operations. Local general aviation operations have declined a bit since 2022 but are still well above the 2021 level. This information is provided to inform the reader and the forecast analyst of the most recent operational data available and the current trends.

TABLE 2S | 2023 Year-To-Date Operations Comparison

	ITINERANT OPERATIONS					LOCAL OPERATIONS			
Timeframe	Air Carrier	Air Taxi	GA	Military	Subtotal	GA	Military	Subtotal	Total Operations Jan-July
Jan-August 2021	230	12,245	27,964	598	41,037	19,809	80	19,889	60,926
Jan-August 2022	250	13,795	32,719	661	47,425	25,257	28	25,285	72,710
Jan-August 2023	251	20,271	31,895	563	52,980	23,251	91	23,342	76,322

Source: OPSNET FAA operations database accessed on October 3, 2023.

Itinerant General Aviation Operations Forecast

Itinerant general aviation operations are by those operators that are arriving or departing to or from other locations. Itinerant operations do not include training activities or other operations within the traffic pattern airspace.

As can be seen in **Table 2R**, itinerant general aviation operations have fluctuated between the high 70,000's and the mid 30,000's. Since the mid-2000's, itinerant operations have been in the lower portion of this range, however, 2021 and 2022 realized noticeable growth. In 2020 there were 38,525 itinerant general aviation operations and in 2022 there were 50,661. An increase of 31.5 percent in just two years. Much of this increase may be attributable to the impact the COVID-19 pandemic had on general aviation operations nationally, which was a growth area.

Itinerant General Aviation Operations Regression Forecasts

Two simple trend-line regression models were run to examine the statistical reliability of extending the trend to the forecast years. The first considered MKC itinerant general aviation operations from 2003-2022. This resulted in a steep decline to a point well below historical levels and an r^2 value of only 0.20. This result is not surprising because of the "U" shape curve of historical itinerant general aviation operations. Regression analysis is generally more reliable when there is a clear trend in the historical data.

A second trend-line was run using the last ten years of data from 2013-2022. This appears to be a more reliable trend for this range, however the notable increase in the last two years will influence the statistical reliability for this regression. Nonetheless, this regression results in a moderate increase over time and an annual growth rate of 1.00 percent. The r^2 value is still low at only 0.42, however this may be attributable to the increase over the last two years. **Table 2T** shows these two trendline regressions.

TABLE 2T | GA Itinerant Operations Regressions

	r^2	2022	2027	2032	2042	CAGR
Trend Line 2003-2022	0.20	50,661	36,641	34,001	28,721	-2.80%
Trend Line 2013-2022	0.42	50,661	49,900	53,886	61,858	1.00%
CAGR - Compound annual growth rate						

Source: Trend-line regression analysis by Coffman Associates

In addition to the time-series regressions, additional independent variables were examined. Those variables are the FAA forecast for national itinerant general aviation operations, the service area population and employment levels. **Table 2U** summarizes the historical data used in the additional regressions.

TABLE 2U | Regression Analysis Variables

Dependent Variable	Independent Variables			
Y1-MKC GA Itinerant Operations[1]	X1-Year	X2 - US GA Itinerant Operations[2]	X3-Population[3]	X4-Employment[3]
39,824	2013	14,117,370	1,916,512	1,232,457
39,691	2014	13,978,993	1,934,700	1,257,064
39,435	2015	13,887,203	1,953,771	1,285,229
42,091	2016	13,905,204	1,977,133	1,309,666
43,335	2017	13,839,151	1,999,016	1,327,819
39,981	2018	14,130,495	2,018,958	1,348,257
45,515	2019	14,244,787	2,034,377	1,353,414
38,525	2020	12,608,003	2,047,658	1,299,246
44,210	2021	13,774,861	2,053,036	1,360,932
50,661	2022	14,634,811	2,068,912	1,391,779
	Projected Independent Variables			
See TABLE 2V for Results and r^2 Values	2027	16,026,989	2,145,474	1,494,285
	2032	16,232,627	2,218,033	1,578,194
	2042	16,660,141	2,346,964	1,730,517

[1]FAA OPSNET database sourced from MKC ATCT.
[2]FAA Aerospace Forecast - fiscal Years 2023-2043
[3]Woods & Poole - Complete Economic and Demographic Data Source (CEDDS) 2022

Table 2V shows the results of both single and multivariable regressions utilizing the data in **Table 2U**. They are organized from highest r^2 value to lowest. As is common with regression analysis, the more variables that are included, the smoother the line becomes and often the higher resulting r^2 value. However, higher r^2 values do not necessarily correlate to a better statistical reliability. Where possible, it is preferrable to consider single variable regressions because there is less smoothing of the results, even if the r^2 values are higher. Ultimately, it falls to the analyst to assess the results and make a determination as to reasonableness. The best single variable regression utilizes employment figures as the independent variable.

TABLE 2V | MKC GA Itinerant Operations Regression Analysis

		FORECAST MKC GA ITINERANT OPERATIONS			
Variables (2013-2022)	r^2	2027	2032	2042	CAGR
Year/US GA Itin Ops/Pop.	0.85	60,925	66,907	79,897	2.30%
Year/US GA Itin Ops/Pop./Emp.	0.85	60,920	66,911	79,924	2.31%
Year/US GA Itin Ops/Emp.	0.84	60,865	66,009	76,684	2.09%
Year/Us GA Itin Ops	0.83	60,200	65,400	75,875	2.04%
US GA Itin Ops/Pop.	0.81	59,282	63,691	71,820	1.76%
US GA Itin Ops/Pop./Emp.	0.81	60,000	64,039	71,486	1.74%
Year/Pop./Emp.	0.77	57,793	65,902	84,264	2.58%
US GA Itin Ops/Emp.	0.75	57,293	62,037	70,808	1.69%
Population/Employment	0.64	53,475	58,615	68,032	1.49%
Year/Employment	0.61	52,742	57,549	66,077	1.34%
Employment	0.60	52,721	57,630	66,540	1.37%
Year/Population	0.49	52,580	58,493	72,527	1.81%
Year - Time Series	0.42	49,900	53,886	61,858	1.00%
Population	0.37	48,512	51,605	57,102	0.60%
US GA Itin Operations	0.36	51,450	52,337	54,182	0.34%
CAGR: compound annual growth rate					

Source: Coffman Associates analysis

Market Share of U.S. Itinerant General Aviation Operations Forecasts

Over the last ten years, itinerant general aviation operations at MKC, as a share of national operations, have increased from 0.2821 percent to 0.3462 percent. By applying the percent change increase to the plan years an increasing market share forecast emerges. This forecast results in 60,615 itinerant general aviation operations in the next five years and 79,022 within 20-years. This forecast is shown in **Table 2W**.

The table also serves as a point of comparison for the employment regression forecast, the airport TAF and the airport TAF growth rate when applied to the 2022 base year itinerant operations figure. The comparison allows the forecast analyst to examine if the market share percentage is reasonable as compared to the historical data. The TAF and the TAF growth rate forecasts both appear to be low compared to the recent trend. The increasing markets share forecast may be reasonable but certainly it would represent a high range forecast. In fact, the airport has not reached 79,000 itinerant general aviation operations within the last 20+ years. The employment regression forecast may be a little low in the first five years compared to recent growth the last two years, but then the 10 year and 20-year forecasts appear to be reasonable. For these reasons it is the opinion of the forecast analyst that the employment regression is the selected forecast for planning purposes.

TABLE 2W | General Aviation Itinerant Operations Forecast

Year	MKC GA Itinerant Operations[1]	US GA Itinerant Operations[2]	Market Share US GA Itinerant Operations
2013	39,824	14,117,370	0.2821%
2014	39,691	13,978,993	0.2839%
2015	39,435	13,887,203	0.2840%
2016	42,091	13,905,204	0.3027%
2017	43,335	13,839,151	0.3131%
2018	39,981	14,130,495	0.2829%
2019	45,515	14,244,787	0.3195%
2020	38,525	12,608,003	0.3056%
2021	44,210	13,774,861	0.3209%
2022	50,661	14,634,811	0.3462%
FAA Airport TAF (CAGR = 0.30%)			
2027	50,626	16,026,989	0.3159%
2032	51,390	16,232,627	0.3166%
2042	52,955	16,660,141	0.3179%
FAA Airport TAF Growth Rate (CAGR = 0.30%)			
2027	51,425	16,026,989	0.3209%
2032	52,202	16,232,627	0.3216%
2042	53,789	16,660,141	0.3229%
Increasing Market Share of U.S. GA Itinerant Operations (CAGR = 2.25%)			
2027	60,615	16,026,989	0.3782%
2032	66,593	16,232,627	0.4102%
2042	79,022	16,660,141	0.4743%
Employment Regression Model (CAGR = 1.37%) - Selected Forecast			
2027	52,721	16,026,989	0.3290%
2032	57,630	16,232,627	0.3550%
2042	66,540	16,660,141	0.3994%

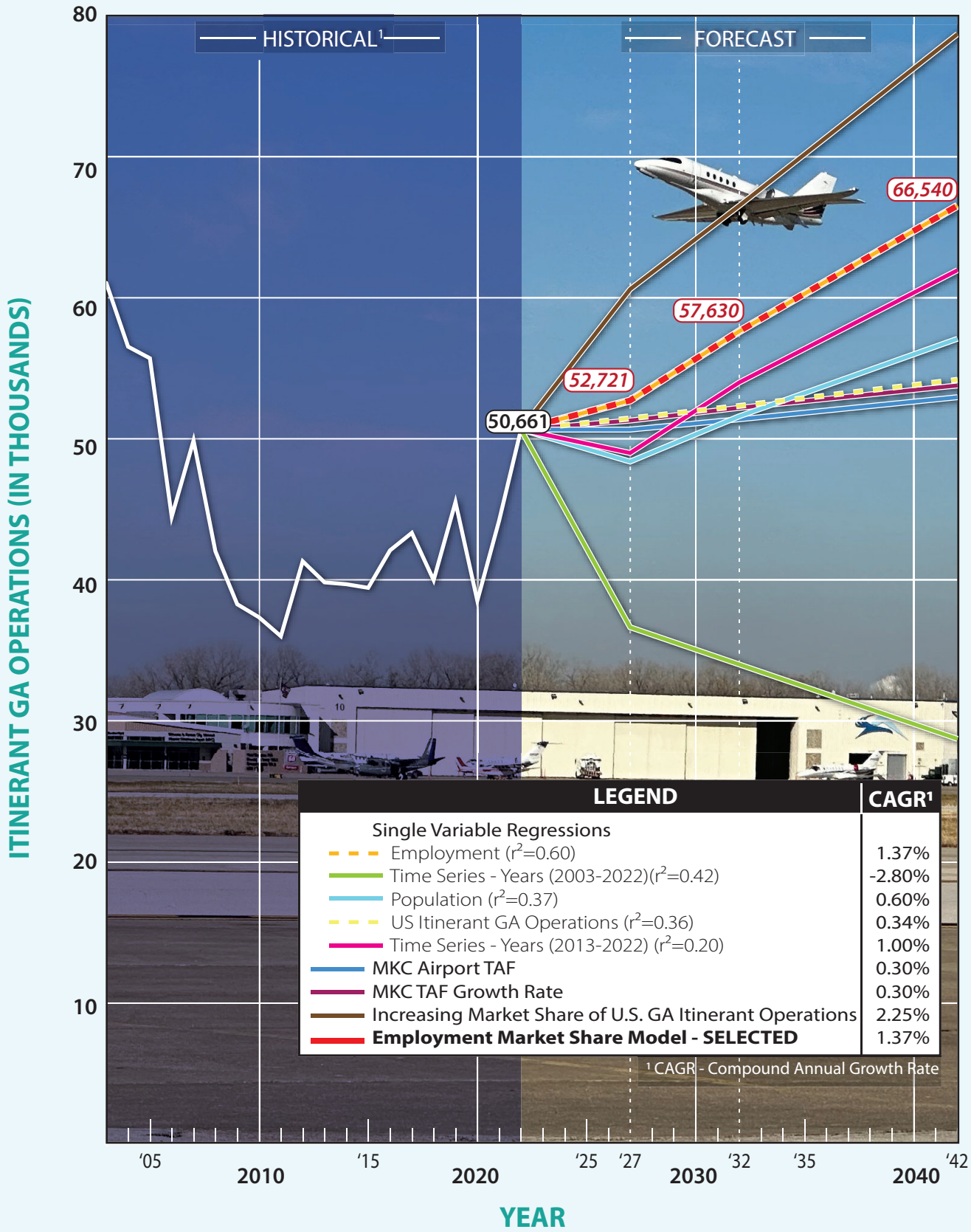
[1]Historical data from ATCT records as reported to FAA in the OPSNET database.
[2]FAA Forecasts Fiscal Years 2023-2043
CAGR = Average Annual Growth Rate from 2022 to 2042

Source: Coffman Associates analysis

Exhibit 2E summarizes the forecasts considered for itinerant general aviation operations.

Local General Aviation Operations Forecast

Local general aviation operations are those that operate within the traffic pattern airspace and are typically characterized as training or touch-and-go operations. Much of the local traffic is attributable to the two flight schools on the airfield, ATP and ATD Flight Systems. ADT has been operating at MKC since 1996, while ATP is relatively new to the airport having established operations in 2021. Historical local operations were outlined in **Table 2R**. Local operations have spiked in the last two years, increasing from 18,803 in 2020 to 40,549 in 2022. The owners of both flight schools were interviewed and asked about future business plans. Both are planning for growth and planning to make additional investments in more aircraft and potentially building their own hangars, once more developable land is available. ATD specifically stated that in the next five to ten years they plan to double their fleet from 13 currently to 26 single and multi-engine piston aircraft.



[1]Historical data from ATCT records as reported to FAA.

Local General Aviation Operations Regression Forecasts

Single and multi-variant regression analysis was done for local general aviation operations. The independent variables considered were years, national local operations as forecast by FAA, the service area population and employment. **Table 2Y** documents the data inputs.

TABLE 2Y | Regression Analysis Variables

Dependent Variable	Independent Variables			
Y1-MKC GA Local Operations[1]	X1-Year	X2 - US GA Local Operations[2]	X3-Population[3]	X4-Employment[3]
12,984	2013	11,688,355	1,916,512	1,232,457
13,221	2014	11,675,040	1,934,700	1,257,064
15,322	2015	11,691,338	1,953,771	1,285,229
13,616	2016	11,632,612	1,977,133	1,309,666
14,260	2017	11,732,324	1,999,016	1,327,819
14,565	2018	12,354,014	2,018,958	1,348,257
16,293	2019	13,109,215	2,034,377	1,353,414
18,803	2020	12,332,877	2,047,658	1,299,246
31,385	2021	13,479,087	2,053,036	1,360,932
40,549	2022	14,029,412	2,068,912	1,391,779
	Projected Independent Variables			
See TABLE 2Z for Results and r^2 Values	2027	15,713,699	2,145,474	1,494,285
	2032	15,987,407	2,218,033	1,578,194
	2042	16,562,635	2,346,964	1,730,517

[1]FAA OPSNET database sourced from MKC ATCT.
[2]FAA Aerospace Forecast - fiscal Years 2023-2043.
[3]Woods & Poole - Complete Economic and Demographic Data Source (CEDDS) 2022.

Table 2Z shows the results of both single and multivariable regressions utilizing the data in **Table 2Y**. They are organized from highest r^2 value to lowest. As is common with regression analysis, the more variables that are included, the smoother the line becomes and often the higher resulting r^2 value. However, higher r^2 values do not necessarily correlate to a better statistical reliability. Where possible, it is preferrable to consider single variable regressions because there is less smoothing of the results, even if the r^2 values are higher. Ultimately, it falls to the analyst to assess the results and determine reasonableness. The best single variable regression utilizes the national forecast for local general aviation operations ss the independent variable.

TABLE 2Z | MKC GA Local Operations Regression Analysis

Variables (2013-2022)	r^2	FORECAST MKC GA LOCAL OPERATIONS 2027	2032	2042	CAGR
Year/Pop./Emp.	0.9796	60,751	85,077	145,715	6.60%
Year/US GA Local Ops/Pop./Emp.	0.9796	60,724	84,779	144,791	6.57%
Year/US GA Local Ops/Pop.	0.9598	57,342	76,682	126,200	5.84%
Year/Population	0.9535	56,804	79,467	136,829	6.27%
Year/US GA Local Ops/Emp.	0.7986	49,567	51,850	57,214	1.74%
US GA Local Ops/Pop./Emp.	0.7956	50,834	51,931	54,794	1.52%
US GA Local Ops/Pop.	0.7952	51,180	52,582	56,004	1.63%
US GA Local Ops/Emp.	0.7945	50,272	51,512	54,575	1.50%
Year/US GA Local Ops	0.7914	50,631	53,679	60,028	1.98%
US GA Local Ops	0.7911	50,705	53,294	58,735	1.87%
Year/Employment	0.6253	42,078	54,198	78,478	3.36%
Year - Time Series	0.6252	42,186	54,337	78,638	3.37%
Population/Employment	0.5191	40,492	50,893	69,568	2.74%
Population	0.4983	37,083	46,078	62,061	2.15%
Employment	0.4833	42,319	53,283	73,186	3.00%
CAGR: compound annual growth rate					

Source: Coffman Associates analysis

Market Share of U.S. Local General Aviation Operations Forecasts

Over the last ten years, local general aviation operations at MKC, as a share of national operations, have increased from 0.1111 percent to 0.2890 percent. By applying the percent change increase to the plan years an increasing market share forecast emerges. This forecast results in 59,398 local general aviation operations in the next five years and 106,796 local operations within 20 years. This forecast is shown in **Table 2AA**.

A second increasing market share of national local operations forecast is also included in the table. This forecast is based on the future plans of the two active flight schools at the airport. Both have indicated that they plan to double in size and operations in the next five to ten years.

The preferred regression forecast is also included in the market share table as a method to examine the reasonableness of the regression forecast. Both the increasing market share forecast, and the flight school forecast, would lead to a level of local operations that far exceeds any year in the last 20 years. Therefore, these two forecasts are not the selected forecast. The regression forecast is selected to be carried forward in this study because it is based on mathematical formulas, historical trends, and represents a reasonable growth trend for the airport. **Exhibit 2F** graphically shows the local general aviation operations forecasts.

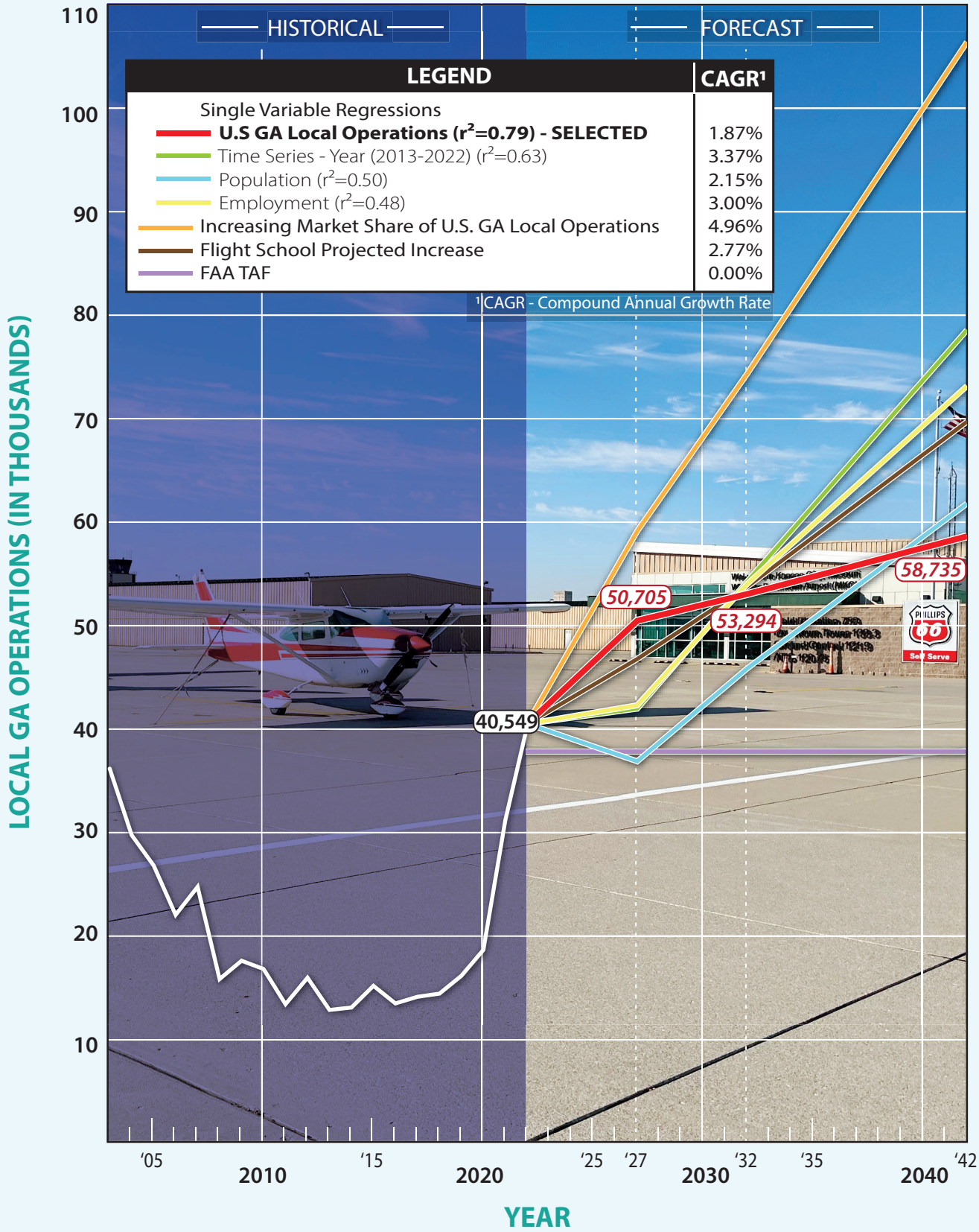

HISTORICAL
FORECAST
LEGEND
CAGR¹
Single Variable Regressions
U.S GA Local Operations (r²=0.79) - SELECTED 1.87%
Time Series - Year (2013-2022) (r²=0.63) 3.37%
Population (r²=0.50) 2.15%
Employment (r²=0.48) 3.00%
Increasing Market Share of U.S. GA Local Operations 4.96%
Flight School Projected Increase 2.77%
FAA TAF 0.00%
¹CAGR - Compound Annual Growth Rate
LOCAL GA OPERATIONS (IN THOUSANDS)
110
100
90
80
70
60
50
40
30
20
10
40,549
50,705
53,294
58,735
'05
2010
'15
2020
'25
'27
2030
'32
'35
2040
'42
YEAR

TABLE 2AA | General Aviation Local Operations Forecast

Year	MKC GA Local Ops[1]	US GA Local Ops[2]	Market Share Local Ops
2013	12,984	11,688,355	0.1111%
2014	13,221	11,675,040	0.1132%
2015	15,322	11,691,338	0.1311%
2016	13,616	11,632,612	0.1171%
2017	14,260	11,732,324	0.1215%
2018	14,565	12,354,014	0.1179%
2019	16,293	13,109,215	0.1243%
2020	18,803	12,332,877	0.1525%
2021	31,385	13,479,087	0.2328%
2022	40,549	14,029,412	0.2890%
US GA Local Operations Regression (CAGR = 1.87%) - Selected Forecast			
2027	50,705	15,713,699	0.3227%
2032	53,294	15,987,407	0.3333%
2042	58,735	16,562,635	0.3546%
Increasing Market Share of U.S. GA Local Operations (CAGR = 4.96%)			
2027	59,398	15,713,699	0.3780%
2032	74,645	15,987,407	0.4669%
2042	106,796	16,562,635	0.6448%
Flight School Projected Increase (CAGR = 2.77%)			
2027	47,000	15,713,699	0.2991%
2032	54,000	15,987,407	0.3378%
2042	70,000	16,562,635	0.4226%

[1]Historical data from ATCT records as reported to FAA OPSNET database.
[2]FAA Forecasts Fiscal Years 2023-2043
CAGR = Average Annual Growth Rate from 2022 to 2042

Source: Coffman Associates analysis

Air Taxi Operations Forecast

Air taxi operations are those with the authority to provide "on-demand" or "for-hire" transportation of persons or property via aircraft with fewer than 60 passenger seats. Air taxi includes a broad range of operations, including some smaller commercial service aircraft, some charter aircraft, air cargo aircraft, many fractional ownership aircraft, aerial tour, and air ambulance services. The team-chartered aircraft operations utilizing aircraft with more than 60 seats are not counted under the air taxi category and are instead classified as air carrier.

MKC air taxi operations had been relatively flat from 2013-2020, generally ranging between 13,000 and 16,000. In 2020, there were 15,075 air taxi operations. The last two air taxi operations have increased sharply with 19,899 in 2021 and 21,592 in 2022. To determine if this trend is continuing, the available air taxi operation counts from January through August 2023 were examined. At the end of August, MKC recorded 20,271 air taxi operations, which appears to be trending toward approximately 28,000 air taxi operations by the end of 2023. Referencing **Table 2R**, in the last 20-years, MKC has exceeded 20,000 air taxi operations only two other times, in 2002 and 2004. So, there is clearly a shift to an increasing trend in air taxi operations.

Regression Analysis

Single and multiple regressions were run to examine the statistical relationship among historical air taxi operations and the year, US air taxi operations as forecast by FAA, population, and employment. **Table 2BB** shows the last 10 years of data considered for the independent variables.

TABLE 2BB | Air Taxi Operations Regression Analysis Variables

Dependent Variable	Independent Variables			
Y1-MKC Air Taxi Operations[1]	X1-Year	X2 - US Air Taxi Operations[2]	X3-Population[3]	X4-Employment[3]
15,656	2013	8,803,402	1,916,512	1,232,457
14,233	2014	8,439,711	1,934,700	1,257,064
15,239	2015	7,895,478	1,953,771	1,285,229
14,685	2016	7,580,119	1,977,133	1,309,666
13,433	2017	7,179,651	1,999,016	1,327,819
15,163	2018	7,125,556	2,018,958	1,348,257
15,747	2019	7,234,239	2,034,377	1,353,414
16,305	2020	5,471,641	2,047,658	1,299,246
15,075	2021	5,884,738	2,053,036	1,360,932
19,899	2022	6,522,238	2,068,912	1,391,779
	Projected Independent Variables			
See TABLE 2CC for Results and r^2 Values	2027	6,009,133	2,145,474	1,494,285
	2032	6,335,768	2,218,033	1,578,194
	2042	7,030,550	2,346,964	1,730,517

[1]FAA OPSNET database sourced from MKC ATCT.
[2]FAA Aerospace Forecast - fiscal Years 2023-2043
[3]Woods & Poole - Complete Economic and Demographic Data Source (CEDDS) 2022

Because of the sharp increase in air taxi operations over the last two years, it was anticipated that the results would be mixed, which proved to be the case**. Table 2CC** shows the results. The highest r^2 value is 0.75, which is from the multi-variate regression for all four independent variables. This may not be a statistically reliable forecast since the r^2 is low. The primary problem with all of the regressions is not necessarily that the r^2 values are low, but that the five-year forecasts are each expected to be exceeded in 2023. The combination of these two issues has led the forecast analyst to discard any of the regressions from further consideration.

TABLE 2CC | MKC Air Taxi Operations Regression Analysis

Variables (2013-2022)	r^2	FORECAST MKC GA ITINERANT OPERATIONS 2027	2032	2042
Year/US Air Taxi Ops/Pop./Emp.	0.75	22,434	29,286	44,088
Year/US Air Taxi Ops/Emp.	0.74	22,245	29,179	43,892
Year/US Air Taxi Ops/Pop.	0.62	22,561	27,794	39,661
Year/Population	0.51	20,697	23,799	31,673
Year/Pop./Emp.	0.51	20,704	23,810	31,690
Year/US Air Taxi Ops	0.51	21,497	26,166	35,571
US Air Taxi Ops/Pop./Emp.	0.48	19,508	24,258	32,880
US Air Taxi Ops/Pop.	0.35	19,648	22,807	28,557
Year/Employment	0.35	18,313	19,855	23,078
Year - Time Series	0.33	18,671	20,318	23,610
Population/Employment	0.26	17,924	19,120	21,241
Population	0.26	17,974	19,190	21,350
US Air Taxi Ops/Emp.	0.21	18,215	19,380	21,483
Employment	0.21	18,357	19,686	22,098
US Air Taxi Operations	0.12	16,218	16,035	15,646

Source: Coffman Associates analysis

Market Share of National Air Taxi Operations as Forecast by FAA

Two air taxi operations forecasts have been developed and are presented in **Table 2DD**. The first continues the percentage increase over the last 10-years and applies that same growth to the future plan years. This results in an air taxi operations forecast that reach 47,091 by 2042. This forecast appears very aggressive, being more than twice the previous high level recorded; therefore, a second increasing market share forecast was developed that moderates the recent sharp growth trend in the outer years over the forecast period.

TABLE 2DD | Air Taxi Operations Forecast

Year	MKC Total Air Taxi Operations[1]	U.S. ATCT Air Taxi Operations[2]	MKC Percent
2013	14,233	8,803,402	0.1617%
2014	15,239	8,439,711	0.1806%
2015	14,685	7,895,478	0.1860%
2016	13,433	7,580,119	0.1772%
2017	15,163	7,179,651	0.2112%
2018	15,747	7,125,556	0.2210%
2019	16,305	7,234,239	0.2254%
2020	15,075	5,471,641	0.2755%
2021	19,899	5,884,738	0.3381%
2022	21,592	6,522,238	0.3311%
Increasing Market Share of U.S. Air Taxi Operations (CAGR = 3.98%)			
2027	24,982	6,009,133	0.4157%
2032	31,706	6,335,768	0.5004%
2042	47,091	7,030,550	0.6698%
Moderate Market Share of U.S. Air Taxi Operations - Selected (CAGR = 1.70%)			
2027	28,508	6,009,133	0.4744%
2032	29,069	6,335,768	0.4588%
2042	30,222	7,030,550	0.4299%

[1]Historical data from ATCT records as reported to FAA OPSNET database.
[2]FAA Forecasts 2023-43
CAGR = Average Annual Growth Rate from 2022 to 2042

Source: Coffman Associates analysis

Through August 2023, there were 20,271 air taxi operations. By adding September-December air taxi operations, we can estimate that there will be 28,068 air taxi operations for the 2023 calendar year. This figure is likely on the conservative side since the 2022 monthly numbers have been exceeded in 2023 every month except in January. **Table 2EE** shows the monthly air taxi operations since January 2021 to demonstrate the sharp increasing trend. (Note: Through October 2023, there were 25,181 air taxi operations.)

TABLE 2EE | Monthly Air Taxi Operations Since January 2021

Month	2021	2022	2023	2023 Including Sept-Dec 2022
Jan	1,267	1,847	1,831	1,831
Feb	1,179	1,482	1,687	1,687
Mar	1,356	1,735	2,233	2,233
Apr	1,420	1,704	3,286	3,286
May	1,579	1,739	3,480	3,480
June	1,627	1,742	3,296	3,296
July	1,890	1,802	2,181	2,181
Aug	1,927	1,744	2,277	2,277
Sept	1,838	2,002		2,002
Oct	1,874	2,052		2,052
Nov	2,038	1,924		1,924
Dec	1,904	1,819		1,819
Total	**19,899**	**21,592**		**28,068**

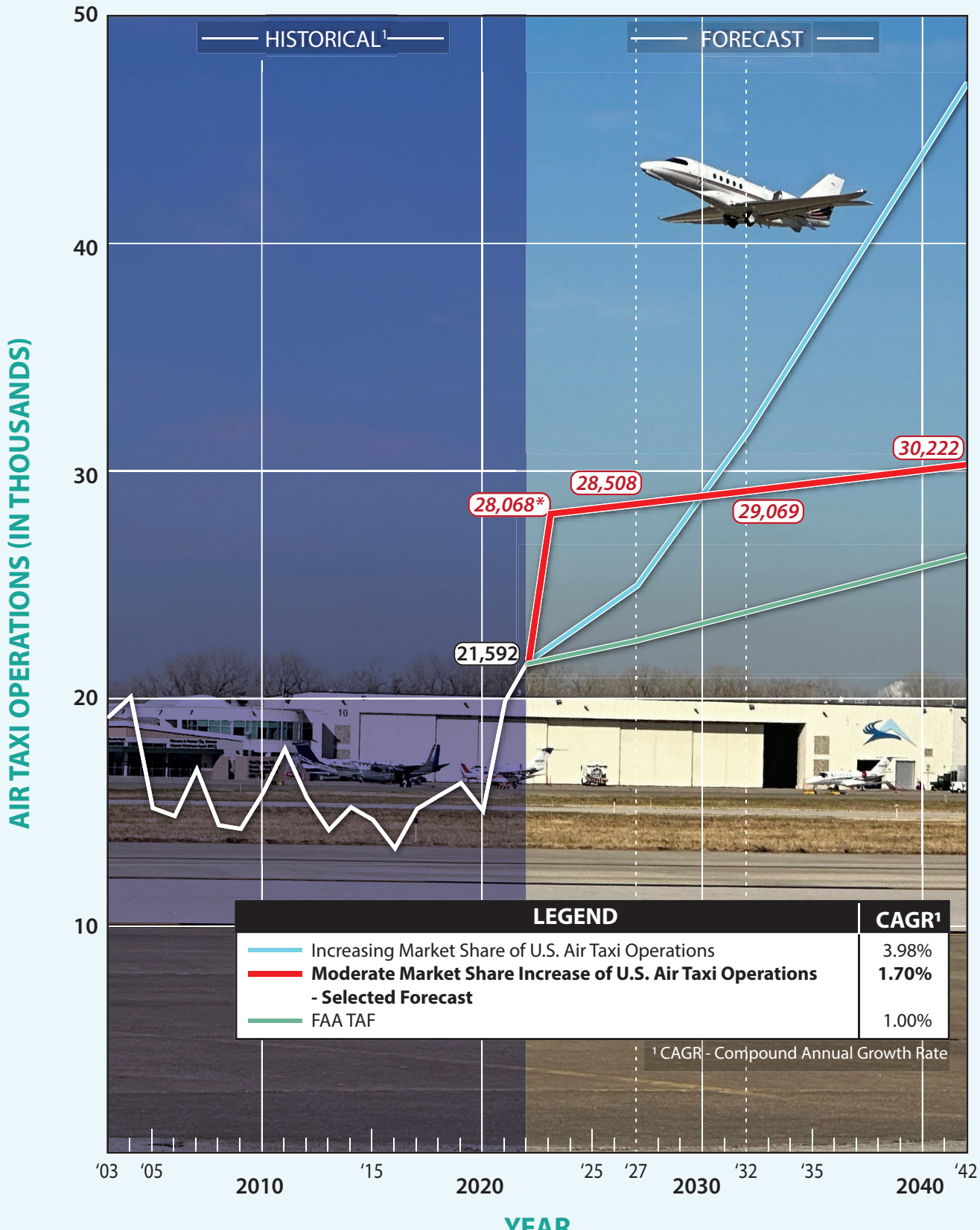
Source: OPSNET FAA operations database accessed on October 3, 2023.

There has been no indication that the growth trend in air taxi operations will reverse in the coming years, however there is also no indication it will continue its current trend. The second market share forecast shows an increasing market share but it has been moderated due to the unknowns created by the recent sharp increase in air taxi operations. This forecast assumes that calendar year 2023 will be around 28,068 air taxi operations and then an annual growth rate of 0.39 percent is applied for each year thereafter. This annual growth rate is the same as the FAA forecast for national air taxi operations. This forecast is outlined in **Table 2DD** and results in 30,222 air taxi operations by 2042 and an overall annual growth rate of 1.70 percent.

Exhibit 2G shows the air taxi operations forecast in graph form as well as the TAF forecast for comparison purposes. The TAF forecast shows a 1.00 percent annual increase in air taxi operations for MKC, however the 2042 TAF estimate of 26,346 is expected to be exceeded in 2023. Thus, it is not the selected forecast.

Military Operations Forecast

Military aircraft can and do utilize civilian airports across the country. There is an inherent challenge to forecasting military operations, as recognized by FAA, because the military's mission can and does change quickly. As a result, FAA in their TAF for airports will include a placeholder figure. At MKC, 984 itinerant military operations are the placeholder for each year in the future. Local military operations



[1]Historical data from ATCT records as reported to FAA.
*Jan-Aug 2023 actual + Sept-Dec 2022 actual

have a placeholder of 47 operations for each year in the future. For this forecasting effort, the itinerant and local military operations will be maintained at the TAF constant rates. **Table 2FF** shows the history of military operations and the forecast.

TABLE 2FF | Military Operations Forecast

Year	Military Itinerant	Military Local	Total
2011	1,168	399	1,567
2012	1,099	307	1,406
2013	685	121	806
2014	913	343	1,256
2015	1,068	400	1,468
2016	1,002	267	1,269
2017	919	86	1,005
2018	950	179	1,129
2019	935	262	1,197
2020	763	137	900
2021	892	108	1,000
2022	930	41	971
FAA *Terminal Area Forecast* (CAGR = 0.0%)			
2027	984	47	1,031
2032	984	47	1,031
2042	984	47	1,031

Note: History from ATCT records as reported to FAA

Source: Coffman Associates analysis

AIR CARRIER OPERATIONS

Air carrier operations are those conducted for commercial purposes utilizing aircraft with more than 60 seats. Typically, air carrier operations are associated with scheduled commercial passenger activity. However, MKC is certificated to accommodate large commercial aircraft operations that are non-scheduled. Perhaps the most common activity in this classification is charter flights for sports teams.

Without scheduled commercial service, it can be challenging to forecast the air carrier category. Nonetheless, there is a history of activity that has been increasing over the last several years. **Table 2GG** shows the air carrier operations history and a forecast for the plan years. Air carrier operations are forecast to increase from 321 in 2022 to 480 by 2042, for an annual growth rate of 2.03 percent. Based on the year-over-year air carrier operations for January through July, air carrier operations are five percent higher in 2023 than in 2022.

TABLE 2GG | Air Carrier Operations Forecast

Year	Air Carrier Operations
2011	169
2012	187
2013	176
2014	203
2015	189
2016	194
2017	232
2018	173
2019	214
2020	176
2021	322
2022	321
Air Carrier Forecast (CAGR = 2.03%)	
2027	360
2032	400
2042	480

Note: History from ATCT records as reported to FAA

Source: Coffman Associates analysis

This forecast assumes that scheduled air carrier operations will not be introduced into MKC primarily because Kansas City International Airport already caters to this class of activity; however, new sports users associated with the women's professional soccer league and increased usage by collegiate sports with regional events at T-Mobile arena will generate more air carrier operations.

TOTAL OPERATIONS FORECAST SUMMARY

Table 2HH presents the total operations forecast. The airport experiences a mix of operation types, including general aviation, air taxi, and military. Multiple forecasts for each of these operational categories were developed, which created a planning envelope that represents a reasonable range of activity. Based on local conditions and the judgement of the forecast analyst, a single forecast was selected for each category. Combined, total operations are forecast to increase from 114,094 in 2022 to 157,008 in 2042, for an annual growth rate of 1.61 percent.

TABLE 2HH | Total Operations Forecast

Year	ITINERANT OPERATIONS				LOCAL OPERATIONS		TOTAL OPERATIONS
	Air Carrier	Air Taxi	GA	MIL	GA	MIL	
2022	321	21,592	50,661	930	40,549	41	114,094
2027	360	28,508	52,721	984	50,705	47	133,326
2032	400	29,069	57,630	984	53,294	47	141,423
2042	480	30,222	66,540	984	58,735	47	157,008
CAGR 2022-2042	**2.03%**	**1.70%**	**1.37%**	**NA**	**1.87%**	**NA**	**1.61%**

CAGR = Compound annual growth rate; GA = General Aviation; MIL = Military

Source: Coffman Associates analysis

PEAKING CHARACTERISTICS

Many aspects of facility planning relate to levels of peaking activity – times when an airport is busiest. For example, the appropriate size of terminal facilities can be estimated by determining the number of people that could reasonably be expected to use the facility at a given time. The following planning definitions apply to the peak periods:

- **Peak Month** – The calendar month when peak aircraft operations occur.
- **Design Day** – The average day in the peak month.
- **Design Hour** – The peak hour within the design day.

Table 2JJ shows the monthly operational levels for 2022 at MKC.

TABLE 2JJ | Peak Month 2022

Month	Total Operations	Percent of Annual
January	8,869	7.77%
February	6,363	5.58%
March	8,580	7.52%
April	8,413	7.37%
May	8,477	7.43%
June	10,593	9.28%
July	10,952	9.60%
August	10,463	9.17%
September	**12,149**	**10.65%**
October	11,909	10.44%
November	9,454	8.29%
December	7,872	6.90%
Total	**114,094**	**100.00%**

Source: OPSNET database.

The peak month of 2022 was September when there was a total of 12,149 operations, which is 10.65 percent of total annual operations. Future peak months were estimated at 10.7 percent of annual operations. The design day was determined by dividing the peak month by the number of days in that month, which is 30 (12,149 ÷ 30 = 405). The design hour was determined through analysis of hourly operations data from September 2022 as provided by the airport traffic control tower. The design hour is the average of the peak hour of the peak day of each week of the peak month. **Table 2KK** summarizes the hourly operations on the peak day of each week of the peak month of September 2022.

TABLE 2KK | Design Hour Determination

Hour	Wednesday Sept. 7	Wednesday Sept. 14	Wednesday Sept. 21	Thursday Sept. 29
11:00-12:00pm	11	3	4	4
10:00-11:00pm	27	4	3	16
9:00-10:00pm	24	29	11	13
8:00-9:00pm	42	35	22	33
7:00-8:00pm	7	6	8	26
6:00-7:00pm	10	24	13	47
5:00-6:00pm	56	18	18	43
4:00-5:00pm	***58***	28	24	40
3:00-4:00pm	38	28	40	44
2:00-3:00pm	21	35	50	38
1:00-2:00pm	40	37	***68***	48
12:00-1:00pm	47	42	45	33
11:00-12:00pm	28	***46***	48	43
10:00-11:00am	32	38	44	***48***
9:00-10:00am	40	38	31	7
8:00-9:00am	42	26	23	24
7:00-8:00am	13	33	9	18
6:00-7:00am	22	27	4	1
5:00-6:00am	4	1	2	0
4:00-5:00am	4	4	3	3
3:00-4:00am	7	6	4	6
2:00-3:00am	3	13	0	0
1:00-2:00am	3	3	4	4
12:00-1:00am	3	2	2	2
Total	**582**	**526**	**480**	**541**
Peak Hour %	**9.97%**	**8.75%**	**14.17%**	**8.87%**

The design hour is the average of 58, 46, 68, and 48, which is 55.
Note: Peak hour is ***BOLD italicized***.

Source: ATCT hourly operations count for September 2022

A summary of the peaking characteristics is outlined in **Table 2LL.**

TABLE 2LL | Peak Operations Forecast

Peaking Parameter	Factor	2022	2027	2032	2042
Annual Operations	100% of tower count	114,094	133,326	141,423	157,008
Peak Month	10.7% of annual operations	12,149	14,199	15,062	16,721
Design Day	3.3% of peak month	405	473	502	557
Design Hour	13.6% of design day	55	64	68	76

Source: MKC control tower operations count.

OPERATIONS BY FLEET MIX

Developing an understanding of the operational fleet mix, including the approximate volume of operations by aircraft type, is an important input in determining future facility needs. The baseline operations mix is derived from an examination of FAA's Traffic Flow Management System Count (TFMSC) database, which captures operations by those that file a flight plan. The FAA believes this database captures approximately 95 percent of operations by jets and turboprops. Total operations by jets and turboprops are summarized in **Table 2MM**.

TABLE 2MM | Historical Jet and Turboprop Operations

Engine Type	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Jet	17,776	18,968	19,084	18,886	20,400	20,450	20,526	15,156	22,838	24,470
Turboprop	5,438	5,268	5,320	4,322	4,650	4,538	4,556	4,382	5,948	6,324
Total	**23,214**	**24,236**	**24,404**	**23,208**	**25,050**	**24,988**	**25,082**	**19,538**	**28,786**	**30,794**

Source: Traffic Flow Management System Count Database - Data normalized annually

Utilizing the Traffic Flow Management System Count (TFMSC) data for jets and turboprops, we can establish a baseline operations number for those aircraft types. Because the FBO performs maintenance repair and overhaul of jet engines, a portion of the operations are local in nature to account for test flights. Future jet and turboprop operational estimates are based on local trends with both aircraft types having higher utilization rates and representing a larger percentage of overall operations.

The operations estimate for helicopters and multi-engine piston aircraft are a function of typical counts in relation to the number of based aircraft. Helicopter operations are estimated at 400 annually per based helicopter, and multi-engine piston are estimated at 200 annual operations per based aircraft. The resulting annual operational estimates account for both local and itinerant operations for helicopters and multi-engine piston aircraft. All remaining operations are assigned to single engine piston operations.

Table 2NN presents the fleet mix operations forecast for MKC. Piston aircraft are anticipated to continue to represent most operations but are forecast to decline as a percentage of the whole over time. Multi-engine piston operations are also forecast to decline as a percentage of the whole over time. Growth areas are in turbine engines and helicopters. While turboprops and jets are rarely used for touch-and-go operations, due to the presence of turbine engine maintenance activities at the airport, some local operations are included by these aircraft.

TABLE 2NN | Fleet Mix Operations Forecast

	2022	%	2027	%	2032	%	2042	%
Local Operations								
Single Engine Piston	39,490	97.29%	49,612	97.75%	52,161	97.79%	57,522	97.86%
Multi-Engine Piston	400	0.99%	400	0.79%	400	0.75%	400	0.68%
Turboprop	100	0.25%	120	0.24%	140	0.26%	180	0.31%
Jet	200	0.49%	220	0.43%	240	0.45%	280	0.48%
Helicopter	400	0.99%	400	0.79%	400	0.75%	400	0.68%
Total Local	**40,590**	**100.00%**	**50,752**	**100.00%**	**53,341**	**100.00%**	**58,782**	**100.00%**
Itinerant Operations								
Single Piston	37,010	50.35%	40,454	48.99%	43,292	49.15%	49,076	49.96%
Multi-Piston	2,000	2.72%	2,000	2.42%	1,800	2.04%	1,600	1.63%
Turboprop	6,224	8.47%	8,570	10.38%	10,130	11.50%	11,670	11.88%
Jet	24,270	33.02%	26,750	32.40%	27,660	31.40%	29,480	30.01%
Helicopters	4,000	5.44%	4,800	5.81%	5,200	5.90%	6,400	6.52%
Total Itinerant	**73,504**	**100.00%**	**82,574**	**100.00%**	**88,082**	**100.00%**	**98,226**	**100.00%**
Total Operations	**114,094**		**133,326**		**141,423**		**157,008**	

Source: Coffman Associates analysis

FORECAST SUMMARY

This study has outlined the various activity levels that might reasonably be anticipated over the planning period. **Exhibit 2H** presents a summary of the aviation forecasts prepared in this study. The base year for these forecasts is 2022, with a 20-year planning horizon to 2042. The primary aviation demand indicators are based aircraft and operations.

Based aircraft are forecast to increase from 196 in 2022 to 226 by 2042, for a CAGR of 0.71 percent. Total operations are forecast to increase from 114,094 in 2022 to 157,008 by 2042, which is a CAGR of 1.70 percent. Several forecasts for each aviation demand indicator were developed to create a range of reasonable forecasts from which a single forecast was selected for use in determining facility needs.

Projections of aviation demand will be influenced by unforeseen factors and events in the future. Therefore, future demand will not likely follow the exact projection line, but, over time, forecasts of aviation demand will tend to fall within the planning envelope. The need for additional facilities will be based upon these forecasts; however, if demand does not materialize as projected, then implementation of facility construction can be slowed. Likewise, if demand exceeds these forecasts, then implementation of facility construction can be accelerated.

	Base Year	Forecast			CAGR
	2022	2027	2032	2042	
ENPLANEMENTS					
Annual Enplanements	**5,055**	**5,422**	**5,815**	**6,689**	**1.41%**
ANNUAL OPERATIONS					
Commercial Operations (Itinerant)					
Air Carrier (>59 seats)	321	360	400	480	2.03%
Air Taxi	21,592	28,508	29,069	30,222	1.70%
Total Commercial Operations	21,913	28,868	29,469	30,702	1.70%
General Aviation Operations					
Itinerant	50,661	52,721	57,630	66,540	1.37%
Local	40,549	50,705	53,294	58,735	1.87%
Total General Aviation Operations	91,210	103,426	110,923	125,275	1.60%
Military Operations					
Itinerant	930	984	984	984	0.28%
Local	41	47	47	47	0.69%
Total Military Operations	971	1,031	1,031	1,031	0.30%
Total Itinerant Operations	73,504	82,574	88,082	98,226	1.46%
Total Local Operations	40,590	50,752	53,341	58,782	1.87%
TOTAL ANNUAL OPERATIONS	**114,094**	**133,326**	**141,423**	**157,008**	**1.61%**
BASED AIRCRAFT					
Single Engine Piston	82	83	85	88	0.35%
Multi-Engine Piston	12	12	11	10	-0.91%
Turboprop	9	11	13	15	2.59%
Jet	82	87	90	96	0.79%
Helicopter	11	13	14	17	2.20%
TOTAL BASED AIRCRAFT	**196**	**206**	**213**	**226**	**0.71%**

CAGR: Compound Annual Growth Rate

PEAKING ACTIVITY PROJECTIONS				
Annual Operations	114,094	133,326	141,423	157,008
Peak Month	12,149	14,199	15,062	16,721
Design Day	405	473	502	557
Design Hour	55	64	68	76



FORECAST COMPARISON TO THE TAF

The FAA reviews the aviation demand forecasts developed in airport planning studies and compares them to the *Terminal Area Forecast* (TAF) for the airport. The forecasts are considered consistent with the TAF if they meet the following criteria:

- Forecasts differ by less than 10 percent in the 5-year forecast period, and 15 percent in the 10-year forecast 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 5090.5, *Formulation of the National Plan of Integrated Airport Systems* (NPIAS) and *Airports Capital Improvement Plan* (ACIP).

If the forecasts exceed these parameters, they may be sent to FAA headquarters in Washington, D.C., for further review. **Table 2PP** presents the direct comparison of the planning forecast with the 2022 TAF published in February 2023. The forecasts are not expected to affect the timing or scale of any major airport projects, and the role of the airport as a reliever general aviation facility is not expected to change.

TABLE 2PP | Forecast Comparison to the 2022 FAA *Terminal Area Forecast* (TAF)

	2022	2027	2032	2042	CAGR 2022-2042
Passenger Enplanements					
Master Plan Forecast	5,055	5,422	5,815	6,689	1.41%
FAA TAF 2022	4,749	5,088	5,457	6,278	1.41%
% Difference	6.2%	6.4%	6.4%	6.3%	
Commercial Operations (Air Carrier/Commuter/Air Taxi)					
Master Plan Forecast	21,913	28,868	29,469	30,702	1.70%
FAA TAF 2022	21,951	23,066	22,607	26,792	1.00%
% Difference	0.2%	22.3%	26.4%	13.6%	
Total Operations					
Master Plan Forecast	114,094	133,326	141,423	157,008	1.61%
FAA TAF 2022	111,392	113,261	115,207	119,316	0.34%
% Difference	2.4%	16.3%	20.4%	27.3%	
Based Aircraft					
Master Plan Forecast	198	206	213	226	0.71%
FAA TAF 2022	176	177	177	177	0.03%
% Difference	11.8%	15.1%	18.5%	24.3%	

CAGR: Compound annual growth rate

Source: Coffman Associates analysis

For passenger enplanements, the master plan forecast is within tolerance of the TAF. Enplanements at MKC are generated primarily through charter flights including sports team flights. The number of sports teams or the frequency of their flights are not expected to change significantly.

Commercial operations and total operations are both higher than the TAF and are not within TAF tolerance. The primary reason for this discrepancy is that the TAF is a lagging indicator and does not fully account for the shape increase in air taxi operations and overall operations.

Based aircraft are not within tolerance of the TAF because the 2022 TAF only has 176 based aircraft when there were 196 validated based aircraft. The TAF projects 177 based aircraft for each year over the next 20-years. The TAF allows for the addition of one (1) new based aircraft over the next 20 years. The master plan-based aircraft forecast instead starts with the actual number of based aircraft, which is 196, as identified in the FAA's National Based Aircraft Inventory database (www.basedaircraft.com). The master plan then shows multiple forecasting methods for based aircraft and identifies a selected forecast that is within the planning envelope formed by the several forecasts.

AIRCRAFT/AIRPORT/RUNWAY CLASSIFICATION

The FAA has established several aircraft classification systems that group aircraft types based on their performance (approach speed in landing configuration) and design characteristics (wingspan and landing gear configuration). These classification systems are used to determine the appropriate airport design standards for specific airport elements, such as runways, taxiways, taxilanes, and aprons.

AIRCRAFT CLASSIFICATION

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical design aircraft is used to define the design parameters for an airport. The design aircraft may be a single aircraft type or a composite aircraft representing a collection of aircraft with similar characteristics. The design aircraft is classified by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). FAA AC 150/5300-13B, *Airport Design*, describes the following airplane classification systems, the parameters of which are presented on **Exhibit 2J.**

Aircraft Approach Category (AAC): A grouping of aircraft based on a reference landing speed (V_{REF}), if specified, or if V_{REF} is not specified, 1.3 times stall speed (V_{SO}) at the maximum certificated landing weight. V_{REF}, V_{SO}, and the maximum certificated landing weight are those values established for the aircraft by the certification authority of the country of registry.

The AAC generally refers to the approach speed of an aircraft in landing configuration. The higher the approach speed, the more restrictive the applicable design standards. The AAC, depicted by a letter A through E, is the aircraft approach category and relates to aircraft approach speed (operational characteristics). The AAC generally applies to runways and runway-related facilities, such as runway width, runway safety area (RSA), runway object free area (ROFA), runway protection zone (RPZ), and separation standards.

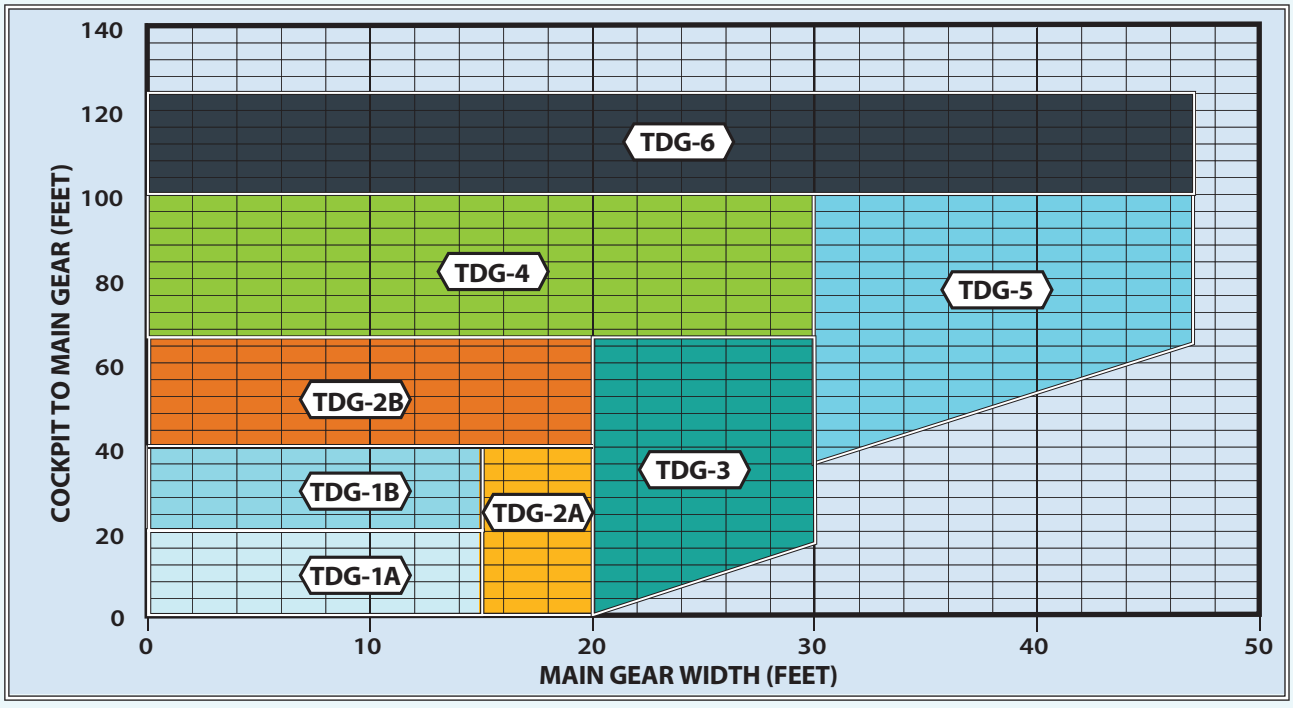
AIRCRAFT APPROACH CATEGORY (AAC)	
Category	**Approach Speed**
A	less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

AIRPLANE DESIGN GROUP (ADG)		
Group #	**Tail Height (ft)**	**Wingspan (ft)**
I	<20	<49
II	20≤30	49≤79
III	30≤45	79≤118
IV	45≤60	118≤171
V	60≤66	171≤214
VI	66≤80	214≤262

VISIBILITY MINIMUMS	
RVR* (ft)	**Flight Visibility Category (statute miles)**
VIS	3-mile or greater visibility minimums
5,000	Not lower than 1-mile
4,000	Lower than 1-mile but not lower than ¾-mile
2,400	Lower than ¾-mile but not lower than ½-mile
1,600	Lower than ½-mile but not lower than ¼-mile
1,200	Lower than ¼-mile

***RVR**: Runway Visual Range

TAXIWAY DESIGN GROUP (TDG)



Source: FAA AC 150/5300-13B, Airport Design

A-I



Aircraft	TDG
• Beech Baron 55	1A
• **Beech Bonanza**	**1A**
• Cessna 150, 172	1A
• Eclipse 500	1A
• Piper Archer, Seneca	1A

B-I



• **Beech Baron 58**	**1A**
• Beech King Air 90	1A
• Cessna 421	1A
• Cessna Citation CJ1 (525)	1A
• Cessna Citation 1(500)	2A
• Embraer Phenom 100	1B

A/B-II *12,500 lbs. or less*



• **Beech Super King Air 200**	**2A**
• Cessna 441 Conquest	1A
• Cessna Citation CJ2 (525A)	2A
• Pilatus PC-12	1A

B-II *over 12,500 lbs.*



• Beech Super King Air 350	2A
• Cessna Citation CJ3(525B), V (560)	2A
• Cessna Citation Bravo (550)	1A
• **Cessna Citation CJ4 (525C)**	**1B**
• Cessna Citation Latitude/Longitude	1B
• Embraer Phenom 300	1B
• Falcon 10, 20, 50	1B
• Falcon 900, 2000	2A
• Hawker 800, 800XP, 850XP, 4000	1B
• Pilatus PC-24	1B

A/B-III



• Bombardier Dash 8	3
• **Bombardier Global 5000**, 6000, 7000, 8000	**2B**
• Falcon 6X, 7X, 8X	2B

C/D-I



Aircraft	TDG
• **Lear** 25, 31, 45, 55, **60**	**1B**
• Learjet 35, 36 (D-I)	1B

C/D-II



• Challenger 600/604/ 800/850	1B
• Cessna Citation VII, X+	1B
• Embraer Legacy 450/500	1B
• **Gulfstream IV,** 350, 450 (D-II)	2A
• Gulfstream G200/G280	1B
• Lear 70, 75	1B
• CRJ 700	2B
• ERJ 175, 195	3
• CRJ 900	2B

C/D-III *less than 150,000 lbs.*



• Gulfstream V	2A
• **Gulfstream** G500, 550, 600, **650 (D-III)**	**2B**

C/D-III *over 150,000 lbs.*



• Airbus A319-100, 200	3
• **Boeing 737 -800**, 900, BBJ2 (D-III)	**3**
• MD-83, 88 (D-III)	4

C/D-IV



• Airbus A300-100, 200, 600	5
• Boeing 757-200	4
• **Boeing 767**-300, **400**	**5**
• MD-11	6

D-V



• Airbus A330-200, 300	5
• Airbus A340-500, 600	6
• Boeing 747-100 - 400	5
• Boeing 777-300	6
• **Boeing 787**-8, 9	**5**

Note: Aircraft pictured is identified in bold type.

Airplane Design Group (ADG): The ADG, depicted by a Roman numeral I through VI, is a classification of aircraft which relates to aircraft wingspan or tail height (physical characteristics). When the aircraft wingspan and tail height fall in different groups, the higher group is used. The ADG influences design standards for taxiway safety area (TSA), taxiway object free (TOFA), taxilane object free area, apron wingtip clearance, and various separation distances.

Taxiway Design Group (TDG): A classification of airplanes based on outer-to-outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. The TDG relates to the undercarriage dimensions of the design aircraft. The TDG is classified by an alphanumeric system: 1A, 1B, 2, 3, 4, 5, 6, and 7. The taxiway design elements determined by the application of the TDG include the taxiway width, taxiway edge safety margin, taxiway shoulder width, taxiway fillet dimensions, and, in some cases, the separation distance between parallel taxiways/taxilanes. Other taxiway elements, such as the taxiway safety area (TSA), taxiway/taxilane object free area (TOFA), taxiway/taxilane separation to parallel taxiway/taxilanes or fixed or movable objects, and taxiway/taxilane wingtip clearances are determined solely based on the wingspan (ADG) of the design aircraft utilizing those surfaces. It is appropriate for taxiways to be planned and built to different TDG standards based on expected use.

Exhibit 2J also summarizes the classification of the most common aircraft in operation today. Generally, recreational and business piston and turboprop aircraft will fall in AAC A and B, and ADG I and II. Business jets typically fall in ACC B and C, while the larger commercial aircraft will fall in AAC C and D.

AIRPORT AND RUNWAY CLASSIFICATIONS

Airport and runway classifications, along with the aircraft classifications defined previously, are used to determine the appropriate FAA design standards to which the airfield facilities are to be designed and built.

Runway Design Code (RDC): A code signifying the design standards to which the runway is to be built. The RDC is based upon planned development and has no operational component.

The AAC, ADG, and runway visual range (RVR) are combined to form the RDC of a runway. The RDC provides the information needed to determine certain design standards that apply. The first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the available instrument approach visibility minimums expressed by RVR values in feet of 1,200 (⅛-mile), 1,600 (¼-mile), 2,400 (½-mile), 4,000 (¾-mile), and 5,000 (1-mile). The RVR values approximate standard visibility minimums for instrument approaches to the runways. The third component reads “VIS” for runways designed for visual approach use only.

Approach Reference Code (APRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway regarding landing operations. Like the RDC, the APRC is composed of the same three components: the AAC, ADG, and RVR. The APRC describes the current operational capabilities of a runway under meteorological conditions where no special operating procedures are

necessary, as opposed to the RDC, which is based upon planned development with no operational component. The APRC for a runway is established based upon the minimum runway-to-taxiway centerline separation.

Departure Reference Code (DPRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway regarding takeoff operations. The DPRC represents those aircraft that can take off from a runway while any aircraft are present on adjacent taxiways, under meteorological conditions with no special operating conditions. The DPRC is like the APRC, but is composed of two components, AAC and ADG. A runway may have more than one DPRC depending on the parallel taxiway separation distance.

***Airport Reference Code (ARC)*:** An airport designation that signifies the airport's highest Runway Design Code (RDC), minus the third (visibility) component of the RDC. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely at an airport.

CRITICAL AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical aircraft is used to define the design parameters for an airport. The critical aircraft may be a single aircraft or a composite aircraft representing a collection of aircraft classified by three parameters: AAC, ADG, and TDG.

The first consideration is the safe operation of aircraft likely to use an airport. Any operation of an aircraft that exceeds design criteria of an airport may result in a lesser safety margin; however, it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently.

The critical aircraft is defined as the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, excluding touch-and-go operations. Planning for future aircraft use is of importance since the design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short-term development does not preclude the reasonable long-range potential needs of the airport.

According to FAA AC 150/5300-13B, *Airport Design*, "Airport designs based only on existing aircraft can severely limit the ability to expand the airport to meet future requirements for larger, more demanding aircraft. Airport designs that are based on large aircraft never likely to be served by the airport are not economical." Selection of the current and future critical aircraft must be realistic in nature and supported by current data and realistic projections.

CURRENT AIRPORT CRITICAL AIRCRAFT

There are three elements for classifying the airport design aircraft. The three elements are the AAC, ADG, and the TDG. The AAC and ADG are examined first, followed by the TDG.

The primary source of operations data is the FAA's TFMSC database, which captures an operation when a pilot files a flight plan and/or when flights are detected by the National Airspace System, usually via radar. It includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. Due to factors, such as incomplete flight plans, limited radar coverage, and VFR operations, TFMSC data does not account for all aircraft activity at an airport by a given aircraft type; however, the TFMSC does provide an accurate reflection of IFR activity. Operators of high-performance aircraft, such as turboprops and jets, tend to file flight plans at a high rate. **Exhibit 2K** presents the last 10 years of TFMSC data for turboprops and business jets for the airport.

On **Exhibit 2K**, the data has been organized to easily analyze operations by classifications. The exhibit includes a table for the Aircraft Approach Category. Each year over the last 10 years, there have been more than 1,000 operations by aircraft in approach category D but only a few in category E; therefore, the appropriate current AAC is D.

The airport has been experiencing a growing number of operations by aircraft in ADG III. In 2021 and 2022, there were more than 1,000 ADG III operations in each year, and, over the last six years, there have been more than 500 every year. There are only a few operations by aircraft in ADG IV. A current ADG of III is clearly supported for the airport.

The TDG is the third component of the airport design aircraft determination. The TDG is primarily based on the main gear wheel width. Medium and large business jets, as well as turboprops, tend to have the greatest wheel widths. The table called Taxiway Design Group on **Exhibit 2K** summarizes the annual operations of jets and turboprops by TDG. Over the last six years, the airport has consistently had more than 500 operations by aircraft in TDG 2B. Operations by aircraft in TDG 3 and higher have been increasing in recent years; however, they have not exceeded the 500 operations threshold as of 2022. Therefore, TDG 2B is the current TDG classification**.**

The current critical aircraft is classified as D-III-2B. Examples of aircraft that fall in this category include the Gulfstream 500, 550, and 650 models. The overall airport critical aircraft is also the critical aircraft for the primary runway, Runway 1-19.

A critical aircraft is also determined for any other runways. Runway 4 has available a critical instrument approach that is not available to Runway 1. Therefore, Runway 4-22 should have the greatest capability feasible to accommodate larger aircraft that might typically utilize an instrument approach to Runway 1. However, Runway 4-22 is shorter than the primary runway, therefore it has been historically planned to B-II design standards to accommodate a large portion of those that might otherwise use Runway 1-19. Therefore, it is recommended that Runway 4-22 continue to be planned to B-II standards at least until a comparable instrument approach is available to Runway 1.

ARC	Aircraft	TDG	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
A-I	B36T - Allison 36 Turbine Bonanza	1A	2	2	0	0	0	0	2	2	0	8
	B60T - Beechcraft 60 Royal Turbine Duke	1A	0	0	0	0	0	2	20	0	0	0
	EA50 - Eclipse 500	1A	272	200	236	146	92	108	42	28	38	28
	EPIC - Dynasty	1A	0	4	0	0	0	2	0	0	2	4
	EVOL - Lancair Evolution	1A	2	2	0	0	0	0	0	0	0	0
	EVOT - Lancair Evolution Turbine	1A	4	2	4	8	12	6	8	0	0	0
	KODI - Quest Kodiak	1A	0	2	2	4	8	4	4	4	4	10
	LNP4 - Lancair Propjet four-seat	1A	6	10	10	4	0	0	0	0	0	6
	P46T - Piper Malibu Meridian	1A	58	88	128	156	104	104	176	98	104	122
	SF50 - Cirrus Vision SF50	1A	0	0	0	4	10	24	62	44	92	120
	TBM1 - Socata TBM	1A	2	0	0	0	0	0	0	0	0	0
	TBM7 - Socata TBM-7	1A	96	96	100	72	64	82	74	60	58	48
	TBM8 - Socata TBM-850	1A	174	208	194	146	106	74	102	44	34	32
	TBM9 - Socata TBM	1A	0	2	0	14	38	42	46	32	60	58
	Total		616	616	674	554	434	448	536	312	392	436
A-II	C208 - Cessna 208 Caravan	1A	276	184	46	16	32	16	28	24	44	6
	DH6 - De Havilland Canada DHC-6 Twin Otter	1A	0	4	0	0	0	0	0	0	0	0
	DHC6 - DeHavilland Twin Otter	1A	8	4	2	2	0	0	2	2	0	0
	PC12 - Pilatus PC-12	1A	300	334	502	536	610	662	840	1,372	1,606	1,686
	Total		584	526	550	554	642	678	870	1,398	1,650	1,692
A-III	DHC7 - De Havilland DHC-7	3	0	0	0	0	0	0	0	6	0	0
	Total		0	0	0	0	0	0	0	6	0	0
B-I	AC80 - Aero Commander Turbo 680	1A	0	0	0	0	0	2	0	0	0	0
	BE10 - Beech King Air 100 A/B	1A	94	84	68	68	68	74	30	12	8	6
	BE40 - Raytheon/Beech Beechjet 400/T-1	1A	1,124	1,016	884	788	682	836	932	882	1,188	1,244
	BE9 - Beechcraft C99 Airliner; Beech Aircraft	1A	2	0	2	0	0	0	2	0	0	0
	BE90 - Beech King Air 90	1A	2	0	0	2	0	0	0	0	0	0
	BE9L - Beech King Air 90	1A	1,250	1,010	1,044	712	738	688	598	772	966	982
	C25M - Cessna Citation M2	1A	0	0	0	0	22	52	48	36	80	110
	C425 - Cessna 425 Corsair	1A	80	100	94	70	90	58	50	26	64	72
	C500 - Cessna 500/Citation I	2A	20	12	6	8	8	8	10	2	14	18
	C501 - Cessna I/SP	2A	76	68	68	42	26	20	22	8	48	36
	C510 - Cessna Citation Mustang	1A	256	180	194	114	112	220	128	42	58	82
	C525 - Cessna CitationJet/CJ1	1A	910	1,144	774	444	398	366	406	170	296	424
	C526 - Cessna 526 CitationJet	1A	0	0	0	2	0	2	0	0	0	0
	CL41 - Canadair CL-41 Tutor	1A	0	0	0	2	0	0	0	0	0	0
	E50P - Embraer Phenom 100	1B	998	1,122	1,240	1,294	2,208	2,506	2,288	1,236	1,420	1,184
	FA10 - Dassault Falcon/Mystère 10	1B	22	24	12	26	28	10	22	2	10	20
	H25C - BAe/Raytheon HS 125-1000/Hawker 1000	1B	2	12	14	26	12	10	12	4	14	18
	HDJT - HONDA HA-420 HondaJet	1A	0	6	0	4	26	28	42	76	96	204
	L29 - Aero L-29 Delfin	1B	0	2	0	0	0	0	0	0	0	0
	L39 - Aero L-139 Albatross	1B	4	4	0	0	0	0	0	0	0	0
	MU2 - Mitsubishi Marquise/Solitaire	1A	16	10	28	6	90	130	108	22	34	28
	MU30 - Mitsubishi MU300/ Diamond I	1A	62	66	48	26	26	6	0	2	0	4
	P180 - Piaggio P-180 Avanti	2A	184	102	88	46	68	74	46	36	36	26

ARC	Aircraft	TDG	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
B-I Cont.	PA42 - Cheyenne III/IV; Piper Aircraft	2A	0	0	0	0	0	2	0	0	0	0
	PAY1 - Piper Cheyenne 1	2A	24	48	42	18	30	26	12	6	24	10
	PAY2 - Piper Cheyenne 2	2A	64	56	44	48	42	24	14	18	8	24
	PAY3 - Piper PA-42-720 Cheyenne 3	2A	26	28	36	42	44	18	14	8	14	0
	PAY4 - Piper Cheyenne 400	2A	0	2	0	0	2	0	0	0	0	0
	PAYE - Cheyenne	2A	0	0	2	0	0	0	0	0	0	0
	PRM1 - Raytheon Premier 1/390 Premier 1	1A	198	206	214	226	244	254	158	64	86	94
	SBR1 - North American Rockwell Sabre 40/60	1A	78	36	44	40	26	14	14	12	16	8
	SJ30 - Swearingen SJ-30	1A	0	0	0	0	0	0	2	0	0	0
	TEX2 - Raytheon Texan 2	1A	0	4	8	8	6	12	8	0	8	8
	Total		0	0	0	0	0	0	0	6	0	0
B-II	AC69 - Jet Prop /Gulfstream	2A	0	2	0	0	0	0	0	0	0	0
	AC90 - Gulfstream Commander	2A	20	36	24	38	32	12	18	6	2	4
	B190 - Beech 1900/C-12J	2A	6	6	6	10	6	4	2	0	8	16
	B350 - Beech Super King Air 350	2A	388	456	488	462	478	398	352	300	454	614
	BE20 - Beech 200 Super King	2A	1,914	1,918	1,828	1,388	1,486	1,514	1,552	1,206	1,954	2,088
	BE30 - Raytheon 300 Super King Air	2A	98	108	142	98	154	162	134	124	172	128
	BE9F - Beechcraft 1900 Freighter	2A	0	2	0	0	0	0	0	0	0	0
	BE9T - Beech F90 King Air	2A	62	86	54	50	58	64	46	20	20	56
	C25A - Cessna Citation CJ2	2A	394	544	944	1,374	1,308	1,306	944	830	928	318
	C25B - Cessna Citation CJ3	2A	282	404	534	516	482	496	612	424	604	1,056
	C25C - Cessna Citation CJ4	1B	32	48	134	160	214	188	144	76	160	178
	C441 - Cessna Conquest	1A	148	150	166	164	142	130	98	44	62	96
	C550 - Cessna Citation II/Bravo	1A	564	512	520	472	392	414	488	242	340	408
	C551 - Cessna Citation II/SP	1A	4	0	12	4	4	6	4	6	4	34
	C55B - Cessna Citation Bravo	1A	0	0	0	0	0	2	32	22	44	82
	C560 - Cessna Citation V/Ultra/Encore	2A	1,168	1,122	558	644	622	534	588	510	810	818
	C56X - Cessna Excel/XLS	1B	1,388	1,644	2,014	1,976	2,028	1,796	1,890	1,052	1,578	2,082
	C680 - Cessna Citation Sovereign	1B	464	472	552	450	534	444	402	230	452	528
	C68A - Cessna Citation Latitude	1B	0	0	0	4	156	262	592	622	1,038	1,036
	C700 - Cessna Citation Longitude	1B	0	0	0	0	0	8	6	18	78	120
	C750 - Cessna Citation X	1B	780	936	666	690	584	518	482	444	678	652
	CL30 - Bombardier (Canadair) Challenger 300	1B	450	492	616	580	546	596	526	360	418	612
	CL35 - Bombardier Challenger 300	1B	0	0	10	268	468	494	472	470	938	1,316
	D328 - Dornier 328 Series	1B	0	0	10	2	14	12	4	2	2	0
	E110 - Embraer EMB110	2A	2	2	2	6	4	8	14	6	8	4
	E120 - Embraer Brasilia EMB 120	3	4	2	14	8	6	16	16	12	12	12
	E55P - Embraer Phenom 300	1B	594	1,020	1,208	1,242	1,608	1,908	2,190	2,182	3,842	3,488
	F2TH - Dassault Falcon 2000	2A	408	380	424	490	404	356	484	308	504	604
	F900 - Dassault Falcon 900	2A	594	516	374	340	254	264	180	126	238	342
	FA20 - Dassault Falcon/Mystère 20	1B	48	42	308	80	58	70	42	56	48	14
	FA50 - Dassault Falcon/Mystère 50	1B	144	112	80	96	100	88	90	70	132	148
	HA4T - Hawker 4000	1B	288	304	318	286	450	342	420	220	324	422
	J328 - Fairchild Dornier 328 Jet	1B	10	6	0	10	24	12	8	2	0	4
	JS31 - BAe-3100 Jetstream	1B	0	4	8	18	14	0	2	0	0	0

ARC	Aircraft	TDG	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
B-II Cont.	JS32 - BAe Jetstream 31	1B	2	0	0	0	0	0	0	0	0	0
	PC24 - Pilatus PC-24	1B	0	0	0	0	4	4	48	44	54	66
	SF34 - Saab SF 340	3	4	0	0	0	0	0	0	0	0	6
	SH33 - Shorts 330	1B	2	0	0	0	0	0	2	0	0	0
	SH36 - Shorts 360	1B	0	0	2	2	4	12	2	0	0	2
	SW2 - Swearingen Merlin 2	1B	2	0	0	0	0	0	0	0	0	0
	SW3 - Fairchild Swearingen SA-226T/TB Merlin 3	1B	22	10	18	28	22	4	4	4	2	8
	SW4 - Swearingen Merlin 4/4A Metro2	1B	58	52	72	44	50	72	56	46	66	44
	Total		10,344	11,388	12,106	12,000	12,710	12,516	12,946	10,084	15,974	17,406
B-III	AT43 - Aérospatiale/Alenia ATR 42-200/300/320	5	0	2	2	0	0	0	0	0	0	0
	C2 - Grumman C-2 Greyhound	3	2	0	0	0	0	0	0	0	2	0
	CN35 - CASA CN-235	1A	0	0	6	2	4	0	0	0	0	0
	CVLT - Convair CV-540/580/600/640, VC-131H	3	0	6	4	0	0	0	0	0	4	0
	DH8A - Bombardier DHC8-100	3	4	0	0	0	0	0	0	0	0	0
	DH8C - Dash 8/DHC8-300	3	0	0	0	2	0	0	4	0	2	4
	FA7X - Dassault Falcon F7X	2A	12	24	26	18	22	34	26	6	16	24
	FA8X - Dassault Falcon 8X	1B	0	0	0	0	0	0	0	0	2	0
	GL5T - Bombardier BD-700 Global 5000	2B	18	20	28	30	96	148	122	62	138	136
	GL7T - Bombardier Global 7500	2B	0	0	0	0	0	8	0	0	8	0
	GLEX - Bombardier BD-700 Global Express	2B	78	50	52	48	58	50	78	60	108	130
	SB20 - Saab 2000	3	2	10	2	2	0	4	6	2	6	18
	Total		1116	112	120	102	180	244	236	130	286	312
C-I	H25A - BAe HS 125-1/2/3/400/600	1B	12	10	12	8	2	8	4	2	0	4
	HAR - Boeing AV-8 Harrier	1B	0	2	2	0	0	0	0	0	0	0
	HAWK - BAe Systems Hawk	1B	0	0	8	0	2	2	4	0	0	0
	HS25 - BAe HS 125; British Aerospace	1B	0	4	2	0	0	0	0	0	0	0
	LJ24 - Bombardier Learjet 24	1B	2	0	2	28	2	0	0	0	0	0
	LJ25 - Bombardier Learjet 25	1B	20	20	22	0	4	0	0	0	0	0
	LJ31 - Bombardier Learjet 31/A/B	1B	262	268	214	448	508	378	362	356	336	390
	LJ40 - Learjet 40; Gates Learjet	1B	368	402	328	192	232	202	170	140	204	282
	LJ45 - Bombardier Learjet 45	1B	538	640	442	560	494	448	388	316	368	620
	LJ55 - Bombardier Learjet 55	1B	50	56	44	48	40	22	42	30	36	28
	LJ60 - Bombardier Learjet 60	1B	194	214	202	154	248	180	140	188	272	338
	LR45 - Learjet 45	1B	0	2	0	0	0	0	0	0	0	0
	LR55 - LearJet 55	1B	0	0	0	2	0	0	0	0	0	0
	WW23 - IAI 1123 Westwind	1B	0	0	0	0	0	0	2	0	0	0
	WW24 - IAI 1124 Westwind	1B	230	230	310	272	200	194	174	134	268	90
	Total		1,676	1,848	1,588	1,712	1,732	1,434	1,286	1,166	1,484	1,752
C-II	A10 - Fairchild A10	1A	4	8	6	6	8	2	16	2	8	18
	A10C - Model A10	1A	0	0	0	0	0	4	4	0	0	0
	ASTR - IAI Astra 1125	1B	60	46	30	22	28	78	82	56	76	120
	C650 - Cessna III/VI/VII	1B	206	212	206	142	174	146	142	124	152	218
	CL60 - Bombardier Challenger 600/601/604	1B	624	694	608	528	688	690	626	376	608	536
	CRJ1 - Bombardier CRJ-100	1B	4	2	2	0	0	0	0	0	0	0
	CRJ2 - Bombardier CRJ-200	1B	4	6	8	6	8	16	8	2	10	6

ARC	Aircraft	TDG	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
C-II Cont.	CRJ7 - Bombardier CRJ-700	2B	0	0	0	2	0	2	0	2	0	2
	E135 - Embraer ERJ 135/140/Legacy	2B	72	56	70	158	34	10	16	8	20	16
	E145 - Embraer ERJ-145	2B	4	10	6	8	22	10	10	6	6	2
	E35L - Embraer 135 LR	2B	0	0	16	16	16	18	20	16	38	26
	E45X - Embraer ERJ 145 EX	2B	0	2	0	8	2	8	0	0	6	0
	E545 - Embraer EMB-545 Legacy 450	1B	0	0	0	14	62	160	164	110	154	194
	E550 - Embraer Legacy 500	1B	0	4	8	34	38	48	62	48	52	20
	G150 - Gulfstream G150	1B	42	54	78	82	98	88	76	58	72	76
	G159 - Gulfstream Aerospace G 159/VC-4	1B	2	0	0	0	0	0	0	0	0	0
	G280 - Gulfstream G280	1B	6	62	88	88	88	126	162	92	212	264
	GLF3 - Gulfstream III/G300	2A	16	30	22	18	8	2	16	6	6	2
	H25B - BAe HS 125/700-800/Hawker 800	1B	1,886	1,832	1,736	1,498	1,304	1,008	1,012	630	808	806
	L29B - Lockheed L-1329 Jetstar 731	1A	72	68	64	32	0	2	0	0	0	0
	LJ70 - Learjet 70	1B	0	32	90	54	34	54	66	40	82	120
	LJ75 - Learjet 75	1B	4	26	108	130	280	312	290	266	372	308
	STAR - Beech 2000 Starship	3	4	0	0	0	0	0	0	0	0	0
	Total		3,010	3,144	3,146	2,846	2,892	2,784	2,772	1,842	2,682	2,734
C-III	A319 - Airbus A319	3	14	4	6	2	2	2	2	0	2	0
	A320 - Airbus A320 All Series	3	22	30	24	14	16	12	16	8	14	16
	A321 - Airbus A321 All Series	3	0	0	8	0	4	0	8	0	2	0
	B722 - Boeing 727-200	4	0	4	0	0	0	0	0	0	0	2
	B732 - Boeing 737-200/VC96	3	4	0	2	0	4	0	2	0	0	0
	B733 - Boeing 737-300	3	0	2	0	0	6	0	0	0	6	2
	B734 - Boeing 737-400	3	8	10	18	8	16	20	26	12	32	8
	B735 - Boeing 737-500	3	0	0	0	0	2	0	0	0	0	0
	B737 - Boeing 737-700	3	0	6	6	8	10	0	16	10	10	38
	B73Q - Boeing 737 Stage 3	3	0	2	0	0	0	0	0	0	0	0
	BCS1 - Bombardier CS100	3	0	0	2	0	0	0	0	0	0	0
	CRJ9 - Bombardier CRJ-900	2B	0	0	0	0	2	0	0	0	0	0
	DH8D - Bombardier Q-400	5	0	4	0	0	0	0	0	0	0	0
	E170 - Embraer 170	3	0	2	0	0	0	0	32	6	0	10
	E190 - Embraer 190	3	0	0	0	0	0	2	0	0	0	4
	E75L - Embraer 175	3	0	0	0	0	2	0	0	0	0	0
	MD81 - Boeing (Douglas) MD 81	4	6	6	4	6	6	6	6	2	6	8
	P3 - Lockheed P-3C Orion	5	0	0	0	2	0	0	0	0	2	0
	Total		54	70	70	40	70	42	108	38	74	88
C-IV	A400 - Airbus A400M Atlas	3	0	0	0	0	2	0	0	0	0	0
	B752 - Boeing 757-200	4	16	36	24	40	30	40	44	18	34	34
	B763 - Boeing 767-300	5	2	0	0	0	0	2	0	0	0	0
	C130 - Lockheed 130 Hercules	1B	24	22	18	16	12	14	12	14	18	18
	C17 - Boeing Globemaster 3	5	10	8	8	2	0	14	0	0	14	0
	C30J - C-130J Hercules ; Lockheed	1B	0	4	10	2	6	6	0	8	24	4
	EA30 - Airbus A300 All Series	5	0	0	2	0	0	0	0	0	0	0
	K35R - Boeing KC-135 Stratotanker	4	0	0	2	0	0	0	2	0	0	0
	Total		52	70	64	60	50	76	58	40	90	56

ARC	Aircraft	TDG	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
C-V	A350 - Airbus 350	6	0	4	0	0	0	0	0	0	0	0
	A36 - Airbus 360	6	2	4	0	0	0	0	0	0	0	0
	B2 - Northrop B-2 Spirit	6	0	0	0	0	2	0	0	0	0	0
	Total		2	8	0	0	2	0	0	0	0	0
D-I	F15 - Boeing F-15 Eagle	1A	2	0	0	0	0	0	0	2	0	0
	F18 - Boeing FA-18 Hornet	1A	12	4	6	0	0	0	4	0	0	0
	F18H - F/A 18 Hornet	1A	0	0	0	0	2	2	12	0	0	0
	F18S - F18 Hornet	1A	0	0	0	2	2	2	4	14	0	2
	F22 - Boeing Raptor F22	1A	0	0	0	0	0	0	2	4	0	0
	F5 - Northrop F-5 Freedom Fighter	1A	0	2	0	0	0	0	0	0	0	0
	FA18 - F18 Hornet	1A	0	0	4	0	0	0	0	0	0	0
	LJ35 - Bombardier Learjet 35/36	1B	236	176	156	176	154	144	142	140	186	134
	LR35 - Learjet 35	1B	0	0	0	0	2	0	0	0	0	0
	T38 - Northrop T-38 Talon	1A	46	30	6	16	20	14	10	4	0	0
	Total		296	212	172	194	180	162	174	164	186	136
D-II	G450 - Gulfstream G450	2A	0	0	2	0	0	0	0	0	0	0
	GALX - IAI 1126 Galaxy/Gulfstream G200	1B	226	172	138	96	86	76	80	50	102	80
	GLF2 - Gulfstream II/G200	1B	28	22	16	28	8	12	12	2	8	2
	GLF4 - Gulfstream IV/G400	2A	462	460	548	626	644	724	540	382	630	696
	Total		716	654	704	750	738	812	632	434	740	778
D-III	B738 - Boeing 737-800	3	88	82	96	86	68	64	58	62	172	138
	B739 - Boeing 737-900	3	0	4	4	14	26	26	34	34	48	56
	G550 - Gulfstream G550	2B	0	0	0	0	0	0	0	2	0	0
	GA5C - G-7 Gulfstream G500	2B	0	0	0	0	0	8	172	178	212	148
	GA6C - G-7 Gulfstream G600	2B	0	0	0	0	0	0	2	8	18	18
	GLF5 - Gulfstream V/G500	2B	154	142	134	208	298	228	182	154	254	322
	GLF6 - Gulfstream	2B	4	6	20	12	26	26	46	50	36	110
	MD83 - Boeing (Douglas) MD 83	4	8	4	2	6	0	0	0	0	0	10
	MD88 - Boeing (Douglas) MD 88	4	0	4	0	0	0	0	0	0	0	0
	Total		254	242	256	326	418	352	494	488	740	802
D-IV	DC10 - Boeing (Douglas) DC 10-10/30/40	6	0	0	0	0	0	0	2	0	0	0
	Total		0	0	0	0	0	0	2	0	0	0
D-V	B744 - Boeing 747-400	5	0	0	0	0	0	0	2	0	0	0
	Total		0	0	0	0	0	0	2	0	0	0
E-I	AJET - Dassault-Bréguet/Dornier Alpha Jet	1A	0	0	0	0	6	0	0	0	0	0
	F16 - Lockheed F-16 Fighting Falcon	1A	2	4	0	8	0	0	0	0	0	0
	Total		2	4	0	8	6	0	0	0	0	0

JETS AND TURBOPROPS

Type	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Jets	17,776	18,968	19,084	18,886	20,400	20,450	20,526	15,156	22,838	24,470
TP	5,438	5,268	5,320	4,322	4,650	4,538	4,556	4,382	5,948	6,324
Total	23,214	24,236	24,404	23,208	25,050	24,988	25,082	19,538	28,786	30,794

Source: TFMSC 2013 through 2022 - Data normalized annually

AIRPORT REFERENCE CODE (ARC) SUMMARY

ARC	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
A-I	616	616	674	554	434	448	536	312	392	436
A-II	584	526	550	554	642	678	870	1,398	1,650	1,692
A-III	0	0	0	0	0	0	0	6	0	0
B-I	5,492	5,342	4,954	4,062	4,996	5,440	4,966	3,436	4,488	4,602
B-II	10,344	11,388	12,106	12,000	12,710	12,516	12,946	10,084	15,974	17,406
B-III	116	112	120	102	180	244	236	130	286	312
C-I	1,676	1,848	1,588	1,712	1,732	1,434	1,286	1,166	1,484	1,752
C-II	3,010	3,144	3,146	2,846	2,892	2,784	2,772	1,842	2,682	2,734
C-III	54	70	70	40	70	42	108	38	74	88
C-IV	52	70	64	60	50	76	58	40	90	56
C-V	2	8	0	0	2	0	0	0	0	0
D-I	296	212	172	194	180	162	174	164	186	136
D-II	716	654	704	750	738	812	632	434	740	778
D-III	254	242	256	326	418	352	494	488	740	802
D-IV	0	0	0	0	0	0	2	0	0	0
D-V	0	0	0	0	0	0	2	0	0	0
E-I	2	4	0	8	6	0	0	0	0	0
TOTAL	23,214	24,236	24,404	23,208	25,050	24,988	25,082	19,538	28,786	30,794

AIRCRAFT APPROACH CATEGORY (AAC)

AAC	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
A	1,200	1,142	1,224	1,108	1,076	1,126	1,406	1,716	2,042	2,128
B	15,952	16,842	17,180	16,164	17,886	18,200	18,148	13,650	20,748	22,320
C	4,794	5,140	4,868	4,658	4,746	4,336	4,224	3,086	4,330	4,630
D	1,266	1,108	1,132	1,270	1,336	1,326	1,304	1,086	1,666	1,716
E	2	4	0	8	6	0	0	0	0	0
TOTAL	23,214	24,236	24,404	23,208	25,050	24,988	25,082	19,538	28,786	30,794

AIRPLANE DESIGN GROUP (ADG)

ADG	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
I	8,082	8,022	7,388	6,530	7,348	7,484	6,962	5,078	6,550	6,926
II	14,654	15,712	16,506	16,150	16,982	16,790	17,220	13,758	21,046	22,610
III	424	424	446	468	668	638	838	662	1,100	1,202
IV	52	70	64	60	50	76	60	40	90	56
V	2	8	0	0	2	0	2	0	0	0
TOTAL	23,214	24,236	24,404	23,208	25,050	24,988	25,082	19,538	28,786	30,794

TAXIWAY DESIGN GROUP (TDG)

TDG	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1A	6,126	5,782	5,416	4,326	4,184	4,446	4,606	4,166	5,400	6,034
1B	10,338	11,520	12,170	11,910	13,928	13,768	13,926	10,322	15,676	16,600
2A	6,220	6,412	6,262	6,282	6,182	6,050	5,626	4,332	6,498	6,884
2B	330	286	326	490	554	516	648	546	844	910
3	156	160	186	144	164	146	220	152	312	312
4,5,6	44	72	44	56	38	62	56	20	56	54
TOTAL	23,214	24,236	24,404	23,208	25,050	24,988	25,082	19,538	28,786	30,794

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FUTURE CRITICAL AIRCRAFT

It is not unusual for an airport to transition from one critical aircraft to another. For MKC, the critical aircraft for the AAC and ADG are forecast to remain the same. That is AAC D and ADG III are expected to account for more than 500 annual operations throughout the planning period. This is primarily based on the fact that there are very few general aviation aircraft that exceed these parameters. In addition, charter operations by even larger aircraft are not anticipated to exceed the 500 operations threshold for either the AAC or ADG. Therefore, the future AAC and ADG will remain D-III.

Determining the future taxiway design group is a little more challenging because there are only a few general aviation aircraft that have a TDG higher than the current 2B TDG. Examples are the Embraer Lineage and Boeing Business Jet, which are general aviation variants of passenger transport aircraft. It is also assumed that charters using the Boeing 737 and 757 will continue to operate and both of these would contribute to the TDG 3 classification. The primary difference between TDG 2B and 3 is the standard taxiway width increases from 35 feet to 50 feet. The current ALP and the recent Taxiway L construction project utilize the 50-foot-wide taxiway standard.

The trend over the last 10 years has been an increasing number of TDG 3 operations as documented in the TFMSC data summarized on **Exhibit 2K**. That data shows that in 2013 there were 200 operations by TDG 3 aircraft and in 2022 there were 366. By extrapolating that growth rate (6.23%), there would be more than 500 operations by TDG 3 aircraft by 2028. Even if an annual growth rate of 2.0 percent were applied, there would still be more than 500 annual operations by TDG 3 aircraft within the 20-year planning horizon. Therefore, it is recommended that a future TDG of 3 remain the future planning standard for the airport.

The analysis presented examined each of the three elements for classifying the airport design aircraft. **The future critical aircraft is characterized as D-III-3.** This could be represented by a single aircraft type or by a combination of aircraft types with more than 500 operations. The overall airport critical aircraft also applies to the primary runway, Runway 1-19.

The future critical aircraft for Runway 4-22 should at a minimum be maintained as B-II. However, additional analysis will be undertaken subsequently in this study to determine the appropriate future critical aircraft for Runway 4-22.

RUNWAY DESIGN CODE

The RDC relates to specific FAA design standards that should be met in relation to a runway. The RDC takes into consideration the AAC, ADG, and the RVR. Each runway will have its own RDC and, in most cases, the critical aircraft will also be the RDC for the primary runway.

Runway 1-19 is 6,827 feet long and 150 feet wide. Runway 19 has an ILS instrument approach with visibility minimums of not lower than ¾-mile. While an instrument approach with ½-mile visibility minimums would be optimal for this airport, it has long been considered unfeasible due to required

missed approach procedures. Based on current and forecast activity, the RDC for Runway 1-19 is **D-III-4000,** and it is planned to remain D-III-4000 through the planning period. Additional instrument approach analysis to be analyzed in the Facility Requirements section of this master plan will analyze the feasibility of lower visibility minimums for all runway ends.

Runway 4-22 is 5,050 feet long and 100 feet wide. This runway also has an ILS instrument approach with visibility minimums of ¾-mile to Runway 3. This runway is currently classified as a B-II runway on the current ALP, which is planned to be maintained throughout this master plan. The RDC for this runway now and in the future is **B-II-4000**.

APPROACH AND DEPARTURE REFERENCE CODES

The approach and departure reference codes (APRC and DPRC) describe the operational capabilities of each runway and the adjacent parallel taxiways, where no special operating procedures are necessary. Essentially, the APRC and DPRC describe the current conditions at an airport in runway classification terms when considering the parallel taxiway. Runway 1-19 is served by parallel Taxiways L and G. Taxiway L is 400 feet from the runway centerline and Taxiway G is 412 feet from the runway centerline. Portions of Taxiways L and G are also parallel to Runway 4-22. Taxiway G is 358 feet from Runway 4-22 and Taxiway L is 400 feet. The runway/taxiway system meets the standards associated with the current and future APRC and DPRC.

CRITICAL AIRCRAFT SUMMARY

Table 2QQ summarizes the airport and runway classification for MKC. The current critical aircraft is defined by those aircraft in D-III-2B, and the future critical aircraft is D-III-3. The current and future RDC for Runway 1-19 is D-III-4000. The current and future RDC for Runway 4-22 is B-II-4000.

TABLE 2PP | Airport and Runway Classifications

	Current	Future
Airport Reference Code (ARC)	D-III-4000	D-III-4000
Airport Design Aircraft	D-III-2B	D-III-3
Runway Design Code (RDC)		
Runway 1-19	D-III-4000	D-III-4000
Runway 4-22	B-II-4000	B-II-4000
Approach Reference Code (APRC)		
Runway 1-19	D-IV-4000/D-V-4000	D-IV-4000/D-V-4000
Runway 4-22	B-III-4000	B-III-4000
Departure Reference Code (DPRC)		
Runway 1-19	D-IV/D-V	D-IV/D-V
Runway 4-22	B-III/D-II	B-III/D-II

Source: Current Airport Layout Plan; FAA AC 150/5300-13B, Airport Design

SUMMARY

This study has outlined the various activity levels that might reasonably be anticipated over the 20-year planning period, as well as the critical aircraft for the airport. Based aircraft are forecast to increase from 196 in 2023 to 226 by 2042, for an annual growth rate of 0.71 percent. Total operations are forecast to increase from 114,094 in 2022 to 157,008 by 2042, which is an annual growth rate of 1.70 percent.

The critical aircraft for the airport was determined by examining the FAA TFMSC database of flight plans. The current critical aircraft is described as D-III-2B and is best represented by large business jets, such as the Gulfstream 550. In the future, aircraft with wider wheelbases may frequent the airport, which would lead to a future critical aircraft of D-III-3.