WORKING PAPER 3

AVIATION DEMAND FORECASTS

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VERSION 0.1

Prepared by RS&H for the

RS&H

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CHAPTER 3

FORECAST OF AVIATION DEMAND

3.1 INTRODUCTION

Chapter 3 provides the 20-year forecast of aviation activity at Tulsa Riverside Airport (RVS or the Airport). The development of a credible forecast is an essential component of the master plan process as it provides the necessary metrics for evaluating and planning the capacity of an airport's facilities and what is required of them over the planning horizon.

A key consideration in the development of aviation forecasts is comparison of the forecast with the Federal Aviation Administration (FAA) Terminal Area Forecast (TAF). The TAF is the official forecast for active airports in the National Plan of Integrated Airport Systems (NPIAS) and is prepared to meet budget and planning needs of the FAA. In accordance with FAA Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions, paragraph 706.b(3), "The sponsor's forecast must be consistent with the [TAF]. To be consistent with the TAF, the sponsor's 5-year forecast should be within 10 percent of the TAF, and a 10-year forecast should be within 15 percent of the TAF."

The FAA must approve sponsor forecasts before they can be used with an airport master plan or an environmental document that requires a forecast. If these stated thresholds are exceeded, the FAA Region office in which the airport is located, will forward the forecasts to FAA headquarters for approval.

During the production of this forecast and report, the aviation industry has been recovering from the devasting impacts of the COVID-19 Public Health Emergency (or pandemic) virtually shut down aviation in the United States of America (U.S.) and most of the world.

3.1.1 Forecast Details

The following forecast details provide the extent, data sources, methodologies, and any other specifics that were used in the process of producing these forecasts. Further discussion on methodologies and points of interest will be expanded upon in the following sections of this document.

3.1.1.1 Forecast Extent:

- Base Year: 2021
- Base Year +1 Forecast Year: 2022
- Base Year +5 Forecast Year: 2027
- Base Year +10 Forecast Year: 2032
- Base Year +15 Forecast Year: 2037
- Base Year +20 Forecast Year: 2042

3.1.1.2 Forecast Data

- Socioeconomic data is provided by Woods & Poole (W&P), Inc. 2021. Using this dataset, the last year of historically confirmed data is 2019.
- Historical Operations data is gathered from the FAA OPSNET database on a monthly basis as it becomes available.
- Peak Daily Operations were gathered from the FAA OPSNET database on an annual basis for 2021.
- Based aircraft data was provided by the Airport, and further detailed using the FAA's Aircraft Registration N-Number Lookup.

- FAA TAF 2020, published in May 2021

3.1.1.3 Forecast Methodologies

The following methodologies were explored or used in the development of this forecast.

- Market share analysis
- Regression analysis
- Historical and socioeconomic trend analysis
- Time series modeling
- Public Health Emergency recovery-based scenarios

3.1.1.4 Forecast Assumptions

The following assumptions were built-into the forecast methodologies.

- The Airport will maintain its current role in the NPIAS
- The current proportion of itinerant operations by air taxi & commuter operations to total operations will remain consistent over the forecast horizon.
- The Airport's demand associated with transient aircraft will continue to increase over the forecast horizon.
- The existing fleet of aircraft are anticipated to be in operation over the forecast horizon
- Military operations remain constant over the forecast horizon.
- The airport traffic control tower (ATCT) will continue to operate from the hours of 06:00-22:00 over the forecast horizon.
- The average number of operations per flight school student will remain constant over the forecast horizon.
- Any decrease in activity relative to the public health emergency will recover within three years to 2019 levels.

3.1.1.5 Forecast Projections

The following projections will be made in the Base Case Forecast:

- Itinerant Operations
  - Air Taxi & Commuter Operations
  - Itinerant General Aviation Operations
- Local Operations (Local General Aviation or Civil Operations)
  - Flight School Students at Airport
- Based Aircraft
- Military Operations which will be the summation of itinerant and local military operations
- Total Operations which will be the summation of all airport operations including:
  - Helicopter Operations
  - IFR and VFR Operations and Annual Instrument Approaches
- Operations by Fleet, which will project the number of aircraft specific operations at RVS.

» Current/Future Critical Aircraft

The base case forecast for total operations and based aircraft will be compared with the FAA TAF 2020 projections for the forecast years 2027 (+5 years) and 2032 (+10 years) to make sure that the projections are within the FAA's threshold for variances. [1] Additionally, an alternative High Case Scenario and Low Case Scenario Forecast will be prepared for itinerant operations, local operations, and total operations.

3.1.2 NPIAS Role

Tulsa Riverside Airport is defined in the FAA's National Plan of Integrated Airport Systems (NPIAS) for 2021-2025 as a nonprimary[2], regional, and reliever airport. The NPIAS describes regional airports as those that serve relatively large populations and are located within large metropolitan areas. On average these types of airports average three based jets and 86 based aircraft overall. Further, reliever airports are defined by the Secretary of Transportation to relieve congestion at a commercial service airport and to provide more general aviation access to the overall community.[3]

[1] Enplanements are also compared with the FAA TAF, but they are not applicable for Tulsa Riverside Airport.
[2] Nonprimary airports have less than 10,000 enplanements, or passenger boardings annually, and primarily support general aviation aircraft.
[3] 49 USC § 47102(23)

3.2 HISTORICAL ACTIVITY AND REVIEW OF OTHER FORECASTS

The following sections will look at the recent aviation activity of Tulsa Riverside Airport, as well as multiple forecasts from a variety of sources. Some of these forecasts are specific to RVS, while others are much broader scale and focus upon the anticipated trends for the U.S. as a whole.

3.2.1 Historical Activity

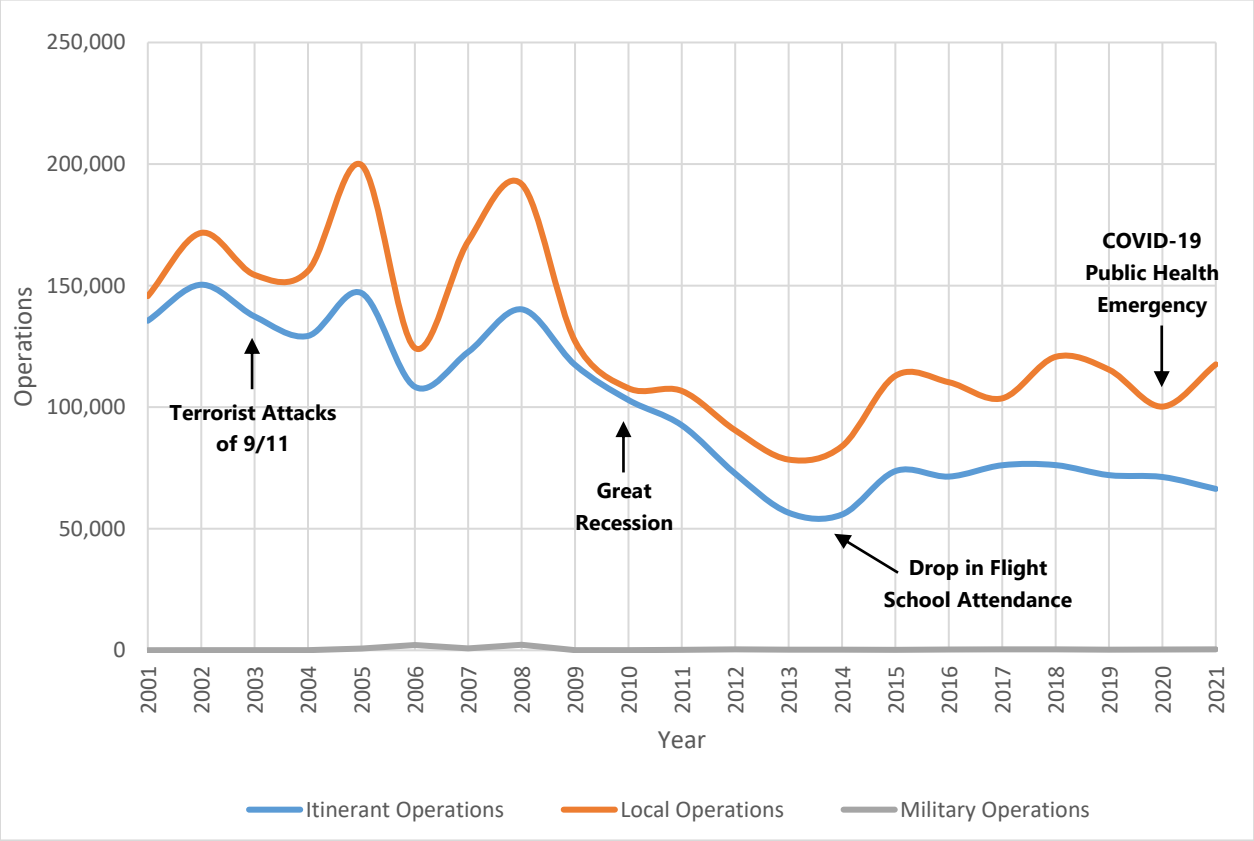
A historical review of activity at Tulsa Riverside Airport over the past 20 years shows that Airport has experienced regular fluctuations in its growth patterns. A general review of the operations and their annual change, shows roughly two-year periods of increasing growth, followed by one-to-two-year periods of decreasing growth.

Specifically, some of these periods of decline were likely related to specific national events such as the terrorist attacks of 9/11 from 2002-2003, or the Great Recession causing a decrease in growth from 2007-2009, and a significant decline in flight school attendance that was most pronounced in 2013-2014 Over its history, the Airport showed resiliency with a quick recovery from events such as these.

Today, the Airport is in a period of growth as it recovers from the COVID-19 public health emergency in 2021. The COVID-19 public health emergency has caused fluctuations in many aspects of the aviation industry; however, general aviation has seemed to be the least affected. Much like the other events in its history, Tulsa Riverside Airport is showing a high likelihood of fully returning to 2019 (or pre-pandemic) totals in the very near future.

Figure 3-1 shows the historical annual growth rates for operations at Tulsa Riverside Airport from 2001-2021.

FIGURE 3-1
HISTORICAL ACTIVITY CHANGE



Source: RS&H, 2022; FAA OPSNET, 2001-20221

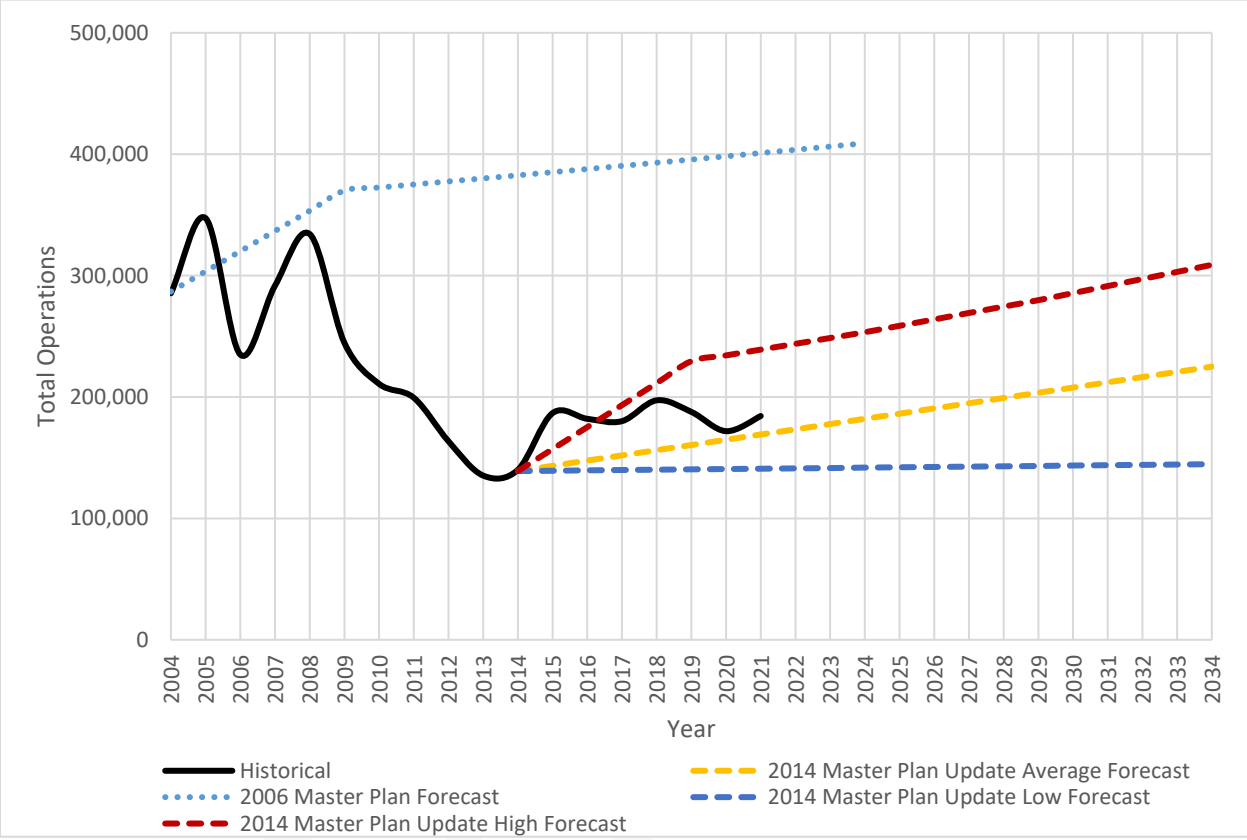
3.2.2 Previous Airport Master Plan Forecasts

Prior to the 2006 Richard Lloyd Jones, Jr.[4] Airport Master Plan, operations at the Airport were at a 20-year high with over 300,000 operations in 2005 and again in 2008. Shortly after the forecast was finalized the Great Recession in 2008 and 2009 caused a significant change in the operations forecast which was projected to be over 400,000 by 2021.

The 2014 Master Plan Forecast Update highlights declines from 2008-2014 due to decreasing numbers of flight school students and their associated activity. **Figure 3-2** shows a comparison of historical operations and the 2006 Airport Master Plan and 2014 Airport Master Plan Update forecasts.

[4] Richard Lloyd Jones Jr. Airport was renamed Tulsa Riverside Airport on January 1, 2022. https://www.tulsaairports.com/news/richard-lloyd-jones-jr-airport-name-being-changed-to-tulsa-riverside-airport/

FIGURE 3-2
PREVIOUS MASTER PLAN FORECASTS



Source: RVS Master Plan 2006 and RVS Master Plan Update 2014

3.2.3 FAA TAF 2020

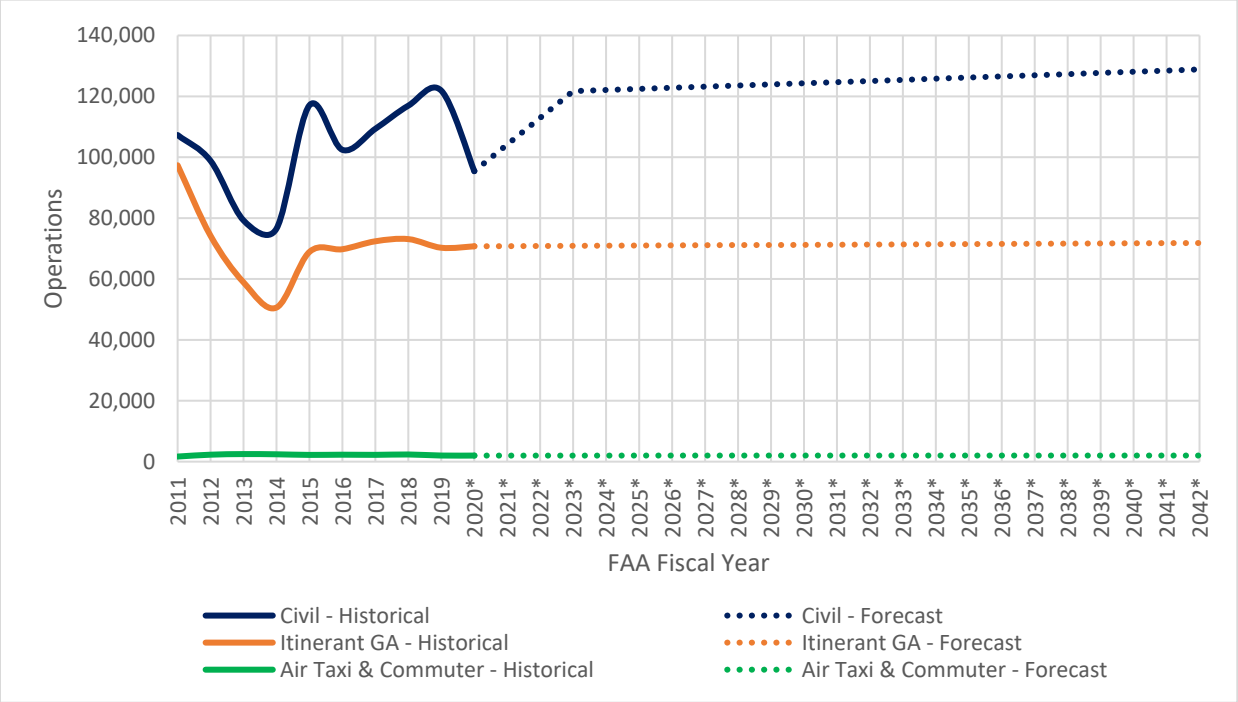
The FAA TAF 2020 was published in May 2021 for all active airports in the NPIAS. The forecast shows historical data through FAA fiscal year (FY)[5] 2019, with projections made through 2045. Because the TAF 2020 was made amidst the COVID-19 public health emergency and its recovery, the unique forecast for each airport accounts for the downturn and recovery from the pandemic to varying degrees based on airport type.

Time series analyses were the primary methodology for developing itinerant general aviation operations and local civil operations. On average the 2020 decline in these types of operations was significantly less than of passenger enplanements and commercial operations.

Figure 3-3 shows the air taxi & commuter, itinerant GA, and civil (or local) operations forecast projections for Tulsa Riverside Airport. A review of the operations by type shows that only civil operations are projected to have a period of recovery from the public health emergency, which was forecast to be four years or 2023.

[5] The FAA fiscal year goes from October 1 to September 30.

FIGURE 3-3
FAA TAF 2020 PROJECTIONS - RVS



Note: * Indicates forecasted years.
Source: FAA TAF 2020; RS&H, 2022

3.2.4 FAA Aerospace Forecast FY 2021-2041

The FAA's Aerospace Forecast provides valuable insight on annual trends in the aviation industry over the next 20 years. The following sections identify and summarize some of the trends that are relevant to Tulsa Riverside Airport, focusing on the air taxi & general aviation sector, as well as piloting, and general aviation aircraft fuel consumption.

3.2.4.1 Air Taxi & General Aviation Active Fleet

The outlook of the active air taxi & general aviation fleet is generated through the use of new aircraft deliveries forecasts, which use the data from the General Aviation Manufacturers Association (GAMA), along with assumptions of aircraft retirement rates. The generated growth rates of the fleet by aircraft categories are then applied to the Part 135 Activity Survey (GA Survey) fleet estimates. These forecasts portray the active fleet, which represents an aircraft that flies at least one hour per year.

Overall, the results of the GA Survey showed that the active fleet of general aviation aircraft declined by 0.4 percent in 2019 from its 2018 total. Because the general aviation sector was less impacted by the COVID-19 public health emergency than other aviation sectors, there is optimism that the decreases in the fleet, will recover to 2019 totals sooner than later. As a result, nearly all aircraft types are anticipated to increase in number from 2021 to 2041. **Table 3-1** shows some of the annual growth rates for aircraft types in the active fleet of air taxi and general aviation aircraft from 2021-2041.

TABLE 3-1
FORECAST OF ANNUAL GROWTH BY AIRCRAFT TYPE IN ACTIVE FLEET

Years	Fixed Wing			Rotorcraft	Experimental	Light Sport	Other	Total GA Fleet
	Piston	Turboprop	Jet					
2021-2031	-0.9%	0.2%	2.5%	1.3%	1.7%	5.4%	3.1%	0.1%
2021-2041	-0.9%	0.6%	2.3%	1.4%	1.4%	4.0%	1.6%	0.1%

Source: FAA Aerospace Forecast FY 2021-2041, Table 28

3.2.4.2 Air Taxi & General Aviation Hours Flown

Similar to the number of aircraft that are in the active fleet, the Aerospace Forecast also projects the number of hours flown by each group of aircraft. While for fixed wing piston aircraft flown hours are anticipated to decline by -0.7 percent over the planning horizon, the rest of the aircraft groups that were analyzed all show anticipated increases in flight time. Meanwhile, jet flying times are anticipated to increase by 5.0 percent in the short-term and 3.5 percent over the planning horizon. **Table 3-2** shows the annual growth rates for the hours flown of aircraft by group from 2021-2041.

TABLE 3-2
FORECAST OF ANNUAL GROWTH BY AIRCRAFT HOURS FLOWN IN ACTIVE FLEET

Years	Fixed Wing			Rotorcraft	Experimental	Light Sport	Other	Total GA Fleet
	Piston	Turboprop	Jet					
2021-2031	-1.0%	1.0%	5.0%	2.3%	3.8%	6.2%	6.7%	1.1%
2021-2041	-0.7%	1.0%	3.5%	2.0%	2.7%	4.5%	3.4%	1.0%

Source: FAA Aerospace Forecast FY 2021-2041, Table 29

3.2.4.3 Pilot Licenses

The FAA also conducts a forecast of pilots by certification category, using the data compiled by the Administration's Mike Monroney Aeronautical Center. The types of pilots that exist shed light on the types of pilots that will be trained to fly particular aircraft, and ultimately what types of equipment will be flown more commonly going forward. A look at the annual growth rates of some of the pilot types from 2021-2041 in **Table 3-3,** shows that from 2021-2041 the number of recreational and private pilots are expected to decrease, while sport, airline transport (ATP) and rotorcraft all show increasing annual growth rates.

TABLE 3-3
FORECAST OF ACTIVE PILOTS BY TYPES

Years	Recreational	Sport	Private	Commercial	Airline Transport	Rotorcraft Only	Total[1]	Instrument Rated
2021-2031	-3.5%	2.7%	-0.3%	0.0%	0.7%	1.5%	0.3%	0.4%
2021-2041	-3.4%	2.7%	-0.4%	-0.1%	0.7%	1.5%	0.2%	0.4%

Note: 1) Total (less students)
Source: FAA Aerospace Forecast FY 2021-2041, Table 30

When a regulatory change went into effect in April 2016 the expiration date on new student pilot certificates was removed, causing a cumulative increase in the number of student pilot certificates. As a result, the FAA has suspended the student pilot forecast since that time. The number of student pilots increased by 1.6 percent annually from 2011-2016.[6]

3.2.4.4 General Aviation Aircraft Fuel Consumption

Finally, the Aerospace Forecast provides historical data and projections on the amount of fuel that is consumed by aircraft type. From 2010-2020, only turboprops showed an annual growth rate of fuel consumption that increased, however, the newest projection for this metric in **Table 3-4** shows that in addition to turboprops, jets, and rotorcraft are all anticipated to increase fuel consumption from 2021-2041, thus showing an increase in jet fuel. Because piston aircraft are anticipated to consume less fuel over the forecast horizon, the AVGAS consumed somewhat aligns with its decreasing operational trend.

TABLE 3-4
FORECAST OF GENERAL AVIATION AIRCRAFT FUEL CONSUMPTION

	Piston				Rotorcraft				
Years	Single Engine	Multi-Engine	Turbo-props	Jets	Piston	Turbine	AVGAS	Jet Fuel	Total Fuel Consumed
2021-2031	-1.1%	-1.0%	0.7%	4.2%	2.2%	1.7%	-0.4%	3.5%	3.1%
2021-2041	-0.8%	-0.5%	0.6%	2.8%	1.9%	1.4%	-0.3%	2.4%	2.2%

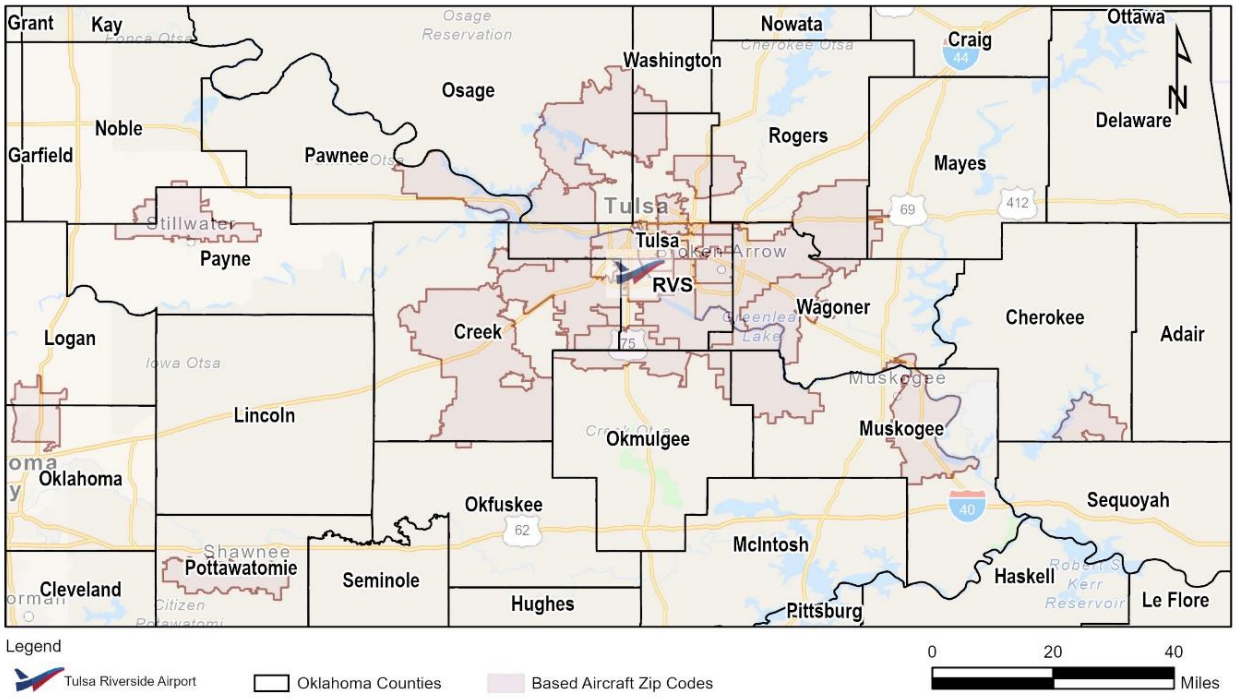
Source: FAA Aerospace Forecast FY 2021-2041, Table 31

[6] FAA Civil Airmen (2021) https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics/

3.3 AIRPORT SERVICE AREA

An airport service area provides a depiction of the geographic area from which the airport's customers and users are expected to originate from. In many cases there are multiple airports that compete with one another, making other variables such as the distance, costs and fees, and specific services/facilities significant drivers in the selection process. Because Tulsa Riverside Airport is a general aviation reliever airport with a flight school presence recognized nationally, the Airport consistently has a large number of local operations and based aircraft. Therefore, a zip code analysis was used to identify counties in which the based aircraft owner resided in. The results in **Figure 3-4** show that the majority of the addresses associated with the Airport's based aircraft records were in Tulsa County or the immediate vicinity.

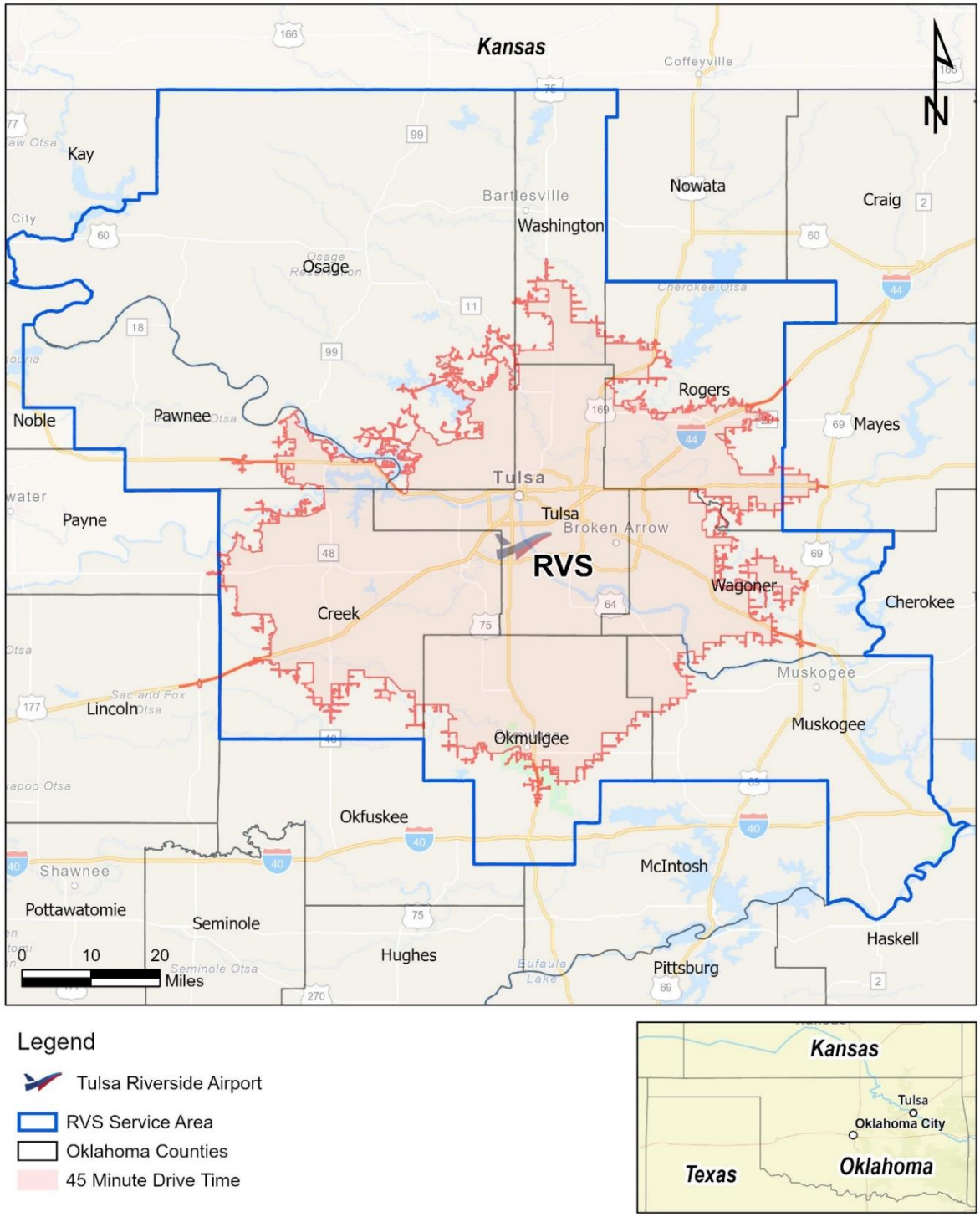
FIGURE 3-4
RVS BASED AIRCRAFT ANALYSIS



Note: 1) Addresses from some based aircraft were found to be outside of the extent of this map.
Source: RS&H, 2022

Additionally, the Airport's location was compared to cities and counties in the surrounding area to determine the extent of which individuals would likely be willing to drive for its facilities and services, using a drive time analysis (DTA). The DTA incorporated the Tulsa area's system of roadways under normal morning traffic conditions on an average weekday, assuming a user of the Airport would drive up to 45 minutes to get there. The results of the analysis showed that individuals could commute from the same counties that were identified in the based aircraft zip code analysis. Each of these analyses helps support and validate an RVS service area made up of the same counties within the Tulsa-Muskogee-Bartlesville, OK - Combined Statistical Area (CSA) which includes Creek, Muskogee, Okmulgee, Osage, Pawnee, Rogers, Tulsa, Wagoner, and Washington counties. **Figure 3-5** shows the RVS Service Area for this forecast with the 45-minute DTA overlaying it.

FIGURE 3-5
RVS SERVICE AREA



Source: RS&H, 2022

3.3.1 Geographic Attributes

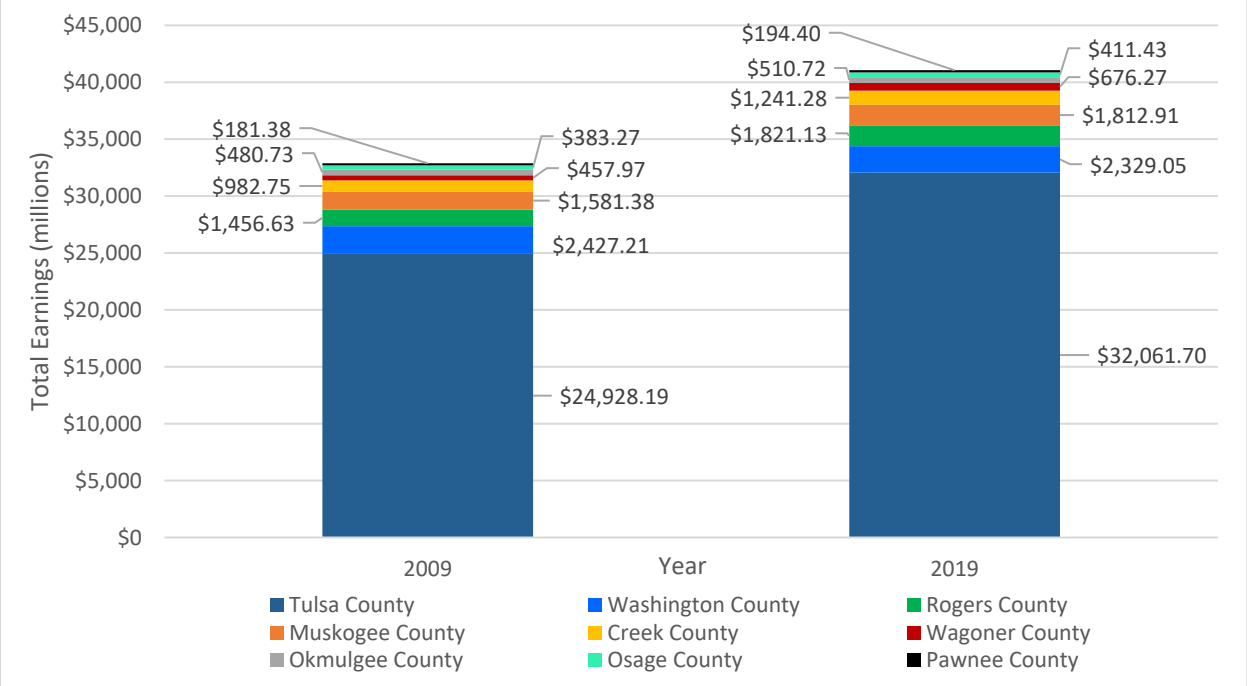
This expansive geographical area is made up of nine counties is located in northeastern Oklahoma. Much of the region is also known as Oklahoma's Green Country[7], which is made up of three smaller subregions known as:

- High Plains – The High Plains region extends from the cities of Tulsa and Broken Arrow to the south, north to the city of Bartlesville, and west into Osage County, as well as the Osage Reservation. Some of the other towns and cities include Pawhuska, Owasso, Sand Springs, Sapulpa, and Pawnee.
- Great Lakes – The Great Lakes region extends to the northeast from Tulsa, and includes the cities and towns of Miami, Vinita, and Pryor, as well as the Cherokee Reservation.
- Foothills – The Foothills region extends to the south and east of Tulsa, and includes the cities and towns of Muskogee, Tahlequah, Sallisaw, and Eufaula as well as the Muskogee (Creek) Reservation.

3.3.1.1 Tulsa Regional Economic Development

The overall region is interconnected through multiple interstates and U.S. highways, as it blends urban, suburban, and rural living with a variety of industries. It is anchored by the Tulsa and supported by a strong workforce and diverse economy. **Figure 3-6** shows the impact of Tulsa County on its regional economy, generating approximately 76% of the RVS service area earnings from 2009 - 2019.

FIGURE 3-6
TOTAL EARNINGS PER COUNTY (2009 & 2019)



Note: 1) Earnings in millions of 2012 US dollars.
Source: RS&H, 2022; Woods & Poole, Inc., 2022

[7] While the Green Country does not reflect the exact RVS service area, a significant amount of it is found within its extent.

Each of the counties within the RVS service area contribute added value supporting the regional economy through their diverse industries. **Table 3-5** provides a comparison of the industries with the top earnings by each county within the RVS service area for 2009 and 2019.

TABLE 3-5
TOP INDUSTRIES BY EARNING PER COUNTY (2009 & 2019)

	2009		2019	
	Industry	**Earnings**	**Industry**	**Earnings**
Creek County	Manufacturing	$208.92	Manufacturing	$303.83
Muskogee County	Manufacturing	$259.86	Manufacturing	$233.20
Okmulgee County	Manufacturing	$91.82	Manufacturing	$91.81
Osage County	Construction	$30.72	Construction	$37.81
Pawnee County	Healthcare and Social Assistance	$21.96	Professional .and Technical Services	$31.68
Rogers County	Construction	$154.44	Construction	$243.94
Tulsa County	Mining	$3,882.24	Mining	$3,474.51
Wagoner County	Construction	$74.07	Construction	$147.53
Washington County	Manufacturing	$858.86	Manufacturing	$597.03

Notes: 1) Earnings in millions of 2012 US dollars.
Source: Woods & Poole, Inc., 2021

The following paragraph provides some additional details and insight on the robust economy of the Tulsa area, highlighted by the Tulsa Regional Chamber of Economic Development.[8] Several of these large manufacturers have been attracted to Tulsa area, prominently establishing themselves into its economy.

- The Sofidel Group recently invested $360 million
- The Greenheck Group recently completed phase of its $100 million Tulsa campus
- Whirlpool invested $55 million worth of capital investment expanding its operations and footprint in the region.
- The NORDAM Group is headquartered in Tulsa, it is home of one of the world's largest independently owned aerospace companies, with many other facilities worldwide.[9]
- Spirit AeroSystems Inc., planned for expansion of its Tulsa facilities in 2019-2021, with the hiring of roughly 250 employees and an investment of more than $80 million in capital projects to support fuselage manufacturing and assembly work.[10]

Other notable Tulsa businesses include Oral Roberts University, which recently invested $75 million on a new welcome center, media arts center, and a high-tech library.[11] The $23 million USA BMX headquarters which completed construction in 2022 and includes the Hall of Fame, the USA BMX Foundation and the Hardesty National Track Stadium containing both an Olympic-level and amateur track.

[8] Tulsa Chamber of Regional Economic Development, (2022) Retrieved online: https://www.tulsasfuture.com/data-and-research-tools/industries-and-clusters/target-industries
[9] The NORDAM Group, (2022) Retrieved online: https://www.nordam.com/who-we-are
[10] Spirit AeroSystems, Inc. (2022) Retrieved online: https://www.spiritaero.com/pages/release/spirit-aerosystems-announces-tulsa-okla-manufacturing-expansion/
[11] Oral Roberts University (2022) Retrieved online: https://oru.edu/news/oru_news/breaking-ground-at-oru.php?locale=en

The area also is home to the Southern Hills Country Club, which attracts visitors from all over the United States, as it was ranked the 34th best golf course in Golf Digest's 100 Greatest Golf Courses in 2019-2020.

Several well-known employers have continued to remain prominent in the local economy with strong numbers of employees. The following list ranks Tulsa Area principal employers based on their 2020 employee totals.[12]

1. St. Francis Healthcare System (10,250 employees)
2. Wal-Mart/Sam's Club (7,335 employees)
3. Tulsa Public Schools (6,269 employees)
4. American Airlines (5,400 employees)
5. Hillcrest Healthcare System (5,358 employees)
6. Ascension St. John (5,332 employees)
7. City of Tulsa (3,628 employees)
8. QuikTrip (3,051 employees)
9. Union Public Schools (2,533 employees)
10. Cherokee Hard Rock Hotel and Casino (2,500 employees)

3.3.2 Socioeconomic Trends

A comparison of the historical and projected annual growth rates for socioeconomic data was made with the state of Oklahoma and United States of America.[13] Since 2011, the RVS service area has tracked closely in population growth with the state of Oklahoma and the U.S., however, it has grown at a lesser rate in personal income per capita (PIPC) and gross regional product (GRP).

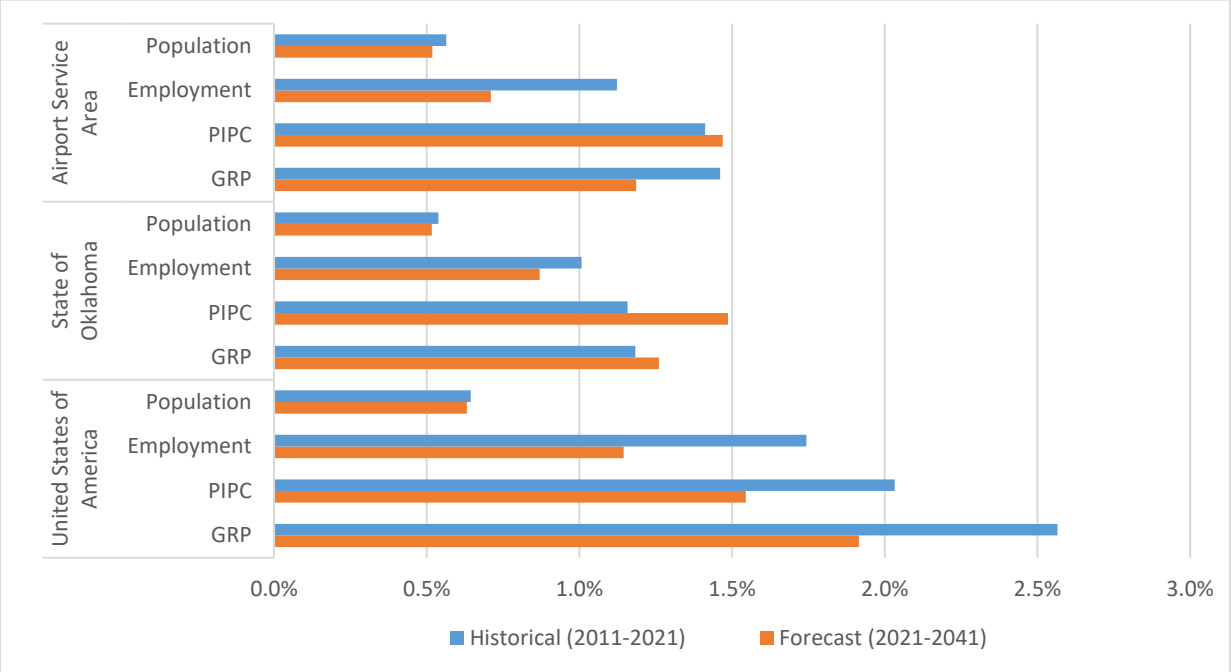
A review of the area's economic recovery out of the COVID-19 public health emergency, shows that neither the RVS service area population nor PIPC are projected to need any period of recovery. Population is projected to increase at 0.5 percent, which is just slightly under its historical average (0.6 percent), and PIPC is projected to increase at 1.5 percent annually, which is greater than the last ten years (1.4 percent). Both employment and GRP are projected to have very minimal recoveries from the public health emergency, with a return to 2019 levels by 2021.

Comparatively, the state of Oklahoma shows nearly identical growth rates in each socioeconomic metric that was analyzed from 2022-2042. The U.S. shows consistencies in the historical and projected growth rates for population but is projected to have a two-year recovery before it returns to pre-pandemic levels, for employment, and gross domestic product (GDP).

Figure 3-7 and **Table 3-6** show the historical growth rates from 2011-2021 and the forecast growth rates from 2022-2042 for the RVS service area, state of Oklahoma, and the United States of America.

[12] Tulsa Comprehensive Annual Financial Report (2020) p. 154. Retrieved online: https://www.sai.ok.gov/Search%20Reports/database/Tulsa%20CAFR_2020_web.pdf
[13] The state of Oklahoma and U.S. socioeconomic data is sourced from the same Woods & Poole, Inc. 2021.

FIGURE 3-7
SOCIOECONOMIC TREND ANALYSIS



Source: RS&H, 2022; Woods & Poole, Inc., 2021

TABLE 3-6
SOCIOECONOMIC TREND ANALSYSIS

Area	Socioeconomic Metric	Historical (2011-2021)	Forecast (2022-2042)
RVS Service Area	Population	0.6%	0.5%
	Employment	1.1%	0.7%
	PIPC	1.4%	1.5%
	GRP	1.5%	1.2%
State of Oklahoma	Population	0.5%	0.5%
	Employment	1.0%	0.9%
	PIPC	1.2%	1.5%
	GRP	1.2%	1.2%
United States of America	Population	0.6%	0.6%
	Employment	1.7%	1.1%
	PIPC	2.0%	1.5%
	GRP	2.6%	1.9%

Source: RS&H, 2022; Woods & Poole, Inc., 2021

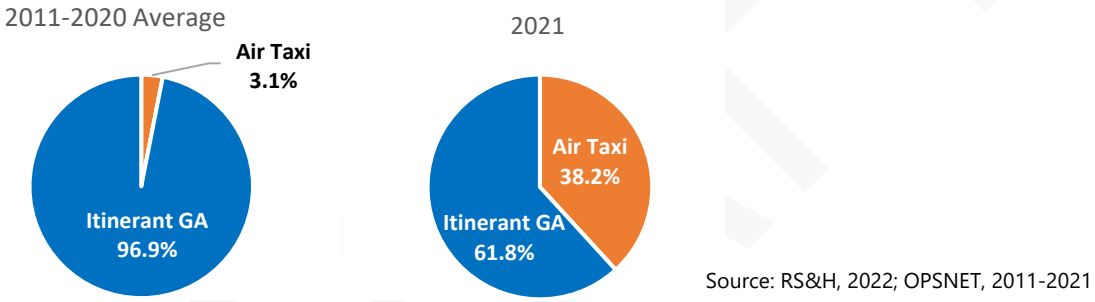
3.4 AVIATION ACTIVITY FORECASTS

3.4.1 Itinerant Operations Forecast

The itinerant operations forecast includes the growth of air taxi & commuter operations and itinerant general aviation operations. From 2011-2020, Tulsa Riverside Airport averaged 2,218 air taxi & commuter operations annually. These operations were on-demand or unscheduled charters. In 2021, air taxi & commuter operations increased to 25,359 annually. The change in distribution of operations is shown in **Figure 3-8**.

This notable increase was somewhat offset, because at the same time, the Airport decreased its itinerant operations by 26.3 percent, leaving it with a total of 41,021. Overall, at the end of 2021 RVS itinerant operations were 7.9 percent lower than its 2019 total as a result of the COVID-19 public health emergency.

FIGURE 3-8
ITINERANT OPERATIONS DISTRIBUTION



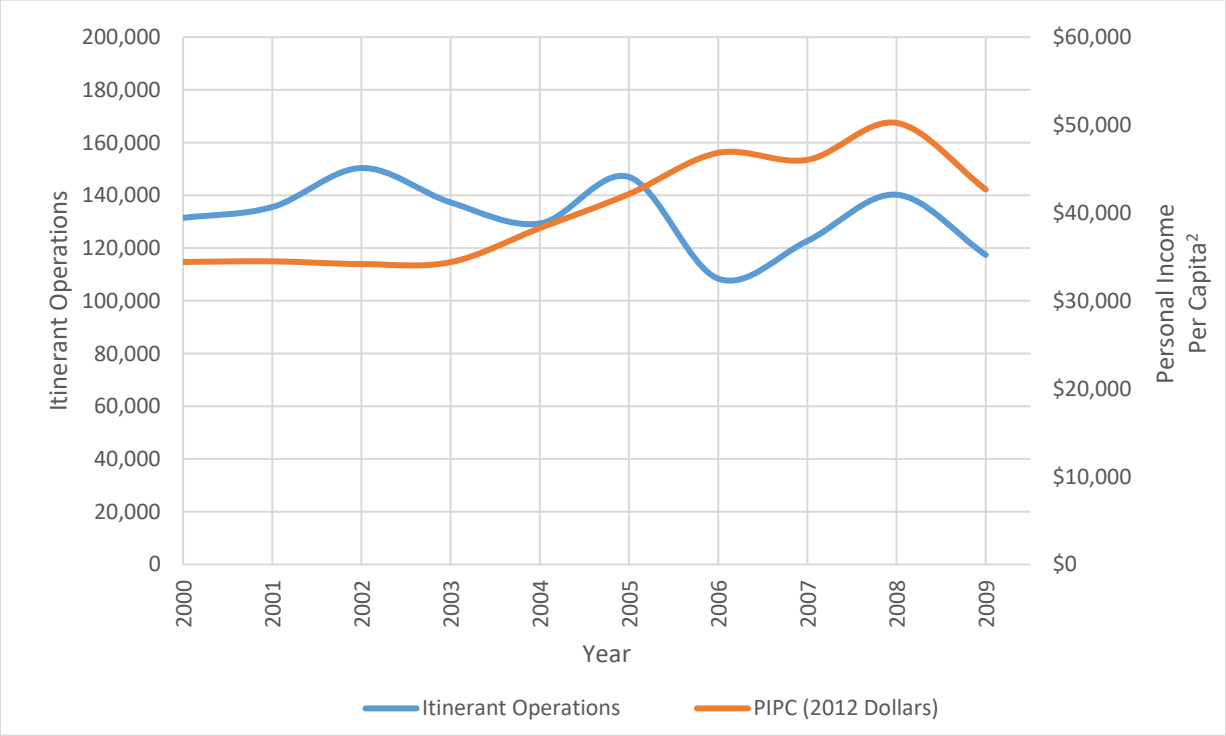
Source: RS&H, 2022; OPSNET, 2011-2021

The base case forecast, and two alternative scenario forecasts incorporated periods of recovery for the Airport (or the length of time to return to 2019 operation totals).

The base case forecast assumes the Airport will fully recover to its 2019 totals by 2023 or within four years. This recovery period took into consideration the historical recovery of PIPC in the RVS service area after the Great Recession. After fully recovering to its pre-pandemic totals in 2023, itinerant operations are projected to grow at 1.5 percent for the remainder of the forecast horizon, which is also the RVS service area's projected increase for PIPC. The distribution of air taxi & commuter (charter) and itinerant general aviation operations were determined by applying the 2021 share of each to the base case and high case scenario forecasts, while the distribution from 2011-2020 was applied to the low case scenario.

Figure 3-9 shows a correlation between the historical itinerant operations and PIPC of the RVS service area.

FIGURE 3-9
ITINERANT OPERATIONS AND RVS SERVICE AREA PIPC CORRELATION



Note: 1) - Itinerant operations do not include military 2) – 2012 U.S. Dollars
Source: FAA OPSNET, 2022; FAA Aerospace Forecast FY 2010-2030

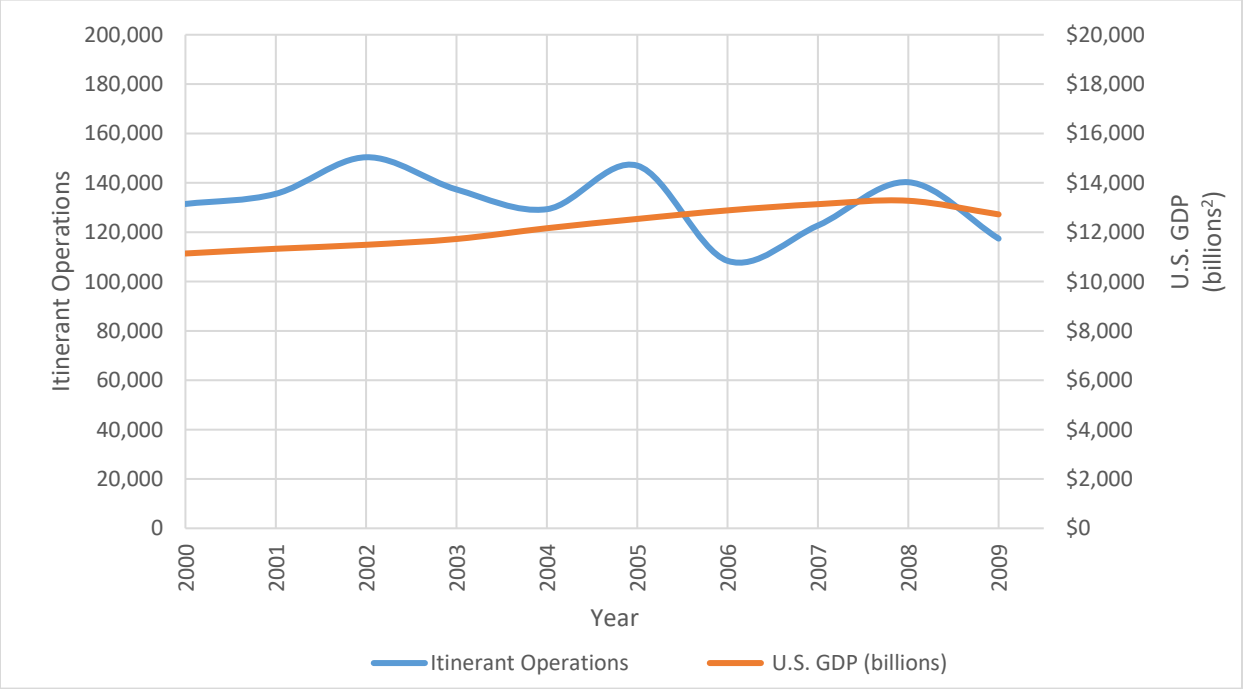
The high case scenario forecast assumes a slightly more optimistic two-year recovery from the public health emergency reaching its 2019 totals by 2022. This recovery scenario is based on the RVS service area's GRP recovery after the Terrorist Attacks of 9/11. After fully recovering in 2022, the high case scenario follows the year-over-year growth rate from the FAA Aerospace Forecast FY 2021-2041 for GDP. The annual growth rate of the high case scenario forecast from 2022-2042 is 2.2 percent.

Figure 3-10 shows the correlation between historical itinerant operations and U.S. GDP.

The low case scenario forecast is slightly more pessimistic with a five-year recovery period from the public health emergency reaching its 2019 totals by 2024, which is reflective of the period of recovery for employment in the RVS service area after the Great Recession. After fully recovering to its 2019 totals in 2024, the low case scenario projects itinerant operations to continue at the same rate as employment in the RVS service area over the forecast horizon. The annual growth rate of the low case scenario forecast from 2022-2042 is 0.9 percent.

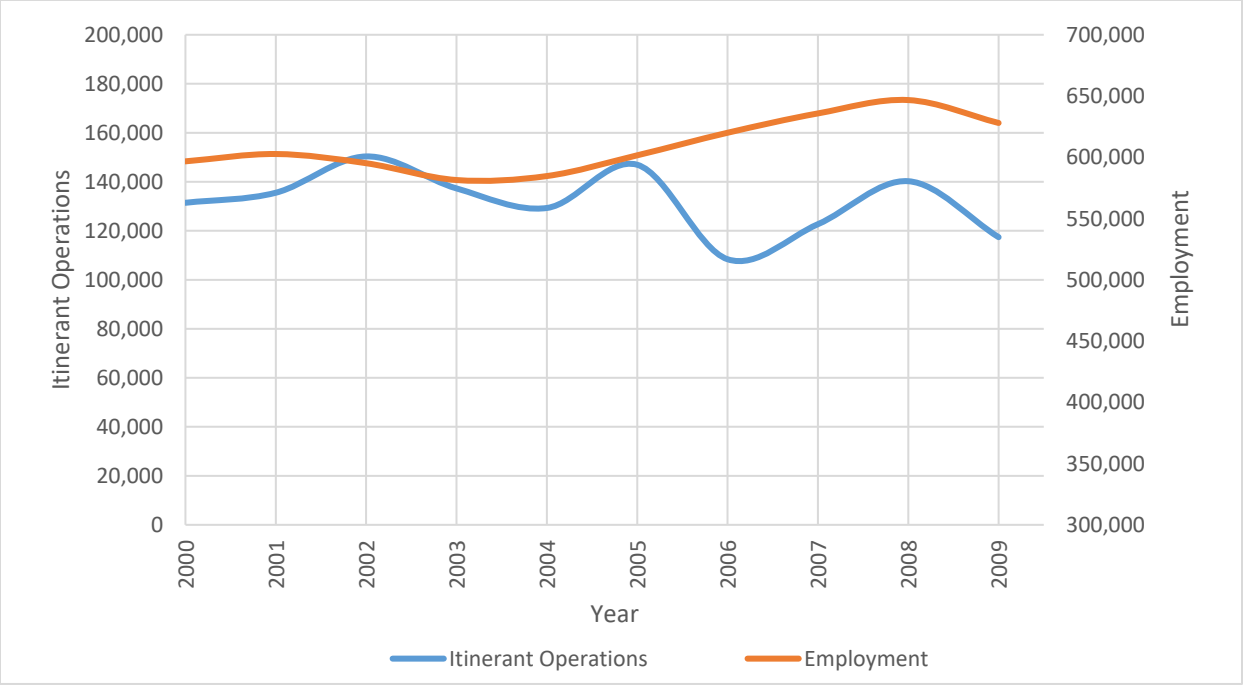
Figure 3-11 shows the correlation between historical itinerant operations and employment of the RVS service area.

FIGURE 3-10
ITINERANT OPERATIONS AND U.S. GDP CORRELATION



Note: 1) - does not include military 2)- 2005 U.S. Dollars
Source: FAA OPSNET, 2022; FAA Aerospace Forecast FY 2010-2030

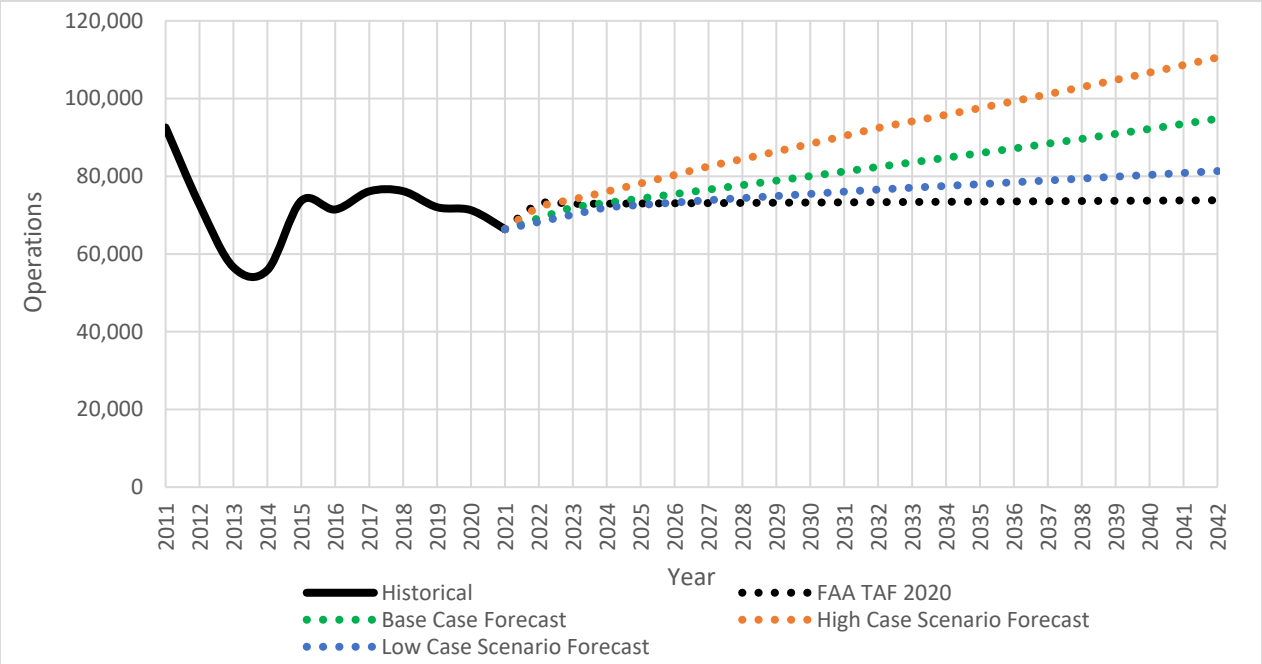
FIGURE 3-11
ITINERANT OPERATIONS AND RVS SERVICE AREA EMPLOYMENT CORRELATION



Note: 1) - Itinerant operations do not include military
Source: FAA OPSNET, 2022; FAA Aerospace Forecast FY 2010-2030

Figure 3-12 and **Table 3-7** show the Itinerant operations forecasts, with a breakdown of charter operations at Tulsa Riverside Airport from 2022-2042.

FIGURE 3-12
FORECAST - ITINERANT OPERATIONS



Source: RS&H, 2022; OPSNET, 2011-2021; FAA TAF, 2020

TABLE 3-7
FORECAST - ITINERANT OPERATIONS

		High Case Scenario Forecast		Base Case Forecast		Low Case Scenario Forecast	
Year	FAA TAF 2020	Charter	Itinerant GA	Charter	Itinerant GA	Charter	Itinerant GA
2011	92,539	1,948	90,591	1,948	90,591	1,948	90,591
2016	71,453	2,205	69,248	2,205	69,248	2,205	69,248
2021	66,380	25,359	41,021	25,359	41,021	25,359	41,021
2022	72,851	27,522	44,519	26,440	42,770	2,163	66,104
2027	73,098	31,532	51,006	29,252	47,319	2,340	71,504
2032	73,339	35,318	57,131	31,490	50,938	2,427	74,165
2037	73,581	38,625	62,480	33,770	54,627	2,501	76,430
2042	73,825	42,241	68,330	36,215	58,582	2,578	78,765
Annual Growth Rate							
2022-2027	0.1%	2.8%		2.0%		1.6%	
2027-2032	0.1%	2.3%		1.5%		0.7%	
2032-2042	0.1%	1.8%		1.4%		0.6%	
2022-2042	0.1%	2.2%		1.6%		0.9%	

Note:1) Add charter and itinerant GA operations from the table to get total itinerant operations for the Airport to compare with FAA TAF; 2) Historical calendar year totals taken from FAA OPSNET' 3) FAA TAF based on FAA fiscal year from October-September 4) Not including itinerant military operations.

Source: RS&H, 2022; OPSNET, 2011-2021; FAA TAF, 2020

3.4.2 Based Aircraft Forecast

Airport records from 2021 identified a total of 389 based aircraft, which is its highest total since 2017 when it had a total of 482. The majority of these aircraft are single engine piston and multi-engine piston. To project growth in each type of aircraft, the growth rates of the active fleet for air taxi & general aviation aircraft from the FAA Aerospace Forecast 2021-2041 was applied to each aircraft type. While pistons are anticipated to decrease nationwide over the forecast horizon, the activity of them at Tulsa Riverside Airport supports growth, therefore, these aircraft were increased at the rate of all general aviation aircraft, and each of the other types were increased based on the forecast projections associated with the aircraft type in the FAA Aerospace Forecast as shown in **Table 3-8**.

TABLE 3-8
FORECAST - BASED AIRCRAFT

Year	Gliders	Pistons	Turboprops	Jets	Helicopters	Total
2021	3	354	11	14	7	389
2022	3	354	11	14	7	390
2027	4	355	12	16	8	395
2032	4	357	13	18	8	401
2037	5	358	14	21	9	406
2042	6	359	16	23	9	413
Annual Growth Rate						
2022-2027	3.1%	0.1%	1.7%	2.5%	1.4%	0.3%
2027-2032	3.1%	0.1%	1.7%	2.5%	1.4%	0.3%
2032-2042	3.1%	0.1%	1.7%	2.3%	1.4%	0.3%
2022-2042	3.1%	0.1%	1.7%	2.4%	1.4%	0.3%

Source: Airport Records, 2022; RS&H, 2022

3.4.3 Local General Aviation Operations Forecast

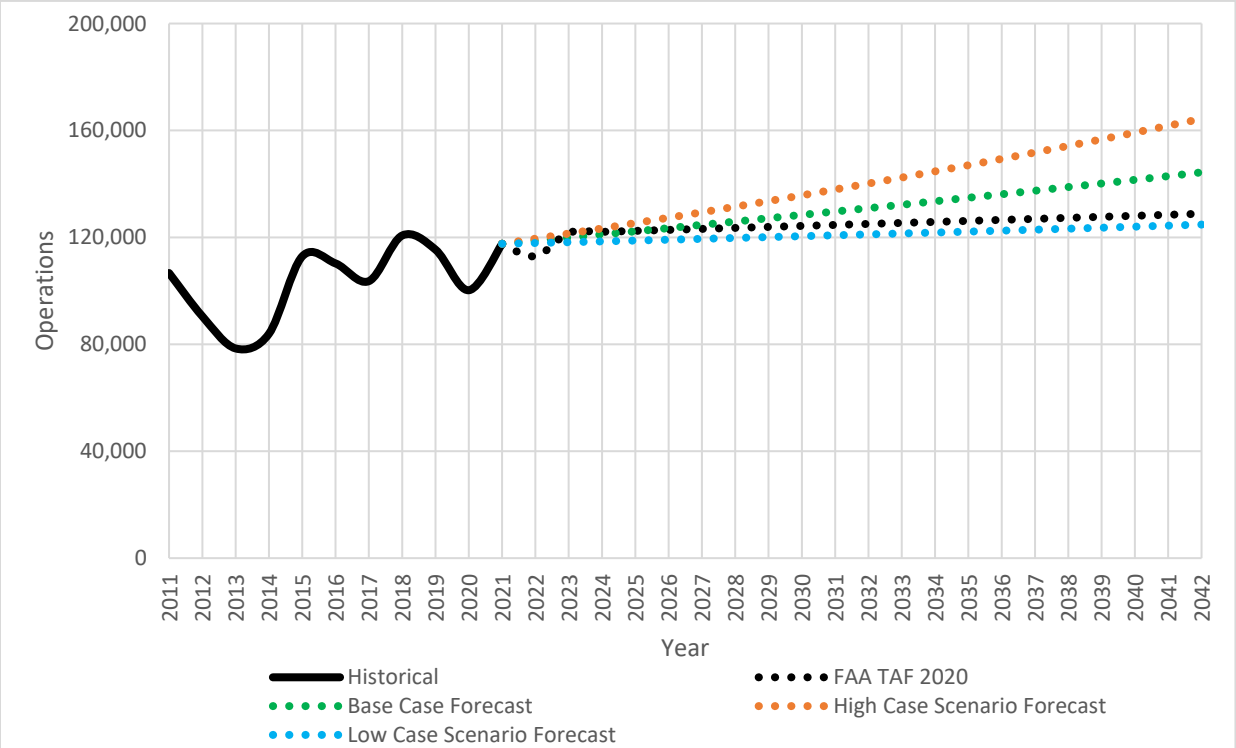
The local general aviation community at Tulsa Riverside Airport produces the greatest number of operations annually. These operations are mainly driven by the demand of the pilots that train year-round in one of several flight schools.

- Christiansen Aviation
- Destinations EFC
- Riverside Flight Center
- Riverside Jet Center
- Spartan College of Aeronautics and Technology
- Tulsa Community College Professional Pilot School

The base case forecast was based on the historical growth trend from 2011-2021 at RVS, which increases the number of local general aviation operations by 1.0 percent annually. As one of the nation's premier airports for flight schools, the high case scenario forecast puts its emphasis on the historical growth of pilots in the U.S. from the FAA Aerospace Forecast, with the projection of future activity supported by national pilot growth. The low case scenario forecast was generated using the FAA's recommended methodology of operations per based aircraft (OPBA). In this OPBA methodology, the number of local operations is divided by the number of based aircraft for base year 2021, and the ratio is kept constant relative to the growth in the Airport's based aircraft projection from the base case forecast.

Figure 3-13 and **Table 3-9** show the forecasts for the local general aviation operations at Tulsa Riverside Airport from 2022-2042.

FIGURE 3-13
FORECAST - LOCAL GENERAL AVIATION OPERATIONS



Source: RS&H, 2022; OPSNET, 2011-2021; FAA TAF, 2020

TABLE 3-9
FORECAST - LOCAL GENERAL AVIATION OPERATIONS

Year	FAA TAF 2020	High Case Scenario Forecast	Base Case Forecast	Low Case Scenario Forecast
2011	106,673	106,673	106,673	106,673
2016	110,251	110,251	110,251	110,251
2021	117,602	117,602	117,602	117,602
2022	112,937	119,492	118,755	117,897
2027	123,173	129,405	124,690	119,451
2032	125,037	140,140	130,921	121,127
2037	126,930	151,767	137,465	122,883
2042	128,851	164,358	144,335	124,792
Annual Growth Rate				
2022-2027	1.8%	1.6%	1.0%	0.3%
2027-2032	0.3%	1.6%	1.0%	0.3%
2032-2042	0.3%	1.6%	1.0%	0.3%
2022-2042	0.7%	1.6%	1.0%	0.3%

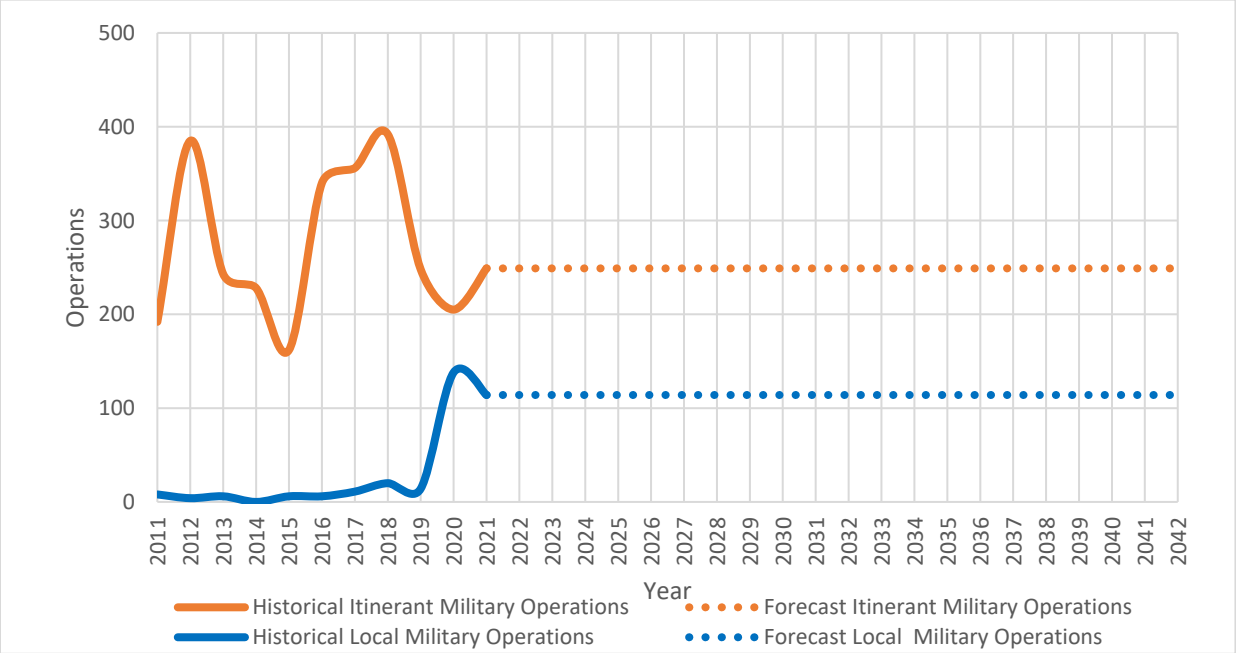
Note:1) Historical calendar year totals taken from FAA OPSNET' 2) FAA TAF based on FAA fiscal year from October-September 3) Not including local military operations.

Source: RS&H, 2022; OPSNET, 2011-2021; FAA TAF, 2020

3.4.4 Military Operations

The itinerant and local military operations from calendar 2021 are held constant throughout the forecast horizon as shown in **Figure 3-14** and **Table 3-10.**

FIGURE 3-14
FORECAST - MILITARY OPERATIONS



Source: RS&H, 2022; OPSNET, 2011-2021

TABLE 3-10
FORECAST - MILITARY OPERATIONS

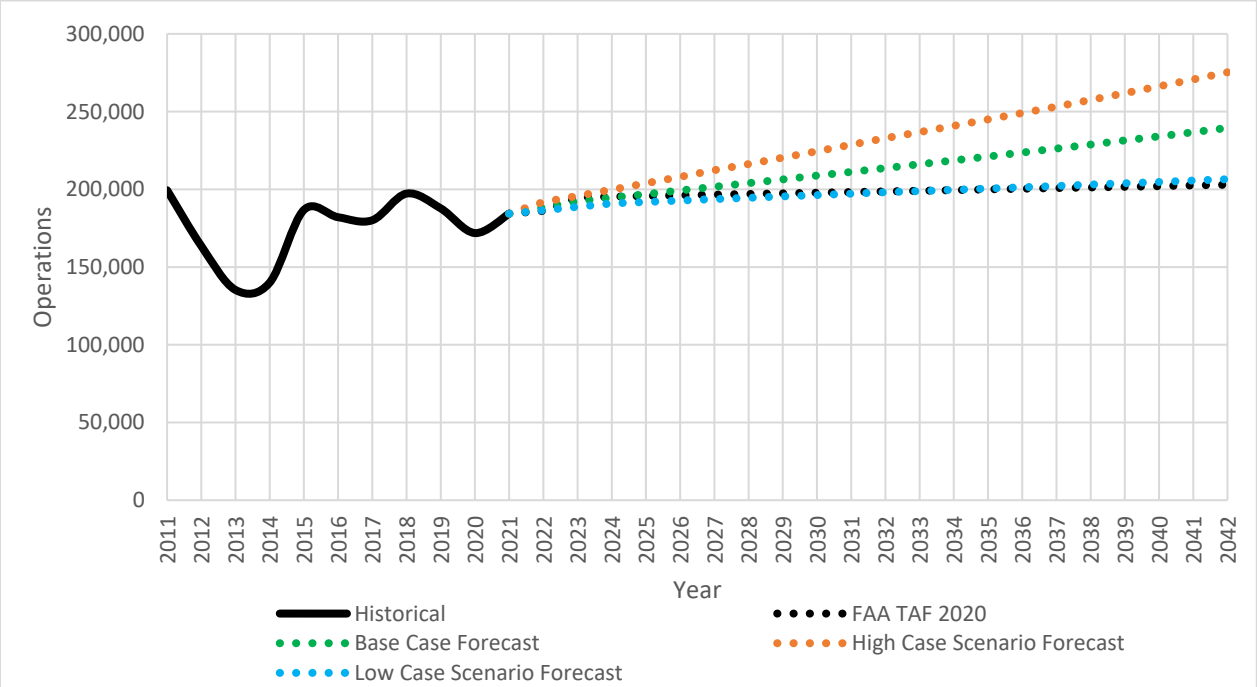
Year	Itinerant Military Operations	Local Military Operations	Total Military Operations
2011	192	8	200
2016	340	6	346
2021	249	114	363
2022	249	114	363
2027	249	114	363
2032	249	114	363
2037	249	114	363
2042	249	114	363
Annual Growth Rate			
2022-2027	0.0%	0.0%	0.0%
2027-2032	0.0%	0.0%	0.0%
2032-2042	0.0%	0.0%	0.0%
2022-2042	0.0%	0.0%	0.0%

Note:1) Historical calendar year totals taken from FAA OPSNET'
Source: RS&H, 2022; OPSNET, 2011-2021

3.4.5 Total Operations Forecast

The bottom-up approach to the base case forecast and the alternative high and low case scenarios, were generated through the summation of the respective itinerant, local general aviation, and military operations forecasts. **Figure 3-15** and **Table 3-11** show the total operations forecasts from 2022-2042.

FIGURE 3-15
FORECAST - TOTAL OPERATIONS



Source: RS&H, 2022; OPSNET, 2011-2021; FAA TAF, 2020

TABLE 3-11
FORECAST - TOTAL OPERATIONS

Year	FAA TAF 2020	High Case Scenario Forecast	Base Case Forecast	Low Case Scenario Forecast
2011	199,412	199,412	199,412	199,412
2016	182,050	182,050	182,050	182,050
2021	184,345	184,345	184,345	184,345
2022	186,065	191,896	188,328	186,527
2027	196,548	212,306	201,624	193,657
2032	198,653	232,953	213,713	198,082
2037	200,788	253,235	226,224	202,177
2042	202,953	275,292	239,495	206,498
Annual Growth Rate				
2022-2027	1.1%	2.0%	1.4%	0.8%
2027-2032	0.2%	1.9%	1.2%	0.5%
2032-2042	0.2%	1.7%	1.1%	0.4%
2022-2042	0.4%	1.8%	1.2%	0.5%

Note:1) Historical calendar year totals taken from FAA OPSNET'
Source: RS&H, 2022; OPSNET, 2011-2021

3.4.5.1 Helicopter Operations

Helicopter activity at Tulsa Riverside Airport was analyzed using fuel records from the Airport's fixed based operator. The records assume a takeoff and landing each time a fuel record is listed by a helicopter. This provides the minimum helicopter activity at Tulsa Riverside Airport accounting for only those helicopters that fueled up before their flights. The number of helicopters projected from 2022-2042 is shown in **Table 3-12**.

TABLE 3-12
FORECAST - HELICOPTER OPERATIONS

Year	Daily	Annual
2021	8	2,818
2022	8	2,878
2027	8	3,082
2032	9	3,266
2037	9	3,458
2042	10	3,660

Note: November and December were extrapolated using 2019 operation totals.
Source: » Christiansen Aviation Fuel Records, 2021 (Jan-Oct)

3.4.5.2 IFR and VFR Operations

The Tulsa (TUL) Terminal Radar Approach and Control (TRACON) was contacted for a breakdown of operations in base year 2021 by aircraft operating under instrument flight rules (IFR)[14], visual flight rules (VFR), and local operations. The base case forecast for total operations applied this same distribution to derive a projected total of IFR, VFR, and local operations which are shown in **Table 3-13** .

TABLE 3-13
FORECAST – IFR, VFR, AND LOCAL OPERATIONS

Year	Total Operations	IFR Operations	Instrument Approaches	VFR Operations	Local Operations
2021	184,345	17,276	8,638	49,353	117,716
2022	188,328	17,649	8,825	50,419	120,260
2027	201,624	18,895	9,448	53,979	128,750
2032	213,713	20,028	10,014	57,215	136,469
2037	226,224	21,201	10,600	60,565	144,459
2042	239,495	22,444	11,222	64,118	152,933

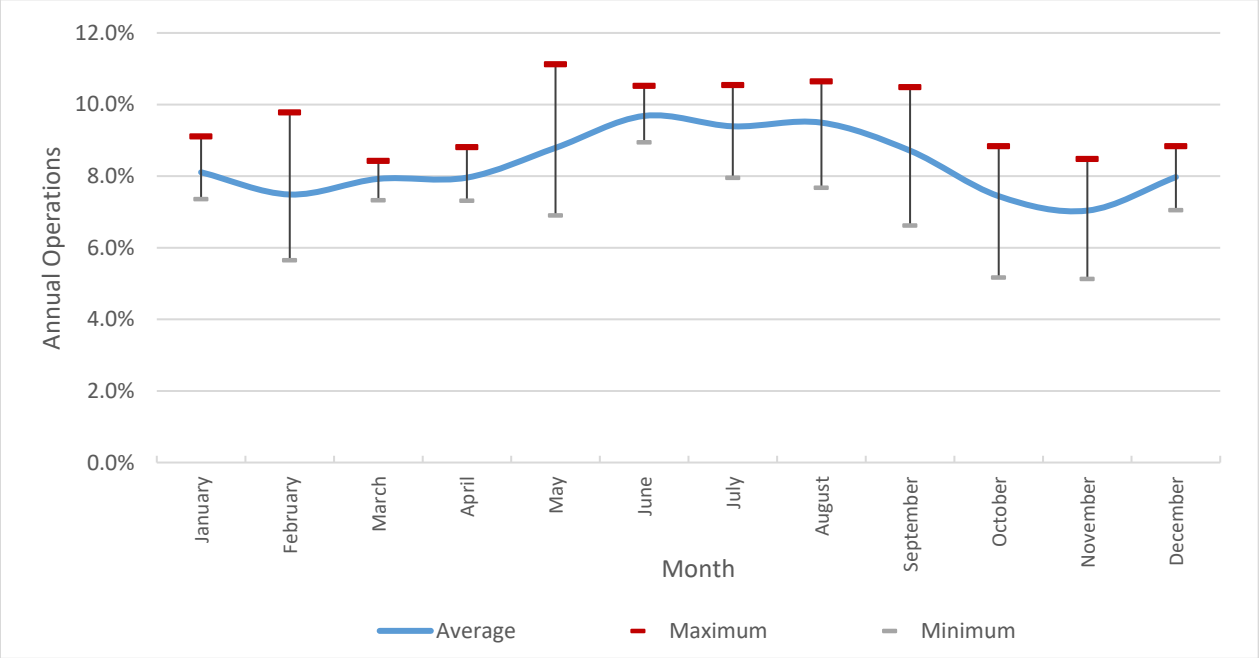
Source: RS&H, 2022; FAA TRACON, 2022

[14] Annual instrument approaches are assumed to be 50% of the IFR total for each forecast year.

3.5 PEAK ACTIVITY

Historically, June has been the peak month of operations at Tulsa Riverside Airport with an average of 9.7 percent of the annual total for the five years prior to the pandemic. **Figure 3-16** shows the average, maximum, and minimum operations at RVS from 2014-2019.

FIGURE 3-16
PEAK MONTH ANALYSIS



Source: RS&H, 2022; OPSNET, 2022

To accurately portray the regular peak activity of the Airport prior to the public health emergency, the FAA OPSNET database was used for establishing a peak day of June 2019. The historical monthly share of operations from June was applied to the total operations for each of the forecast years. The share of the peak day in June 2019 was also applied to each peak month forecast to project a peak day operation total. Lastly, the number of operations on an average hour of the peak day was calculated using the hours of operation that the ATCT is open from (06:00 to 22:00). **Table 3-14** shows the peak operations at Tulsa Riverside Airport from 2022-2042.

TABLE 3-14
FORECAST - PEAK OPERATIONS

Year	Peak Month Operations	Peak Day Operations	Average Hour on the Peak Day
2022	18,235	1,000	62
2027	19,522	1,070	67
2032	20,693	1,134	71
2037	21,904	1,201	75
2042	23,189	1,271	79

Source: RS&H, 2022; OPSNET, 2022

3.6 CRITICAL AIRCRAFT

The critical aircraft of a runway or airport is essential to airport planning as it identifies the dimensional requirements, such as the separation distances and the sizes of safety areas. FAA Advisory Circular (AC) 150/5000-17 *Critical Aircraft and Regular Use Determination*, lays out the requirements for identifying a critical aircraft. The AC states that the critical aircraft is the most demanding aircraft type, or grouping of aircraft with similar characteristics, which make regular use of the airport. It further establishes regular use as 500 annual operations, not including touch-and-goes.

After confirming the annual operations, an aircraft or a representative aircraft for a group of aircraft with the most demanding characteristics and greater than 500 operations is identified. A two-part critical aircraft identification code is established for an airport, which define the FAA design standards that apply. The first part of the critical aircraft identification code is the Aircraft Approach Category (AAC), which groups aircraft by reference landing speed (VREF) at the maximum certificated landing weight. **Table 3-15** shows the criteria listed in the AC for determination of the AAC. The second part of the critical aircraft identification code is the Airplane Design Group (ADG). The ADG is based upon the dimensions of the tail height and wingspan, with the ADG being determined by whichever characteristic is more demanding. **Table 3-16** shows the criteria listed in the AC for determination of the ADG.

TABLE 3-15
AIRCRAFT APPROACH CATEGORY

AAC	V_{REF}/Approach Speed
A	< 91 knots
B	≥ 91 knots < 121 knots
C	≥ 121 knots < 141 knots
D	≥ 141 knots < 166 knots
E	166 knots or more

Source: FAA AC 150/5300-13A, *Airport Design*, Table 1-1, 2014

TABLE 3-16
AIRPLANE DESIGN GROUP

Group	Tail Height	Wingspan
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'

Source: FAA AC 150/5300-13A, *Airport Design*, Table 1-2, 2014

In this Master Plan, operations by aircraft were identified using the FAA Traffic Flow Management System Count (TFMSC) database for CY 2021. The FAA OPSNET database was used to confirm the exact number of operations by each category (e.g., air taxi, itinerant general aviation, local general aviation, and military). After increasing the TFMSC operations for each aircraft in the fleet so that they aligned with the OPSNET

numbers, the forecast of each operation type was incorporated. The growth of each operation type reflects the base case forecast, with the proportion of operations by each aircraft in the fleet remaining consistent with that of base year 2021.

Based on the analysis, the current critical aircraft is identified as the Challenger 600/601/604 (CL60) which is representative of the Challenger family of aircraft, with an AAC-C and ADG-II. The base case forecast projects this group of aircraft to continue to be the critical aircraft for the remainder of the forecast horizon.

Table 3-17 shows the projections of some of the more demanding aircraft in the Airport's base year fleet and projects their activity throughout the remainder of the forecast horizon.

TABLE 3-17
CRITICAL AIRCRAFT

			Annual Operations[1]				
Aircraft	**AAC**	**ADG**	**2021**	**2022**	**2027**	**2032**	**2042**
CL30 - Bombardier (Canadair) Challenger 300	C	II	291	303	335	361	415
CL35 - Bombardier Challenger 300	C	II	600	626	693	746	858
CL60 - Bombardier Challenger 600/601/604	C	II	169	177	195	210	242
G150 - Gulfstream G150	C	II	64	67	74	79	91
G280 - Gulfstream G280	C	II	120	125	138	149	171
GALX - IAI 1126 Galaxy/Gulfstream G200	C	II	57	60	66	71	82
GL5T - Bombardier BD-700 Global 5000	C	III	32	33	37	39	45
GLEX - Bombardier BD-700 Global Express	C	III	32	33	37	39	45
GLF4 - Gulfstream IV/G400	D	II	107	112	124	133	153
GLF5 - Gulfstream V/G500	D	III	26	27	29	32	37
GA5C - G-7 Gulfstream G500	D	III	119	124	138	148	170
Subtotals[2]							
Subtotal AAC - A	A		59,596	61,170	65,997	70,216	79,188
Subtotal AAC - B	B		30,272	31,558	34,901	37,562	43,180
Subtotal AAC - C	C		3,308	3,448	3,813	4,103	4,715
Subtotal AAC - D	D		335	349	387	416	479
Subtotal ADG - I		I	75,471	77,719	84,301	89,915	101,834
Subtotal ADG - II		II	17,816	18,572	20,538	22,103	25,408
Subtotal ADG - III		III	224	234	259	279	320
Subtotal ADG - IV		IV	-	-	-	-	-
Critical Aircraft							
AAC-ADG			C-II	C-II	C-II	C-II	C-II
Representative Aircraft			CL600/ 601/ 604	CL600/ 601/ 604	CL600/ 601/ 604	CL600/ 601/ 604	CL600/ 601/ 604

Notes: 1) Annual operations by aircraft were taken from the FAA TFMSC database and adjusted in 2021 to reflect the OPSNET total for that year; 2) Subtotals include aircraft not listed in table above. Local operations not identified in the TFMSC were assumed to be single engine piston aircraft (A-I).
Source: FAA TFMSC, 2022; FAA OPSNET, 2022: RS&H, 2022

3.7 SUMMARY OF FORECASTS

As mentioned in **Section 3.1**, the sponsor's forecast, which is identified here as the base case forecast, must be consistent with the FAA TAF 2020 so that the 5-year forecast is within 10 percent of the TAF and a 10-year forecast is within 15 percent of the TAF.

Table 3-18 shows the required metrics of the base case forecast compared with the FAA TAF 2020 for the forecast years 2022-2027.

Table 3-19 shows the FAA's summary sheet for the base case forecast.

TABLE 3-18
FORECAST - BASE CASE FORECAST & FAA TAF 2020 COMPARISON

Category	FAA TAF 2020	Base Case Forecast	Difference (%)
2021 - Base Year			
Enplanements	-	-	-
Total Operations[2]	177,251	184,345[1]	4.0%
Based Aircraft	364	389	6.9%
2022			
Enplanements	-	-	-
Total Operations	186,167	188,328	1.2%
Based Aircraft	367	390	6.3%
2027			
Enplanements	-	-	-
Total Operations	196,610	201,624	2.6%
Based Aircraft	383	395	3.2%
2032			
Enplanements	-	-	-
Total Operations	198,715	213,713	7.5%
Based Aircraft	398	401	0.7%

Notes: 1) - Base year 2021 operations were taken from OPSNET; 2) – Total operations is the sum of air carrier, air taxi & commuter, itinerant GA, itinerant military, civil, and local military operations.
Source: RS&H, 2022; FAA TAF 2020

TABLE 3-19
FAA SUMMARY SHEET – BASE CASE FORECAST

	Base Yr. Level	Base Yr. +1yr.	Base Yr. +5yrs.	Base Yr. +10yrs.	Base Yr. +15yrs.	Base Yr. to +1	Base Yr. to +5	Base Yr. to +10	Base Yr. to +15
Passenger Enplanements									
Air Carrier	0	0	0	0	0	-	0.0%	0.0%	0.0%
Commuter	0	0	0	0	0	-	0.0%	0.0%	0.0%
TOTAL ENPLANEMENTS	**0**	**0**	**0**	**0**	**0**	**-**	**0.0%**	**0.0%**	**0.0%**
Operations									
Itinerant									
Air carrier	0	0	0	0	0	-	0.0%	0.0%	0.0%
Commuter/air taxi	25,359	26,440	29,252	31,490	33,770	4.3%	2.9%	2.2%	1.9%
Total Commercial Operations	25,359	26,440	29,252	31,490	33,770	4.3%	2.9%	2.2%	1.9%
General aviation	41,021	42,770	47,319	50,938	54,627	4.3%	2.9%	2.2%	1.9%
Military	249	249	249	249	249	0.0%	0.0%	0.0%	0.0%
Local									
General aviation	117,602	118,755	124,690	130,921	137,465	1.0%	1.2%	1.1%	1.0%
Military	114	114	114	114	114	0.0%	0.0%	0.0%	0.0%
TOTAL OPERATIONS	**184,345**	**188,328**	**201,624**	**213,713**	**226,224**	**2.2%**	**1.8%**	**1.5%**	**1.4%**
Instrument Operations	17,276	17,649	18,895	20,028	21,201	2.2%	1.8%	1.5%	1.4%
Peak Hour Operations	62	62	67	71	75	0.7%	1.5%	1.3%	1.3%
Cargo/mail (enplaned + deplaned tons)	Not Applicable								
Based Aircraft									
Single Engine (Nonjet)	320	320	322	323	325	0.1%	0.1%	0.1%	0.1%
Multi Engine (Nonjet)	45	45	46	47	47	0.3%	0.4%	0.3%	0.3%
Jet Engine	14	14	16	18	21	2.5%	3.1%	2.8%	2.6%
Helicopter	7	7	8	8	9	1.4%	1.6%	1.5%	1.5%
Other	3	3	4	4	5	3.1%	3.7%	3.4%	3.3%
TOTAL	**389**	**390**	**395**	**401**	**406**	**0.3%**	**0.3%**	**0.3%**	**0.3%**

B. Operational Factors

	Base Yr. Level	Base Yr.+1yr.	Base Yr.+5yrs.	Base Yr.+10yrs.	Base Yr.+15yrs.
Average aircraft size (seats)					
Air carrier	Not Applicable				
Commuter	Not Applicable				
Average enplaning load factor					
Air carrier	Not Applicable				
Commuter	Not Applicable				
GA operations per based aircraft	408	414	435	454	473