CHAPTER B

Forecasts of Aviation Activity

This chapter discusses the findings and methodologies used to project aviation demand at Tulsa International Airport (the Airport or TUL). The forecasts developed in the Airport Master Plan provide a framework to guide the analysis for future facility needs and alternatives. It should be recognized that there are always short- and long-term fluctuations in an airport's activity due to a variety of factors that cannot be anticipated.

Projections of aviation activity for the Airport were prepared for the near-term (2019), mid-term (2024), and long-term (2034) timeframes. These projections are generally unconstrained and assume the Airport will be able to develop the various facilities necessary to accommodate based aircraft and future operations.

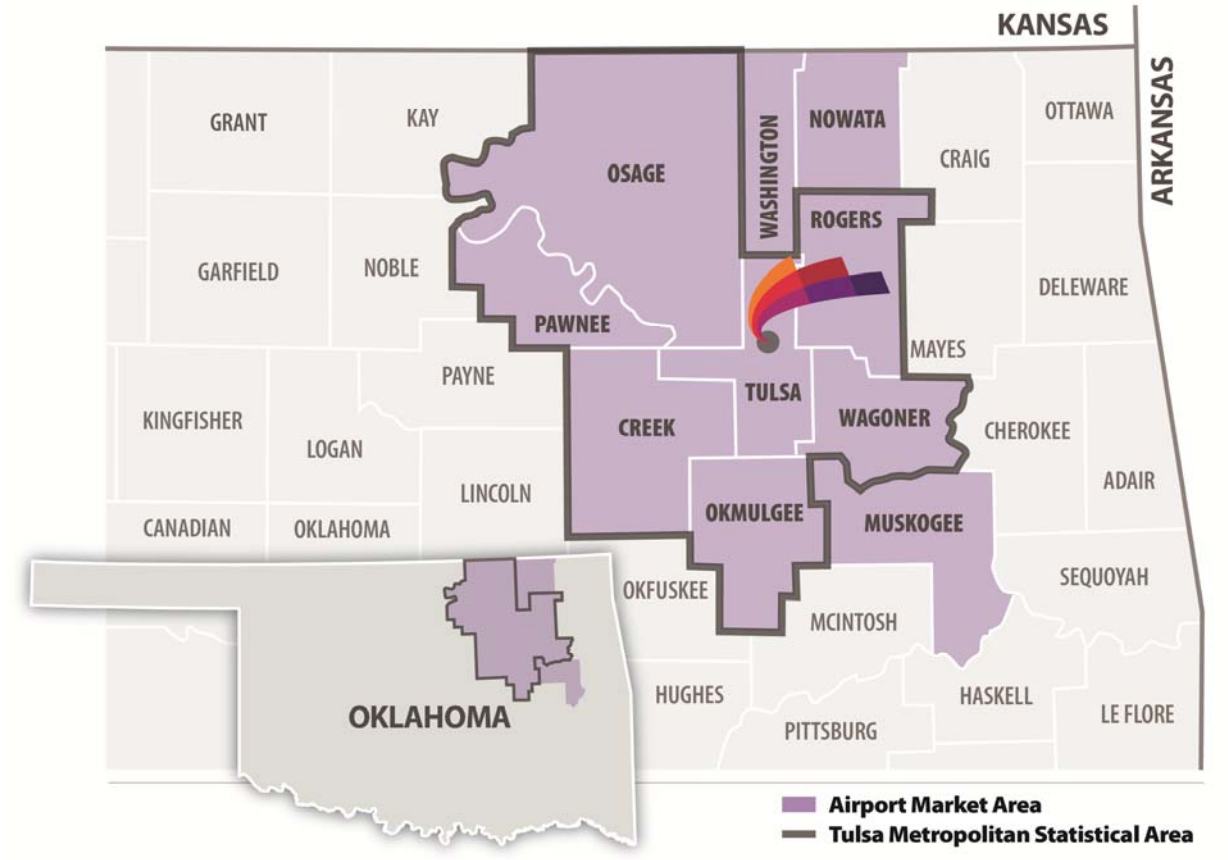
The projections of aviation demand prepared for the Airport are documented in the following sections:

- **Overview of Airport Market Area**
- **Trends/Issues Influencing Future Growth**
- **Historic and Current Aviation Activity**
  - Commercial Service
  - General Aviation
  - Military
  - Air Cargo
- **Projections of Aviation Demand**
  - Commercial Service Enplanements
  - Airline Operations and Fleet Mix
  - Air Cargo Operations and Activity
  - General Aviation and Military Activity
- **Forecast Summary**
- **Runway Design Code (RDC)/Critical Aircraft Analysis**

Overview of the Airport Market Area

The Airport Market Area is the geographic region served by Tulsa International Airport. The majority of the commercial air service demand is focused around a 10-county area. This area is slightly larger than the seven-county Tulsa Metropolitan Statistical Area (MSA). This market area was defined as part of the *True Market/Leakage Study* completed for the Airport in 2013. For the purpose of this Master Plan, this will be considered the market area for the Airport as well. This area is presented in the following figure, entitled *AIRPORT MARKET AREA.*

Figure B1 **AIRPORT MARKET AREA**



Tulsa International Airport is the only airport in this market area that has scheduled commercial passenger service. It is assumed that the airport will remain the only commercial service airport in the region throughout the forecast period. Although some demand associated with the outer areas of the market area sometimes utilize competing airports, most of the demand uses TUL. In the 2013 *True Market/ Leakage Study* for TUL, it was estimated that 73% of the passenger demand associated with the market area utilizes the Airport. Nearly 26% of the passenger demand in the 10-county area utilizes Dallas-Ft. Worth

International or Dallas Love Field airports. The remainder use Will Rogers World Airport in Oklahoma City or Kansas City International Airport.

In addition, there are 16 public use general aviation airports located in the Airport Market Area. Richard L. Jones, Jr. Airport, also owned and operated by the City of Tulsa, is classified as the Reliever airport for TUL and is the busiest airport in Oklahoma. Other large general aviation airports in the 10-county region include: Okmulgee Regional, Davis Field in Muskogee, William R. Pogue Airport in Sand Springs, Claremore Regional, and Bartlesville Municipal. These airports do impact the general aviation market area of TUL, but it is assumed that the Airport will continue to serve the needs of the larger general aviation users within the region, specifically corporate users.

Regional Demographics

Socioeconomic characteristics are often collected during the airport planning process and examined to derive an understanding of the dynamics of historic and projected growth within the geographic area served by an airport. This information is then typically used as one tool to forecast aviation demand. The types of socioeconomic data that are presented include population, employment, and per capita personal income. A summary of historic and projected socioeconomic trends for the Airport Market Area and the MSA (when data is unavailable for the Airport Market Area) is presented below.

Population. Between 1980 and 2014, the population of the Airport Market Area grew at a compound average growth rate (CAGR) of 1.1% per year. Between 2010 and 2014 growth slowed to 0.7% per year, on average. In 2014, it was estimated that the Airport Market Area population was 1.10 million. Tulsa County accounted for over 57% of the Airport Market Area population in 2014. Rogers and Wagoner counties have seen the greatest growth in population, 1.9% and 1.7% respectively, since 1980. This data is presented in the following table, entitled *HISTORIC POPULATION BY MARKET AREA COUNTY. (U.S. Census Bureau)*.

According to Woods & Poole, the Airport Market Area population is projected to grow 0.7% per year on average between 2011 and 2035. By 2035, the 10-county market area is expected to have a population of 1.27 million, an increase of 117,000 people over current levels. In comparison, population growth of the state of Oklahoma and the U.S. overall is expected to outpace the market area, experiencing a CAGR of 1.5% and 0.8%, respectively, between 2011 and 2035. (*Woods & Poole Economics 2015*)

The Indian Nations Council of Governments (INCOG) is the association of local and tribal governments within the Tulsa metropolitan area. INCOG has developed projections of population for 2010-2035 for Tulsa County and parts of Creek, Osage, Rogers, and Wagoner counties. In 2010, the population for the INCOG region was 778,551. By 2035, INCOG forecasts population of this region to reach 1.03 million, growing at a CAGR of 1.1% over the 25 year forecast period. *(INCOG*)

Table B1 **HISTORIC POPULATION BY MARKET AREA COUNTY**

County	1980	1990	2000	2010	2014	2014 % of Total	CAGR 1980-2014	CAGR 1990-2014	CAGR 2000-2014	CAGR 2010-2014
Creek	59,395	60,813	67,507	70,199	70,632	**6.4%**	0.5%	0.6%	0.3%	0.2%
Muskogee	67,142	68,153	69,418	71,105	69,966	**6.4%**	0.1%	0.1%	0.1%	-0.4%
Nowata	11,558	9,956	10,583	10,513	10,524	**1.0%**	-0.3%	0.2%	0.0%	0.0%
Okmulgee	39,298	36,478	39,625	40,102	39,095	**3.5%**	0.0%	0.3%	-0.1%	-0.6%
Osage	3,9360	41,603	44,579	47,436	47,981	**4.4%**	0.6%	0.6%	0.5%	0.3%
Pawnee	15,403	15,552	16,684	16,612	16,401	**1.5%**	0.2%	0.2%	-0.1%	-0.3%
Rogers	46,828	55,357	71,383	87,024	89,815	**8.2%**	1.9%	2.0%	1.7%	0.8%
Tulsa	473,128	505,289	563,748	605,092	629,598	**57.2%**	0.8%	0.9%	0.8%	1.0%
Wagoner	4,2140	48,027	57,711	73,393	75,702	**6.9%**	1.7%	1.9%	2.0%	0.8%
Washington	48,635	48,338	48,987	51,080	51,937	**4.7%**	0.2%	0.3%	0.4%	0.4%
TOTAL	**769,537**	**889,566**	**990,225**	**1,072,556**	**1,101,651**	**100.0%**	**1.1%**	**0.9%**	**0.8%**	**0.7%**

***SOURCE**: U.S. Census Bureau*

Employment. Between 1990 and 2010 (most recent county data available), employment in the Airport Market Area grew at an average annual rate of 1.2%. Over the last 10 years (2000-2010), employment grew at greater average annual rate of 2.4%. In 2010, 624,200 people were employed in the Airport Market Area.

The unemployment rate (non-seasonally adjusted) for the Market Area in 2014 was 5.9%. The unemployment rate peaked in 2010 at 7.5% and has been slowly declining over the last four years. Comparatively, the unemployment rates for Oklahoma and the U.S. in 2014 were 5.3% and 8.1%, respectively. *(Woods & Poole, U.S. Bureau of Labor Statistics)*

Table B2 **HISTORIC EMPLOYMENT BY MARKET AREA COUNTY**

County	1980	1990	2000	2010	2010% of Total	CAGR		
						1980-2010	1990-2010	2000-2010
Creek	19,132	21,378	28,956	29,392	**4.7%**	**1.4%**	**1.6%**	**3.2%**
Muskogee	30,462	32,304	39,178	38,504	**6.2%**	**0.8%**	**0.9%**	**1.8%**
Nowata	4,147	3,813	4,025	4,051	**0.6%**	**-0.1%**	**0.3%**	**0.6%**
Okmulgee	14,409	13,062	1,435	15,327	**2.5%**	**0.2%**	**0.8%**	**1.6%**
Osage	11,039	10,065	12,446	18,577	**3.0%**	**1.8%**	**3.1%**	**6.3%**
Pawnee	5,120	5,874	5,873	6,271	**1.0%**	**0.7%**	**0.3%**	**0.7%**
Rogers	13,252	19,791	33,259	40,810	**6.5%**	**3.8%**	**3.7%**	**7.5%**
Tulsa	326,029	349,336	427,018	430,899	**69.0%**	**0.9%**	**1.1%**	**2.1%**
Wagoner	7,432	11,253	13,859	12,677	**2.0%**	**1.8%**	**0.6%**	**1.2%**
Washington	27,681	26,697	24,203	27,688	**4.4%**	**0.0%**	**0.2%**	**0.4%**
TOTAL	**458,703**	**493,573**	**590,252**	**624,196**	**100.0%**	**1.0%**	**1.2%**	**2.4%**

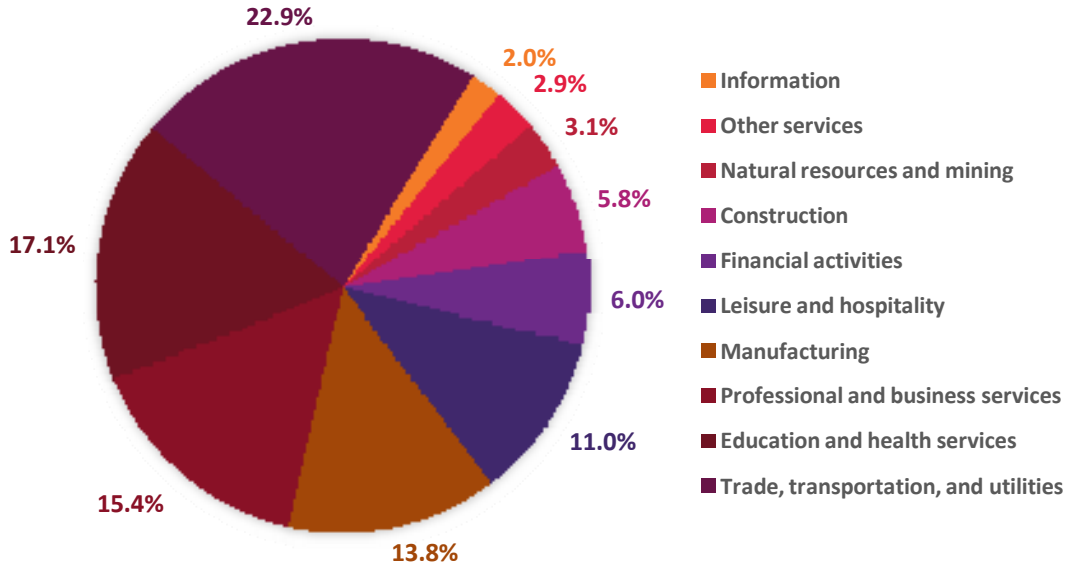
***SOURCE**: U.S. Bureau of Labor Statistics. Woods & Poole Economics*

Projections made by Woods & Poole and INCOG call for positive long-term employment growth of 1.2% and 0.8% per year through 2035, respectively.

Industry Mix. In 2014, 77% of the private sector jobs in the Airport Market Area were in the service-providing industries, while goods-producing jobs accounted for 23% of the MSA jobs. As shown in the figure title *AIRPORT MARKET AREA EMPLOYMENT BY INDUSTRY*, trade, transportation, and utilities, education and health services, and professional and business services, and manufacturing account for the highest percentages of private sector jobs in 2014. (*Bureau of Labor Statistics, Quarterly Census of Employment and Wages)*

Other key industry sectors include aerospace, energy, and healthcare. Although there has been a recent decline in the energy sector, which has endured falling oil prices, the Tulsa economy is becoming increasingly more diversified. The Tulsa Regional Chamber projects strong job growth through 2018 in the manufacturing and business and professional services industry. With the cost of doing business well below the U.S. average due to low rental rates, energy costs and taxes, Tulsa is a prime location for companies looking to expand or relocate. (*Tulsa Regional Chamber*)

Figure B2 **AIRPORT MARKET AREA EMPLOYMENT BY INDUSTRY (2014)**



***SOURCE**: U.S. Bureau of Labor Statistics*

Income. According to Federal Reserve Economic Data, between 2000 and 2013, per capita income (PCPI) rose at an average annual growth rate of 4.0%. The MSA's 2013 per capita income, approximately $47,300, was more than the $41,900 per capita income than the state of Oklahoma and $44,700 for the entire U.S. Woods and Poole project PCPI of the MSA to grow at a CAGR of 1.4% between 2011 and 2035. (*Bureau of Economic Analysis, Woods & Poole)*

Cost of Living. The Airport Market Area has consistently been one of the most cost-effective places to live in the U.S., with the region's cost of living being 10% less than the national average. Factors contributing to this include affordable housing, low cost of health care, and high quality of life. These factors help the area attract and retain new residents and employees.

Trends/Issues with the Potential to Influence Future Airport Growth

There are several factors that may influence aviation activity which are independent of airport activity. It is worthwhile to review outside influences to determine how they may impact future growth. These factors include the lifting of the Wright Amendment, national aviation trends, and local factors.

Lifting of the Wright Amendment

In October 2014, the Wright Amendment, the federal law which banned long-haul flights out of Love Field in Dallas since 1979, was lifted. The Wright Amendment restricted flights from Love Field to airports in the

adjacent five states, including Tulsa International. For TUL, this meant that many of the people on Southwest flights originating at or destined for Love Field that stopped at the Airport were not going to Tulsa, but were "through passengers," going on to a final destination in a state to which the amendment prohibited nonstop travel. The legislation was put in place largely to promote growth from Dallas/Ft. Worth International Airport. While domestic flights are now unrestricted, several restrictions remain, including limiting Love Field to 20 gates and international flights are still banned.

When the Wright Amendment Compromise was reached in 2006, it was known that Southwest's flight schedules at the TUL would be impacted, but the magnitude was unknown. Over the last eight years, many changes have occurred in the industry such as airline mergers, including a stronger American Airlines after its merger with US Airways in 2013. The mergers, as well as airline attempts at capacity discipline, have led to a smaller impact on service at TUL than once anticipated. Following the lift of the Wright Amendment in October 2014, Southwest reduced the Airport schedule by three daily nonstop flights- one each day to Dallas (four to three), Denver (three to two), and St. Louis (two to one)- in order to use the aircraft on its expansion of new routes out of Love Field. This equates to a loss of 412 daily departing seats. While these frequencies and capacity declined, there are also now more seats available on the Southwest flights that remain at TUL, as many of the people who were once "through passengers" can now take nonstop flights from Love Field to their final destination.

Airport management is in frequent discussions with Southwest Airlines regarding their future plans at the Airport and are hopeful that Southwest will return the dropped frequencies by 2016 and possibly add new routes. System-wide, Southwest plans to add additional capacity in the near term, and many of the planes acquired as part of the Southwest-Air Tran merger in 2011 are being refurbished and will be added back into the Southwest livery in 2015.

National Aviation Trends

Historic and anticipated trends related to commercial service, general aviation, and air cargo will be important considerations in developing regional forecasts of demand for Tulsa International Airport. National trends can provide insight into the future of aviation activity and anticipated facility needs. The aviation industry has experienced significant changes over the last 30 years. This section will briefly discuss the trends and the factors that have influenced those trends in the U.S.

Commercial Service Industry Trends. While Tulsa International Airport's future commercial air travel demand will be primarily driven by local demand and regional events, it will also be dictated by industry events, particularly with regard to what type of aircraft will be utilized by airlines flying into the Airport. The following trends have and will have the potential to impact air service at the Airport.

- **Airline rightsizing and capacity discipline.** In response to the Great Recession of 2007-2009, air service trends have shifted in conjunction with airline management attempts to focus on profitability by cutting unprofitable and redundant flying to minimize the number of empty seats. Overall, commercial service operations at all U.S. airports declined 15% between 2007

and 2014. Domestic seat capacity was down nearly 6% during the period and 3% fewer passengers were carried. In addition, many of the network carriers no longer possess the aircraft needed to cost-effectively serve small airports as they have transitioned routes once served by the mainline carrier over to regional partners.

However, U.S. airlines have been profitable over the last several years and the strategy of a conservative approach in their capacity planning will remain. It will likely be a "limited growth" environment in terms of capacity in the near term. While some carriers may try to grow market share by keeping some of their older equipment in service, high fuel costs will reinforce stated intentions to retire older equipment, leading most airlines to remain capacity disciplined. Longer term, the environment should improve somewhat, as airlines continue to add aircraft in the 70-100 seat range. Many new aircraft will be delivered over the next several years and serve to modernize the existing fleet.

- **Continued airline consolidation and restructuring.** Airline consolidation in the last decade, including the mergers of American and US Airways, Delta and Northwest, and United and Continental, has left us with four network carriers. Low Cost Carriers (LCCs) Southwest and AirTran also merged in 2011, with final integration occurring in 2015. Consolidation, as well as a focus on yield improvement, led to improved capacity rationalization. It is anticipated that the consolidated airlines will continue to operate based on cost cutting strategies and driven by profit margins.

- **Limited aircraft.** The trend in strong growth of the 37-50 seat regional jet (RJ) in 1990s and early 2000s to replace turboprop aircraft in small markets and supplement narrow-body jet aircraft in larger markets ended following the spike in jet fuel costs during 2007-2008. It was no longer as economical to fly RJs to provide service to short-haul markets. The cost, coupled with the economic recession and curtailed demand, led to the rapid retirement of small RJs throughout the network. However, it is anticipated that the small RJs will continue to have a presence in carrier's route networks, albeit to a much lesser extent. This migration of network carriers to aircraft with higher capacities in search of lower costs, has left many smaller communities with few choices in terms of carriers and equipment.

- **Airfares and growth of ancillary revenues.** The price for air travel is a significant factor that influences demand. In general, airfares are influenced by airline operating costs and by competitive influences. Fares have seen a downward trend over the last decade due to largely both changes in fuel price and the decoupling of ticket price with ancillary air services such as baggage fees, seat fees, reservation changes, and food and drink purchases. U.S. carriers posted net profits for five consecutive years, due, in part, to ancillary revenues. According to the *American Express Global Business Travel Forecast 2015*, after several years of fare wars and tighter corporate travel budgets causing a decline in airfares, it is projected that 2015 airfares in North America will rise across the board citing an improving economy and capacity discipline by airlines.

General Aviation Industry Trends. At the national level, fluctuating trends regarding general aviation usage and economic upturns/downturns resulting from the nation's business cycle have impacted general aviation demand. Slow economic recovery and economic uncertainties will impact demand for general aviation at many airports throughout the U.S. as well as the Airport over the next several years.

- **General aviation fleet changes.** While single-engine piston aircraft still account for the majority (62%) of the U.S. aircraft fleet in 2014, the national historic trends indicate that multi-engine turboprop and business jet fleets grew at a faster rate than the single-engine and multi-engine piston fleet. The most active growth in the fleet size has been in turbine aircraft and rotorcraft. According to the FAA *General Aviation and Air Taxi Activity Surveys*, as a result of the recent recession, the U.S. general aviation aircraft fleet has declined 4.7% from 231,606 aircraft in 2007 to an estimated 198,860 in 2014.

- **Active pilots decline.** There were nearly 593,500 active pilots in the U.S. at the end of 2014. An active pilot is a person with a pilot certificate and a valid medical certificate. There was a negative 0.3% CAGR in pilot population from 2001. Recreational and private pilot certificates accounted for the largest declines.

- **Drop in general aviation operations.** According to FAA air traffic activity, between 2001 and 2014, general aviation operations experienced a negative 2.9% CAGR. In 2014, there were 25.6 million general aviation operations at 514 towered airports, 54% of which were itinerant operations.

Other national trends that may impact general aviation demand at the Airport include:

- **Movement from 100LL AvGas to no-lead aviation fuel**
- **Changes in manufacturing for new general aviation aircraft**
- **Escalating costs for new general aviation aircraft**
- **Increases in business reliance on general aviation travel**
- **Growth in alternative general aviation segments: sport and experimental aircraft**

Air Cargo Industry Trends. Total air cargo volumes in the U.S. have declined over the last 10 years as a result of the following industry changes including increased jet fuel costs, declines coinciding with the global recession, increased security regulations, market saturation and improved ground efficiency. The U.S. air cargo industry is not expected to sustain the high growth rates experienced in previous decade and it is clear that the market for air cargo has changed. This decline in air cargo and its maturity can be explained by the following:

- **Increased jet fuel costs over the last 15 years.** High fuel prices have slowed demand and negatively impacted cargo carriers, just as it has impacted passenger airlines. Many carriers,

including FedEx, are replacing older aircraft with fuel efficient aircraft and changing route structures to maximize fuel efficiency.

- **Decline coinciding with global recession.** Air cargo traffic fell dramatically during the recent global recession which began in 2007. There are indicators that the recovery from the recession is occurring, but slowly.

- **Increased shipment security.** In August 2010, new security rules went into effect requiring 100 percent screening of all cargo transported on U.S. domestic passenger aircraft, creating an additional obstacle for providers of air cargo belly space.

- **Slowing domestic growth resulting from mature market.** The U.S. air cargo industry is considered a mature industry based on market saturation by vertically-integrated carriers like DHL, FedEx, and UPS, a modal shift from air to trucking due to improved ground efficiency, declining availability of belly space on U.S. carriers due to fleet changes and higher load factors, which reduces belly cargo capacity, and the decrease in U.S. Postal Service (USPS) mail volume due to increased use of technology including email and smartphones. In addition, historically mail that travelled over 500 miles was flown; this has now increased to up to 800 miles.

National Projections of Demand. On an annual basis, the FAA publishes aerospace forecasts that summarize anticipated trends in all components of aviation activity. Each published forecast revisits previous aerospace forecasts and updates them after examining the previous year's trends in aviation and economic activity. Many factors are considered in the FAA's development of aerospace forecasts, some of the most important of which are U.S. and international economic forecast and anticipated trends in fuel costs.

The recent projections found in *FAA Aerospace Forecast Fiscal Years 2015-2035* are summarized below.

- Between 2014 and 2035, real **Gross Domestic Product** (GDP) growth is assumed to grow at 2.4% annually, on average, while real disposable personal income is also projected to grow at a CAGR of 2.6% over the same period.

- With lower energy prices, U.S. carrier profitability should remain steady or increase as an economy in its sixth year of recovery leads to strengthening demand and increased revenues, while operating costs are falling or stable. Over the long term, FAA sees a competitive and profitable aviation industry characterized by increasing demand for air travel and airfares growing more slowly than inflation, reflecting over the long term a growing U.S. economy.

- For the 30-year period, the FAA is forecasting total **domestic seat capacity** to grow 1.9% annually. **Load factors** are expected to increase just slightly over the forecast period, from 84.4% in 2014 to 85.7% in 2035.

- **Domestic enplanements** will grow at an average annual rate of 1.7% for the 30 year forecast.
- **Average seats per aircraft mile** is anticipated to grow from 126.9 in 2014 to 139.3 in 2035.
- The FAA projects that **air carrier operations** will grow at an average annual rate of 2.7% between 2014 and 2035, while **air taxi/commuter operations** will decline at a CAGR of negative 1.2% with most of the drop coming in the next 10 years to coincide with the rapid retirement of the 50-seat regional jets.
- **Narrow-body passenger jet aircraft** is expected to grow at a CAGR of 1.1% between 2014 and 2035. **Regional jet aircraft** are projected to decline 1.1% per year over the forecast period.
- The FAA estimates that the U.S. **general aviation aircraft fleet** will grow from an estimated 198,900 aircraft in 2013 to 214,300 aircraft in 2035. This is equal to an average annual rate of growth of 0.4%. **Jet aircraft** are expected to grow at a greater rate than other general aviation aircraft, experiencing a CAGR of 3.6% through 2035. Turboprop, sport aircraft and experimental aircraft are also anticipated to grow.
- It is anticipated that **general aviation aircraft operations** will grow at a CAGR of 0.4% through 2035.
- The FAA's national forecast for **domestic revenue ton miles (RTMs)** by U.S. all- cargo carriers is expected to grow at a CAGR of 0.7%. Growth in RTMs is expected to come primarily from increased rates rather than tonnage. RTMs on passenger carriers is expected to decline slightly between 2014 and 2035.
- National forecasts project that the number of **cargo narrow-body jet aircraft** for U.S. carriers will grow at and CAGR of 1.1% between 2014 and 2035.

Local Factors Affecting Demand

There are other factors unique to the Airport are also have the potential to impact the forecasts developed in this chapter.

Proximity to Competing Airports. The proximity to competing airports is one of the key determinants of the demand and size of an airport's service or catchment area. It is estimated that the service area of the Airport has a population of 1.1 million people. Dallas area airports Love Field (DAL) and Dallas/Ft. Worth International (DFW), 250 miles to the south, Will Rogers World Airport (OKC), 110 miles to the West and to a much lesser extent, Kansas City International (MCI,) 240 miles to the north are all within close proximity to TUL and impact the ability of the airport to retain passengers, especially leisure passengers.

The *2013 True Market/Leakage* for the Airport was developed by Sixel Consulting Group. This study determined the total number of passengers that are generated within the Airport's 10-county market area regardless of airport used. According to the study, the Airport's air service served 73% of the catchment area market which is a solid retention rate for the market. However, 1,275 passengers daily each way (PDEW) or 465,375 passenger a year drive to competing airports, primarily DAL and DFW, indicating the potential to support additional air service in the future in order to capture more of the demand associated with the market area.

American Airlines Aircraft Maintenance Base. One of the largest employers in the Airport Market Area is American Airlines, which employees 5,500 people at its 260 acre maintenance base located at the Airport. The base serves as headquarters for all the airlines' maintenance and engineering activities worldwide. In recent years, the employees work mainly on engines for the MD-80 aircraft, but American is rapidly retiring those planes from its fleet and should be completely out of service by 2018. The fuel-efficient Boeing 737-800 is the aircraft that is replacing many of the MD-80, as well as some Boeing 757s and 767s, and is the main part of the airline's aircraft modernization.

The City of Tulsa is working closely with American Airlines to ensure that it's maintenance base gets the upgrades needed in the next few years to accommodate the new fleet, which in addition to the 737-800, includes the Airbus 319, 320, and 321. The upgrades needed include the docking, engine test cells, and bench test equipment. City officials recognize the importance of keeping this major economic engine and employer located at the Airport. It is anticipated that the upgrades will occur and the operational projections will shift from the MD-80 aircraft to the Boing 737-800. This shift is already occurring. In 2014, nearly 8% of the Airport's commercial service operations were by American Airlines on MD-80 aircraft. According to *Official Airline Guide* data, by the end of 2015 only two daily departures will be provided by American Airlines on MD-80 aircraft (4% of total scheduled operations). Several flights to Dallas/Ft. Worth will be shifted from MD-80s to CRJ-700 and Boeing 737-800 aircraft.

Historic and Current Aviation Activity

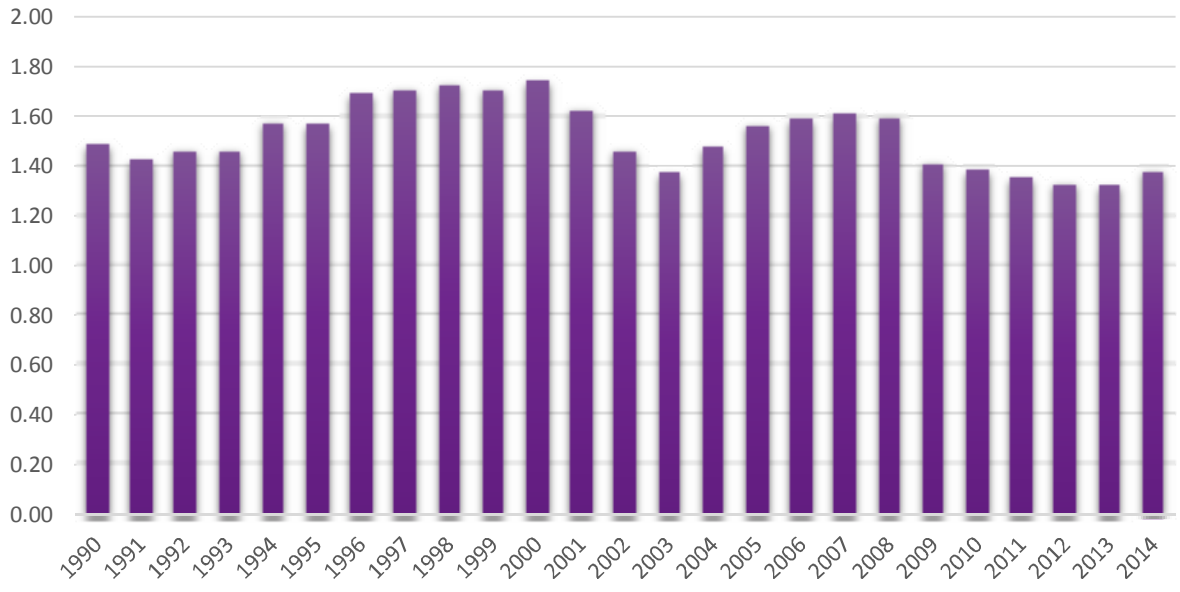
Historic activity data for the Airport provides the baseline from which future activity can be projected. While historic trends are not always reflective of future periods, historic data does provide insight into how local, regional, and national demographic and aviation-related trends may be tied to the Airport.

Commercial Air Service

Enplanements. Between 1990 and 2014, passenger enplanements at the Airport have fluctuated as illustrated in the following figure entitled *HISTORIC PASSENGER ENPLANEMENTS*. In the 1990s, enplanements at the airport grew steadily. Enplanements peaked in 2000, with 1.74 million passengers. Following the events of 9/11, enplanements at the Airport, as well as the entire U.S., dipped as airlines struggled financially. After rebounding between 2003 and 2008, the economic recession and cutbacks associated with subsequent carrier mergers (United-Continental, Delta-Northwest, American-US Airways) have led to a decline in service

and enplanements once again. After five years of declines, enplanements grew in 2014, up 3.9% from 2013 to 1.38 million.

Figure B3 **HISTORIC PASSENGER ENPLANEMENTS (In Millions of Passengers)**



SOURCE: *TAIT Staff records*

When enplanements are analyzed by carrier, a shift can be seen over the last 10 years as airline mergers have impacted activity levels at the Airport. The figure entitled *HISTORIC ENPLANEMENTS BY CARRIER* presents the historic enplanements by the major carriers and their regional partners. The figure entitled *HISTORIC AIRLINE SHARE OF ENPLANEMENTS* highlight how the airlines' shares have shifted since 2004.

Southwest has carried the most passengers over the last 10 years. In 2014, Southwest accounted for 37.3% of TUL passengers, compared to 33.5% in 2004. Airline mergers have impacted both enplanements and service levels. Continental and United (and their regional partners) each carried nearly 11% of the passengers. These carriers merged in 2010 and, in 2014, a combined carrier accounted from nearly 20% of the TUL enplanements. A combined Delta and Northwest airlines (and their regional partners) experienced the largest drop in market share over the last 10 years, dropping from 18.9% in 2004 to 13.5% in 2014. Allegiant entered the TUL market in 2013 and accounted for just 0.2% of the enplanements in 2014.

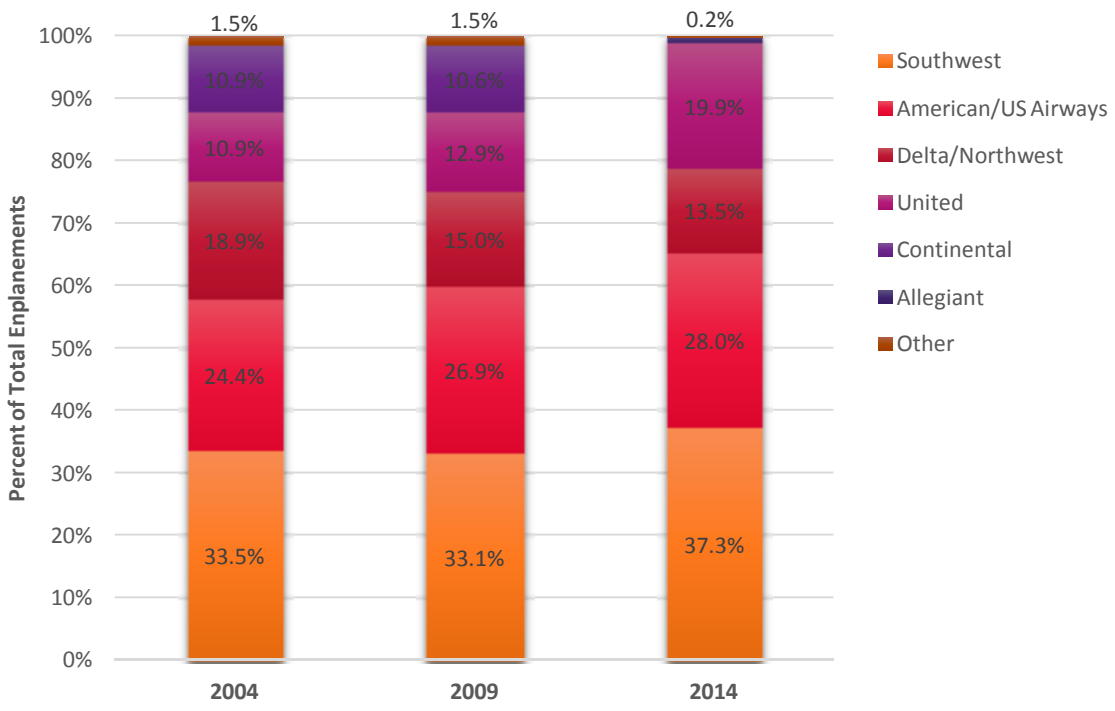
Table B3 **ENPLANEMENTS BY CARRIER**

AIRLINE	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
SOUTHWEST	**493,666**	**510,725**	**500,087**	**494,696**	**522,661**	**465,555**	**490,901**	**493,029**	**475,265**	**496,763**	**512,569**
AMERICAN[1] (incl. US Airways)	**359,725**	**409,137**	**387,137**	**432,085**	**411,958**	**378,943**	**349,278**	**349,813**	**355,581**	**352,178**	**385,358**
American	277,716	292,958	259,665	314,546	311,440	315,603	294,973	293,110	297,967	294,012	310,371
American Eagle	82,009	103,745	102,745	83,672	68,673	47,281	54,305	56,703	57,614	58,166	56,822
Am Connect/US Airways	0	12,434	24,727	33,867	31,845	16,059	0	0	0	0	18,165
UNITED[1]	**151,519**	**167,285**	**196,611**	**221,008**	**209,141**	**181,079**	**177,723**	**172,904**	**145,599**	**248,633**	**273,968**
United	55,507	55,954	80,659	98,183	86,296	86,459	59,971	39,912	17,819	25,223	1,078
ACA/Express Jet	30,648	0	0	0	0	0	16,117	66,752	74,356	160,075	168,351
SkyWest	52,436	67,436	75,025	56,632	57,788	57,241	70,154	38,798	45,247	50,105	53,815
GoJet	0	5,715	38,630	0	0	0	351	25,467	8,177	13,230	25,032
Transstates	0	2,101	2,297	22,361	29,447	37,379	27,126	1,975	0	0	25,692
ExpressJet	0	0	0	43,832	35,610	0	4,004	0	0	0	0
Air Wisconsin	12,928	36,079	0	0	0	0	0	0	0	0	0
CONTINENTAL[1]	**160,929**	**151,358**	**172,404**	**159,205**	**172,192**	**149,736**	**138,275**	**134,558**	**147,632**	**30,654**	**0**
Continental	78,006	68,583	58,578	62,829	98,347	37,455	21,622	19,405	24,933	6,557	0
CO Express	58,181	82,775	113,826	63,443	36,977	101,954	101,034	74,394	108,552	24,097	0
Colgan	0	0	0	0	0	0	0	39,634	14,147	0	0
Chautauqua	24,742	0	0	32,933	36,868	10,327	15,619	1,125	0	0	0
DELTA[1] (incl. Northwest)	**278,341**	**284,874**	**260,624**	**240,166**	**242,166**	**211,512**	**213,861**	**199,863**	**197,900**	**188,187**	**186,141**
Delta	88,181	47,621	0	0	0	0	9,094	12,615	27,843	53,565	53,273
Atlantic Southeast	21,912	53,378	92,569	78,922	82,651	85,147	71,476	98,639	79,107	79,253	86,695
SkyWest	26,685	47,683	41,208	28,540	35,011	26,805	32,568	30,876	18,609	39,246	22,192
Northwest Airlink	99,663	97,232	97,533	97,152	101,514	95,645	86,047	53,392	58,343	16,047	23,981
Compass	0	0	0	0	0	0	5,336	82	11,932	76	0
Comair	41,900	38,960	29,314	35,552	22,990	2,692	5,932	509	1,950	0	0
Other	0	0	0	0	0	1,223	2,102	2,924	40	0	0
Mesaba	0	0	0	0	0	0	1,306	826	76	0	0
ALLEGIANT	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2,876**	**14,577**
SUN COUNTRY	**0**	**0**	**0**	**183**	**97**	**534**	**1,245**	**1,180**	**1,069**	**1,289**	**1,620**
FRONTIER	**0**	**19,018**	**38,752**	**39,272**	**21,269**	**15,227**	**7,847**	**0**	**0**	**0**	**0**
TWA	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Others	**30,896**	**21,311**	**30,928**	**21,900**	**12,219**	**5,092**	**925**	**1,345**	**2,517**	**1,435**	**1,166**
TOTAL	**1,475,076**	**1,563,708**	**1,586,543**	**1,608,515**	**1,591,703**	**1,407,678**	**1,380,055**	**1,352,692**	**1,325,563**	**1,322,015**	**1,375,399**

SOURCE: *TAIT Staff records*

Notes: Delta and Northwest merged in 2008; United and Continental merged in 2010; and American and US Airways merged in 2013. Since Continental accounted for over 10% of the historic enplanements, this airline has been shown separately from United. .

Figure B4 **HISTORIC AIRLINE SHARE OF ENPLANEMENTS**

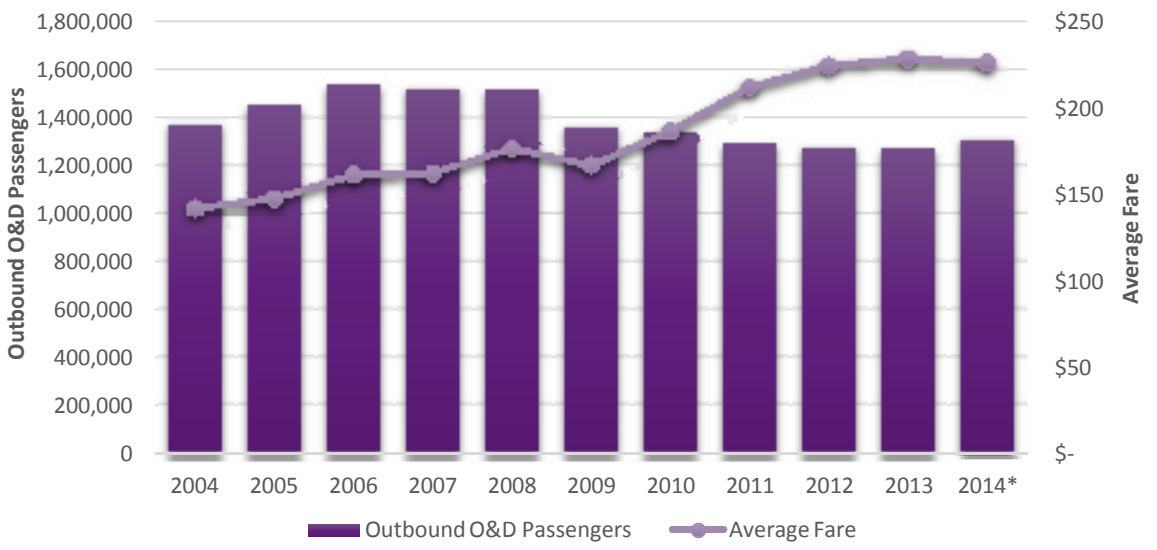


SOURCE: *TAIT Staff records*

Origin & Destination (O&D) Passengers. Almost all passengers using the Airport either originate or terminate their journeys at TUL. In the year ended September 30, 2014, O&D traffic accounted for 95% of the enplaned passengers at the Airport. The remaining passengers were a combination of enplanements on unscheduled (charter) flights, connecting flights at the Airport, or non-revenue passengers.

Between the 12 months ended September 30, 2014 and the same periods of 2004, O&D passengers declined at an average annual rate of 0.5%. Airfares rose at a CAGR of 4.8% over the 10-year period. Most of the growth in fares occurred between 2009 and 2012, when fares jumped from $167 to $225.This fare hike accompanied Frontier's exit from the TUL market and the carrier's attempt to right size capacity and fares on all routes to improve profitability. While airfares jumped 35% between 2009 and 2012, O&D passengers declined during the period, down just over 6%. By 2014, fares leveled off and O&D passengers rose 3.0%. This data is presented in the figure entitled *OUTBOUND O&D PASSENGERS AND AVERAGE ONE-WAY FARES.*

Figure B5 **OUTBOUND O&D PASSENGERS AND AVERAGE ONE-WAY FARES**



SOURCE: *Official Airline Guide, Diio data*
*Note: *Data for 2014 is for year ended September 30.*

The top 25 O&D markets for the year ended September 30, 2014 and the average one way fares in markets at TUL can be found in the table entitled *OUTBOUND ORIGIN-DESTINATION PASSENGERS 2014*. The top 25 markets account for 66.5% of all passengers. Houston (including Hobby and Intercontinental combined) was the largest O&D market at TUL, with 10.2% of the Airport's total outbound O&D traffic. Dallas (Love Field and DFW combined) accounted for 7.8% of the total O&D passengers. Denver, Chicago and Los Angeles round out the top five O&D markets at TUL. Nine of the top 10 markets have nonstop service 2015. New York, the 7th ranking destination, is the only city currently without nonstop service. United provided nonstop service between Tulsa and Newark from March 2012 to January 2015. The service was discontinued due to poor performance, the average load factor on the route was 65% in 2014.

Table B4 **OUTBOUND ORIGIN-DESTINATION PASSENGERS**

2014 Rank	City	Airport	Code	2015 Nonstop Service	Outbound O&D Passengers	% of Total	Average One-Way Fare
1	**Houston**				**133,255**	**10.2%**	**$175**
		Houston Hobby	HOU	*	78,657	6.0%	$157
		Houston Intercontinental	IAH	*	54,599	4.2%	$202
2	**Dallas**				**101,886**	**7.8%**	**$101**
		Love Field	DAL	*	59,142	4.5%	$100
		Dallas-Ft. Worth	DFW	*	42,744	3.3%	$101
3	**Denver**		**DEN**	*	**71,465**	**5.5%**	**$151**
4	**Chicago**				**54,696**	**4.2%**	**$177**
		O'Hare	ORD	*	40,003	3.1%	$187
		Midway	MDW	*	14,693	1.1%	$149
5	**Los Angeles**				**51,473**	**3.9%**	**$229**
		Los Angeles	LAX	*[1]	24,080	1.8%	$228
		Orange County	SNA		14,410	1.1%	$221
		Ontario	ONT		8,250	0.6%	$237
		Burbank	BUR		4,551	0.3%	$236
		Long Beach	LGB		182	0.0%	$381
6	**Las Vegas**		**LAS**	*	**43,261**	**3.3%**	**$190**
7	**New York**				**41,954**	**3.2%**	**$218**
		LaGaurdia	LGA		19,867	1.5%	$209
		Newark	EWR		19,095	1.5%	$225
		New York Kennedy	JFK		1,980	0.2%	$231
		White Plains	HPN		906	0.1%	$235
		Islip	ISP		107	0.0%	$296
8	**Orlando**				**36,079**	**2.8%**	**$163**
		Orlando	MCO		23,774	1.8%	$210
		Sanford	SFB	*	12,305	0.9%	$72
9	**Phoenix**		**PHX**	*	**39,831**	**3.0%**	**$177**
10	**Atlanta**		**ATL**	*	**31,952**	**2.4%**	**$225**
11	**San Francisco**				**26,953**	**2.1%**	**$230**
			SFO		14,070	1.1%	$233
			OAK		6,541	0.5%	$218
			SJC		6,342	0.5%	$234
12	**Washington D.C.**				**25,956**	**2.0%**	**$224**
			DCA		16,393	1.3%	$213

2014 Rank	City	Airport	Code	2015 Nonstop Service	Outbound O&D Passengers	% of Total	Average One-Way Fare
			IAD	*	9,563	0.7%	$244
13	**South Florida**				**25,752**	**2.0%**	**$193**
		Ft. Lauderdale	FLL		11,087	0.8%	$188
		Miami	MIA		11,057	0.8%	$193
		West Palm Beach	PBI		3,608	0.3%	$213
14	**St. Louis**		**STL**	*	**20,673**	**1.6%**	**$126**
15	**San Antonio**		**SAT**		**18,690**	**1.4%**	**$173**
16	**Seattle**		**SEA**		**18,371**	**1.4%**	**$236**
17	**Austin**		**AUS**		**17,439**	**1.3%**	**$169**
18	**Salt Lake City**		**SLC**	*	**15,966**	**1.2%**	**$206**
19	**San Diego**		**SAN**		**15,957**	**1.2%**	**$225**
20	**New Orleans**		**MSY**		**15,001**	**1.1%**	**$195**
21	**Detroit**		**DTW**	*	**13,661**	**1.0%**	**$222**
22	**Minneapolis/St. Paul**		**MSP**	*	**13,079**	**1.0%**	**$238**
23	**Tampa**		**TPA**		**12,682**	**1.0%**	**$216**
24	**Philadelphia**		**PHL**		**12,292**	**0.9%**	**$247**
25	**Boston**		**BOS**		**12,135**	**0.9%**	**$229**
TOTAL TOP 25 O &D					**870,461**	**66.5%**	**$181**
TOTAL ALL OTHER MARKETS					**439,461**	**33.5%**	**$315**
TOTAL ALL MARKETS					**1,309,922**	**100.0%**	**$226**
TOTAL DOMESTIC O&D					**1,197,857**	**91.4%**	**$199**
TOTAL INTERNATIONAL O&D					**112,064**	**8.6%**	**$523**

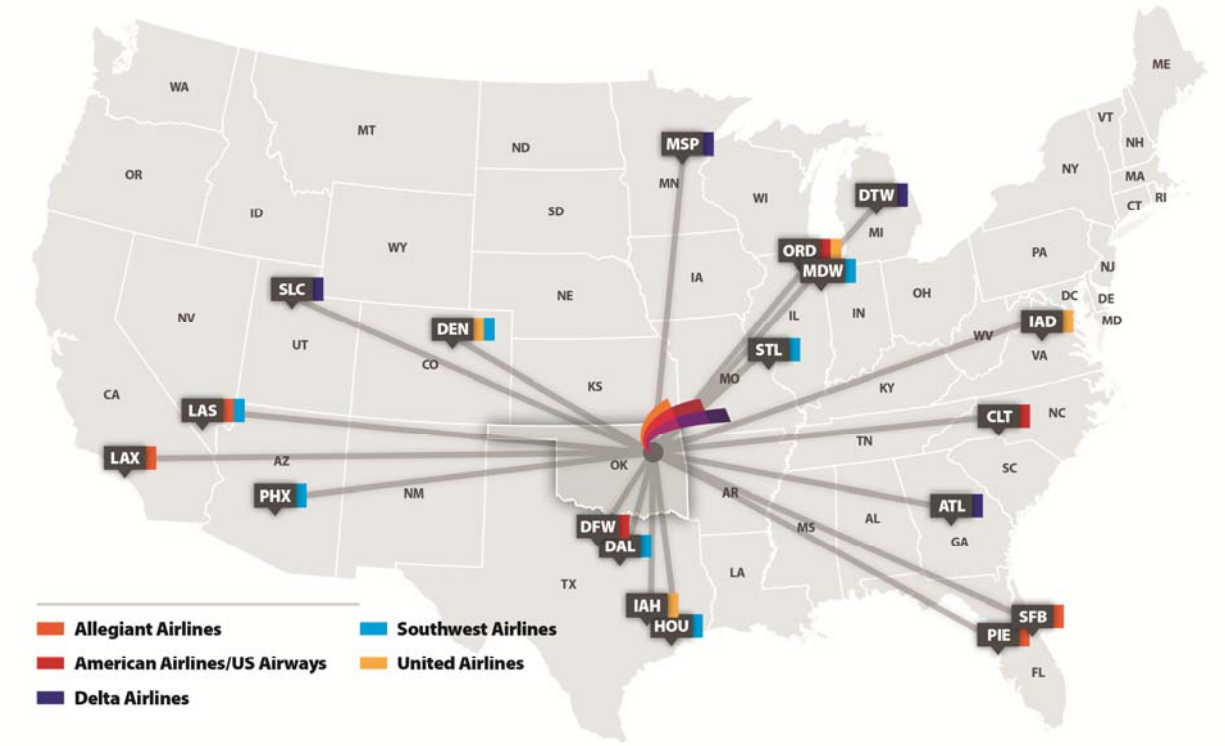
SOURCE: *Official Airline Guide, Diio data*
Note: [1] Services to LAX begins in June 2015 on Allegiant Airlines.

International O&D passengers accounted for just 8.6% of the total in 2014. However, due to the higher average fares, these routes made up 20% of the airline revenue out of TUL in 2014. The top five international O&D markets include London, Cancun, Toronto, Calgary, and San Jose, Costa Rica.

Air Carrier Activity. The Airport is served by five major airlines: two low cost carriers (LCCs), Southwest and Allegiant, and three network carriers, American (includes merger partner US Airways and regional partner American Eagle), United (and regional partners ACA/ExpressJet, SkyWest, GoJet, and Transstates), and Delta (and regional partners ASA, SkyWest, and Northwest Airlink). The nonstop routes by carrier from the Airport are presented in the following exhibit entitled *NONSTOP ROUTES FROM TULSA INTERNATIONAL AIRPORT, APRIL 2015*.

TUL had nonstop service to 17 airports in April 2015, with two additional destinations to be added by Allegiant by the summer. Southwest offered nonstop service to seven airports on jet aircraft. Delta and United each offered nonstop service to four airports, while American offered service to three airports. Allegiant, who began serving TUL in 2014, offered two weekly flights to both Las Vegas and Orlando-Sanford in April 2015, and will be begin the same level of service to Los Angeles and Tampa-St. Petersburg in the Summer of 2015. Several airports- Chicago-O'Hare, Denver, and Las Vegas- have nonstop service on multiple carriers.

Figure B6 **NONSTOP ROUTES FROM TULSA INTERNATIONAL AIRPORT, APRIL 2015**



***SOURCE**: Official Airline Guide, Diio data*
Note: Allegiant service to Los Angeles and Tampa St. Petersburg begin by summer 2015.

A summary of current scheduled departures, seats, average seats per flight, and load factors for each route is shown in the following table entitled *AVERAGE DAILY SCHEDULED NONSTOP SERVICE, APRIL 2015*. There were 52.9 average daily departures in April 2015. The cities with the most destinations include Dallas (12.9 daily departures), Houston (10.8 daily departures) and Chicago (8.1 daily departures). TUL has service to multiple airports in each of these cities. The average load factor in 2014 at all markets combined was 76%.

Table B5 **AVERAGE DAILY SCHEDULED NONSTOP SERVICE, APRIL 2015**

Nonstop City Airport	Code	Carrier	Scheduled Departures	Scheduled Departing Seats	Average Seats per Flight	2014 Load Factor[1]
Dallas			**12.9**	**1,524**	**118**	**73%**
Dallas/Ft. Worth	DFW	American	10.0	1,136	114	75%
Dallas Love Field	DAL	Southwest	2.9	388	135	71%
Houston			**10.8**	**831**	**77**	**77%**
Houston Intercontinental	IAH	United	8.0	472	59	80%
Houston Hobby	HOU	Southwest	2.8	356	129	74%
Chicago			**8.1**	**662**	**287**	**72%**
Chicago-O'Hare	ORD	American	3.7	319	86	66%
Chicago-O'Hare	ORD	United	3.4	199	59	77%
Chicago Midway	MDW	Southwest	1.0	143	143	76%
Denver	**DEN**		**6.6**	**545**	**83**	**79%**
		United	4.6	260	57	83%
		Southwest	2.0	285	143	76%
Atlanta	**ATL**	**Delta**	**4.7**	**452**	**95**	79%
Las Vegas	**LAS**		**1.3**	**198**	**148**	**82%**
		Southwest	1.0	142	142	82%
		Allegiant	0.3	55	166	-
Phoenix Sky Harbor	**PHX**	**Southwest**	**1.2**	**176**	**143**	**76%**
St. Louis	**STL**	**Southwest**	**1.0**	**143**	**143**	**68%**
Charlotte	**CLT**	**US Airways**	**2.0**	**134**	**67**	**77%**
Detroit	**DTW**	**Delta**	**1.1**	**73**	**67**	**69%**
Salt Lake City	**SLC**	**Delta**	**0.9**	**61**	**67**	**79%**
Minneapolis-St. Paul	**MSP**	**Delta**	**1.0**	**50**	**50**	**81%**
Washington DC-Dulles	**IAD**	**United**	**0.8**	**40**	**50**	**70%**
Orlando-Sanford	**SFB**	**Allegiant**	**0.3**	**47**	**177**	**88%**
Miami	**MIA**	**American**	**0.1**	**21**	**160**	**62%**
Tampa/St. Petersburg	**PIE**	**Allegiant**				
Los Angeles	**LAX**	**Allegiant**				
Grand Total			**52.9**	**4,954**	**94**	**76%**

***SOURCE**: Source: Official Airline Guide, Diio Mi T-100*
Notes: [1] Load factor data was only available for 2014.Allegiant did not start serving Las Vegas until 2015.

The table below entitled *AVERAGE DAILY SCHEDULED NONSTOP SERVICE BY CARRIER*, summarizes the existing service by carrier. As shown, while American and United offer the most daily departures, Southwest, which operates only B737-300 and B737-500 narrow-body jet aircraft, offers the most scheduled departing seats. American and Delta both fly a combination of narrow-body jet, 90-seat regional jet, 70-seat regional jet, and 50-seat regional jet aircraft. The majority of United's operations are on 50-seat regional jets, operated by regional partners. Allegiant operates MD-80 and A-320 aircraft, but offers only 2 to 3 flight departures per week to the destinations it serves. The average number of seats per flight in April 2015 was 94.

Table B6 **AVERAGE DAILY SCHEDULED NONSTOP SERVICE BY CARRIER, APRIL 2015**

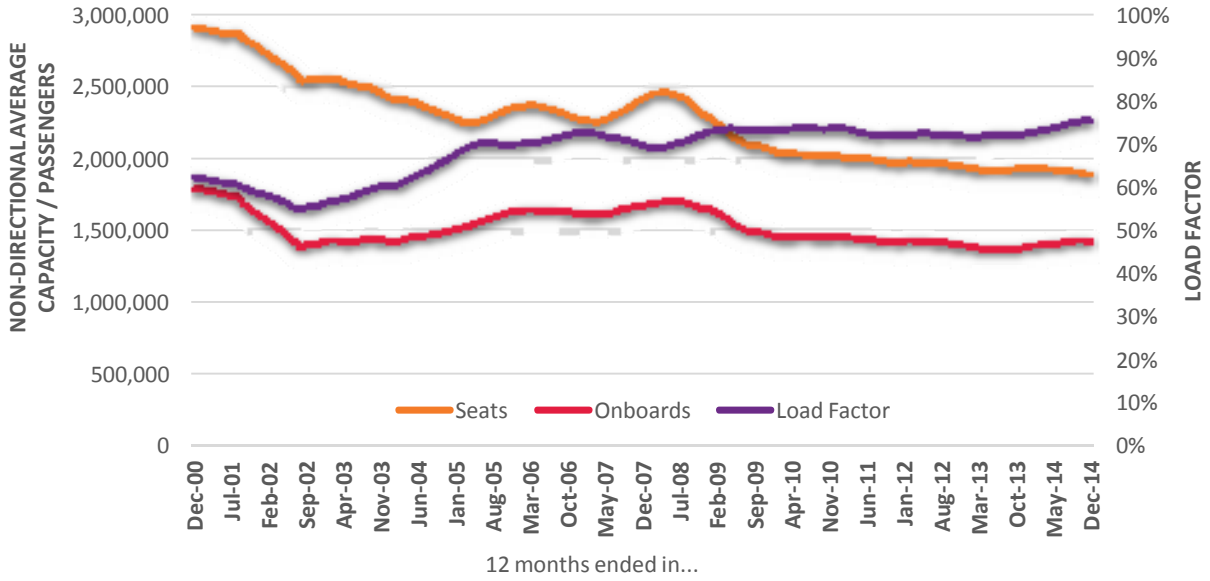
Carrier	Scheduled Departures	% of Total	Scheduled Departing Seats	% of Total	Average Seats per Flight	2014 Load Factor[1]
Southwest	11.9	22.5%	1,633.30	33.0%	138	75%
American	15.9	30.1%	1,610.70	32.5%	102	71%
United	16.8	31.8%	974.2	19.7%	58	78%
Delta	7.7	14.6%	635.8	12.8%	82	77%
Allegiant	0.6	1.1%	102.5	2.1%	171	88%
Total	**52.9**	100.0%	**4,956.50**	100.0%	**94**	76%

***SOURCE**: Official Airline Guide, Diio Mi T-100.*
Notes: [1] Load factor data was only available for 2014.

The following figure entitled *COMMERCIAL SERVICE MARKET TRENDS* shows the changes in seats, onboard passengers, and load factors since 2000 at TUL. The onboard passengers include "through passengers" on Southwest Airline's flights. In 2014, there were nearly 41,000 more onboard passengers than enplanements at the Airport. With the lifting of the Wright Amendment in October 2014, it can be assumed that the number of onboard passengers will go down at TUL as Southwest adds new nonstop destinations out of Love Field. Southwest did account for some of this decline by pulling three daily flights (one each from Love Field, Denver, and St. Louis). This should also provide more available seats from TUL on existing Southwest flights.

As shown below, capacity (seats) has declined overall since 2000 while onboard passengers have dropped at a slower rate, allowing for load factors to remain strong, especially despite the economic downturn that has occurred since 2007. Both load factors and onboard passengers have increased slightly over the past 18 months, ending the decline in passengers.

Figure B7 **COMMERCIAL SERVICE MARKET TRENDS**



***SOURCE**: Diio Mi T-100.*
Notes: Most recent data available was through December 2014.

Operations

An operation is defined as either a takeoff or a landing. Historic aircraft operations data, as reported by the Federal Aviation Administration (FAA) air traffic control tower for the Airport are summarized in the following table entitled *HISTORIC AIRCRAFT OPERATIONS*. In 2014, a total of 95,198 operations occurred at the Airport.

Table B7 **HISTORIC AIRCRAFT OPERATIONS**

Year	ITINERANT						LOCAL			
	Air Carrier	Air Taxi	Total	General Aviation	Military	Total All Itinerant	General Aviation	Military	Total All Local	Total Ops
2004	31,181	16,923	**48,104**	51,177	38,677	**137,958**	14,740	14,816	**29,556**	**167,514**
2005	33,603	31,369	**64,972**	39,069	14,426	**118,467**	20,067	15,883	**35,950**	**154,417**
2006	34,355	32,597	**66,952**	36,997	9,337	**113,286**	13,372	12,318	**25,690**	**138,976**
2007	32,120	37,234	**69,354**	34,533	9,572	**113,459**	14,349	11,989	**26,338**	**139,797**
2008	29,925	36,877	**66,802**	28,090	10,285	**105,177**	10,494	12,086	**22,580**	**127,757**
2009	27,650	29,987	**57,637**	24,650	9,893	**92,180**	12,485	11,915	**24,400**	**116,580**
2010	30,000	26,510	**56,510**	24,012	10,700	**91,222**	8,427	11,817	**20,244**	**111,466**
2011	31,728	23,899	**55,627**	23,505	9,423	**88,555**	7,141	10,858	**17,999**	**106,554**
2012	29,302	25,129	**54,431**	23,678	9,601	**87,710**	5,404	6,766	**12,170**	**99,880**
2013	27,935	24,190	**52,125**	22,738	8,639	**83,502**	4,370	7,695	**12,065**	**95,567**
2014	27,849	23,831	**51,680**	23,788	10,377	**85,845**	2,913	6,440	**9,353**	**95,198**

SOURCE: *FAA ATADS database*

As shown, total annual operations have declined drastically over the last 10 years, down 43% overall or a compound annual growth rate (CAGR) of -5.5% between 2004 and 2014. This decline is similar to national trends and was likely driven largely by the drop in smaller general aviation activity and military activity at the Airport.

- **Commercial Service Operations.** Overall, commercial service operations (which include air carrier and air taxi/commuter operations) experienced a CAGR of negative 0.7% between 2004 and 2014. When Frontier began serving the Airport in 2005, other carriers including American, Continental, and Delta added additional operations and capacity to compete with the new LCC (low cost carrier) service. In addition, Delta shifted all mainline jet operations at TUL to its regional jet partner, Atlantic Southeast Airlines (ASA). Commercial service operations, driven by growth in 50- and 70-seat regional jet service peaked in 2007 and more than doubled from 2004 levels. The economic recession, carrier mergers and efforts to right-size, and rapid retirement of the 50-seat regional jet led to the decline in commercial operations between 2007 and 2014. Total commercial service operations declined over 25% over the period.

  In 2014, 46% of the commercial operations were operated by aircraft that are recorded in the air taxi category, and this number also includes some general aviation operations by business aircraft.

- **General Aviation Operations.** Total general aviation operations (both local and itinerant) have declined over the last 10 years. In 2014, general aviation operations were less than half of what they were in 2004 (or a CAGR of negative 8.6%). This is not a situation unique to the Airport and is reflective of the decline in general aviation activity across the nation due to economic weakness during the recession, coupled with high fuel prices.

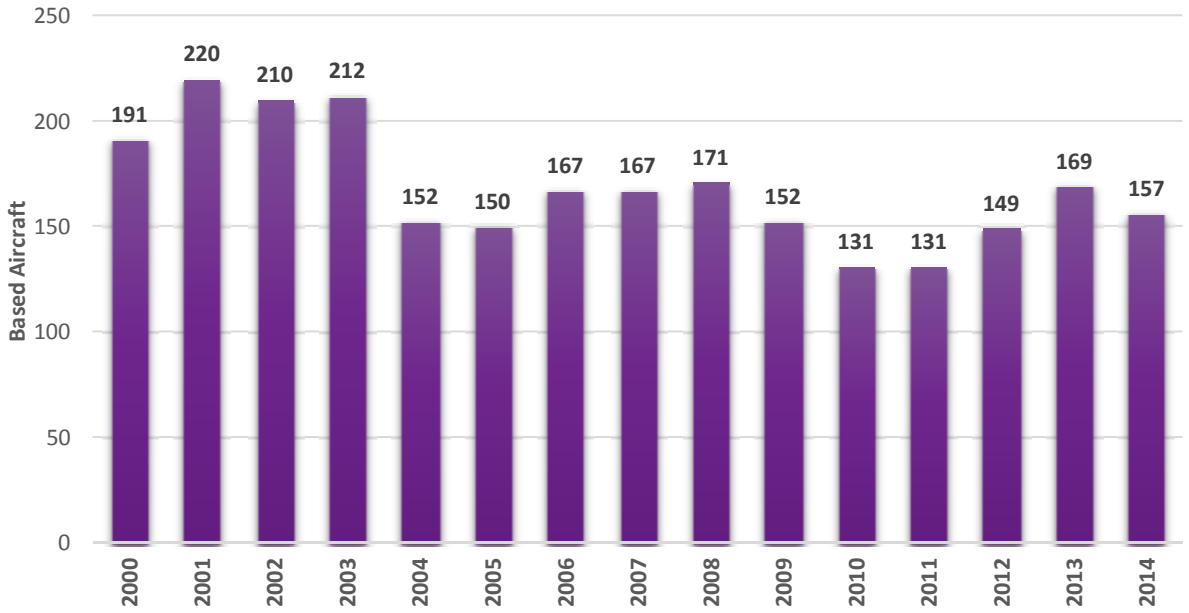
- **Military Operations.** The 138th Fighter Wing of the Oklahoma Air National Guard occupies 81 acres at the Airport. The unit currently flies the F-16 Falcon. In addition, the Oklahoma Army National Guard is also located at the Airport and has a fleet of Black Hawk helicopters for training. Itinerant military aircraft historically have utilized TUL mainly for training operations and cargo transport. Total military operations (local and itinerant) have experienced a drop in the last 10 years, declining 69% from 2004. This represents a CAGR of negative 10.9%.

- **Air Cargo Operations.** According to PASSUR aircraft operations data provided by airport management, all cargo carriers flew 4,790 operations in 2014. The four major all-cargo carriers that serve TUL include FedEx, UPS, Martinaire, and Ameriflight. The operations by all cargo carriers are included in the air carrier and air taxi itinerant operations in the table above and historic data is not available.

Based Aircraft

Based aircraft are those permanently stored at an airport. The number of aircraft based at the Airport has fluctuated since 2000 as shown in the following figure entitled *HISTORIC BASED AIRCRAFT*. In 2014, 157 aircraft were based at the Airport – (74 jet aircraft, 35 multi-engine aircraft, 47 single engine aircraft, and one helicopter). In addition, there are also 30 military aircraft based at the airport- (22 F-16 jet aircraft at the Air National Guard Base and eight (8) Black Hawk helicopters at the Army National Guard Base). These 30 aircraft are not included in the projections since they will not impact airport planning and facility needs. It is projected that these aircraft will remain constant through the 20-year forecast period.

Figure B8 **HISTORIC BASED AIRCRAFT**



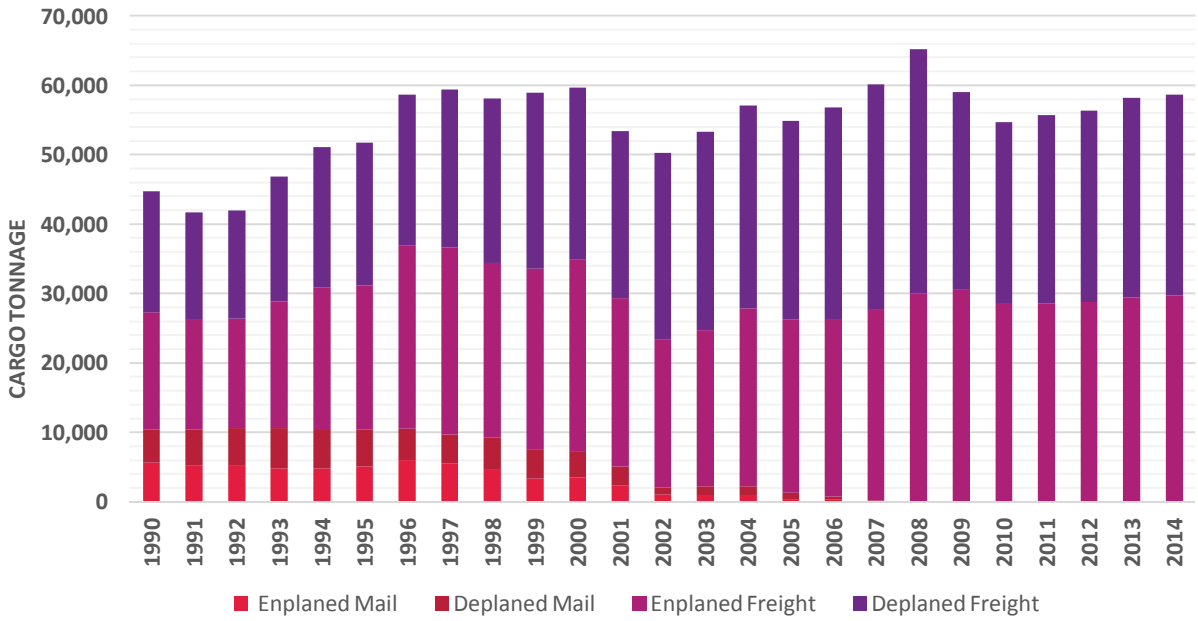
SOURCE: *FAA Terminal Area Forecasts, airport management records*

Air Cargo

A total of 58,627 tons of air freight and mail were enplaned and deplaned at TUL in 2014. The level of air cargo at the Airport has fluctuated since 1990 as shown in the following figure entitled *HISTORIC AIR CARGO TONNAGE*. Air mail shipments at the Airport declined when the U.S. Postal Service began contracting with Federal Express (FedEx) starting in 2001. Also, FedEx does not provide a breakout of mail and freight to airport management and they have a policy in place that any mail sent within 800 miles must be trucked. With FedEx's hub in Memphis, 400 miles to the east, it is assumed that much of the mail and freight carried by FedEx is still being trucked. Between 1990 and 2014, total air cargo tonnage has grown at a CAGR of 1.1% while air freight has grown at a CAGR of 2.3%. Air cargo peaked in 2008 with 65,170 tons. After a two year drop, air cargo has been once again growing, up 7.2% since 2010.

FedEx carried 72% of the air cargo in 2014 at the Airport. UPS enplaned and deplaned 20% of the cargo. Other all-cargo carriers that serve the airport include Ameriflight, and Martinaire. The scheduled commercial carriers also carried a small amount of cargo (2% of the total) in 2014. The all-cargo carriers accounted for about 5% of the total airport operations (4,790 of 95,198) at TUL in 2014.

Figure B9 **HISTORIC AIR CARGO TONNAGE**



SOURCE: *TAIT Staff records*

Projections of Aviation Demand

Projections of aviation demand at Tulsa International Airport for the 20-year planning period are presented here using various methodologies. The results of these different methodologies are compared and a preferred projection of each is selected.

Typically in a Master Plan, forecasts can be produced from historical trends in passenger enplanements, operations, and air cargo. These factors can often correlate with econometric data such as population, employment and income. However, TUL's activity show no linkage to econometric data due to the declines in enplanements and operations over the last 20 years. One statistical methodology, linear regression analysis is not presented due to a low correlation coefficient (Pearson "r") between historic airport activity and various econometric factors (population, employment, PCPI) as well as total U.S. historic domestic enplanements and other aviation activity. Therefore regression analysis is not a viable methodology due to low predictive reliability.

Often, planners compare their projections of demand to previous forecasts for an airport. The last Airport Master Plan for TUL was completed in 1996. The airline industry has changed immensely since the previous master plan, including impacts related to the events of 9/11, the most recent economic recession, and carrier bankruptcies and mergers. The projections from the previous master plan are therefore no longer relevant for comparison purposes.

The passenger forecast developed are unconstrained, in that, facilities, infrastructure, resources, and development funding are assumed to be available as needed for the forecast period. The forecast baseline year is 2014, the most recent full year of data available when this chapter commenced.

The following assumptions were made in developing the projections of aviation demand at the Airport:

- **The national and local economies will continue to grow through the overall forecast period.**
- **Economic disturbances may cause year-to-year traffic variations, but the long term projections will likely be realized.**
- **Aviation activity at the Airport will generally reflect the national aviation industry. The FAA projects growth in all aspects of aviation.**
- **The Airport will continue air service development efforts to reduce leakage and obtain additional service and capacity.**
- **The current air service schedule will remain, including the recent new service additions.**
- **Southwest Airlines will not reduce capacity any further in reaction to the lifting of the Wright Amendment.**
- **TUL enplanement demand will be met by the airlines through the addition of flight frequencies and/or capacity on existing routes, service to new destinations, and more fuel efficient aircraft.**
- **No consideration was made for additional airline mergers. It is assumed that the four mainline airlines, Southwest, and Allegiant will continue to operate at the Airport through the forecast period.**
- **The 50-seat regional jet will continue to be phased out of airline fleets and will be replaced by the 70-90 seat regional jets. American will continue to phase out the 140-seat MD-80 and some of the 184-seat Boeing 757s. These aircraft will probably be replaced by the 160-seat Boeing 737-800. These changes will impact the average seats per flight over the forecast period.**
- **Due to its proximity to downtown Tulsa and the amenities it offers, the Airport will continue to serve a strong base of corporate general aviation travel and jet operations will continue to grow.**
- **The military will continue to use the Airport for cargo, transport, and training activity through the forecast period.**

Passenger Enplanements

Forecasts of passenger enplanements serve as the foundation for other commercial service activity forecasts, and provide a basis for determining future requirements for facilities integral to the accommodation of passengers. A variety of methods exist for forecasting passenger enplanement activity at an airport. Historical and statistical models serve to provide a general range of possibilities and assume that the past is a sufficient indicator of the future. Several forecasting sources and methods were evaluated as to their usefulness, reasonableness, and pertinence to Tulsa International Airport.

Despite Tulsa's growing population base and relatively robust corporate economy, TUL has experienced declines in service and enplanements that mirrored national trends following 9/11 and the economic recession. Recent airline mergers, carrier attempts to reduce capacity and increase load factors and profits, the rapid retirement of the 50-seat regional jet, and the lifting of the Wright Amendment have all contributed to the decline in service and enplanement levels at TUL. However, the downward trend at TUL ended in in 2014 and it is anticipated that the airport will experience growth again, albeit at smaller rates due to the cautious decisions of carriers.

The five methodologies evaluated for projecting passenger enplanements are summarized below and shown in the following table and figure both entitled *PASSENGER ENPLANEMENT PROJECTIONS*.

- **Scenario 1: Constant Market Share of U.S. Domestic Enplanements.** The *FAA Aerospace Forecast Fiscal Years 2015-2035* projects that U.S. enplanements will grow at an average annual rate of 1.7% through 2035. In 2014, the Airport's share of total U.S. enplanements was 0.206%. This scenario assumes that the Airport will maintain this share through the forecast period.

- **Scenario 2: Growing Market Share of U.S. Domestic Enplanements.** Prior to the economic recession beginning in 2007, the Airport maintained a market share of 0.234% of U.S. domestic enplanements. This scenario assumes that the TUL's share of the national enplanements will grow from 0.206% to 0.234% during the forecast period and projects a CAGR of 2.3% between 2014 and 2035.

- **Scenario 3: Enplanements Per Capita.** In 2014, the TUL enplanements per capita of the INCOG region (Tulsa County and parts of Creek, Osage, Rogers, and Wagoner counties) was 1.69. This scenario assumes that this enplanements per capita ratio will remain constant through the forecast period. Enplanements would increase at an average annual rate of growth of 1.1% utilizing this method.

- **Scenario 4: Income Growth.** This scenario projects enplanements to increase at an average annual rate of 2.2%, which is equal to the rate of income growth projected for the Tulsa MSA by Woods & Poole between 2011 and 2034.

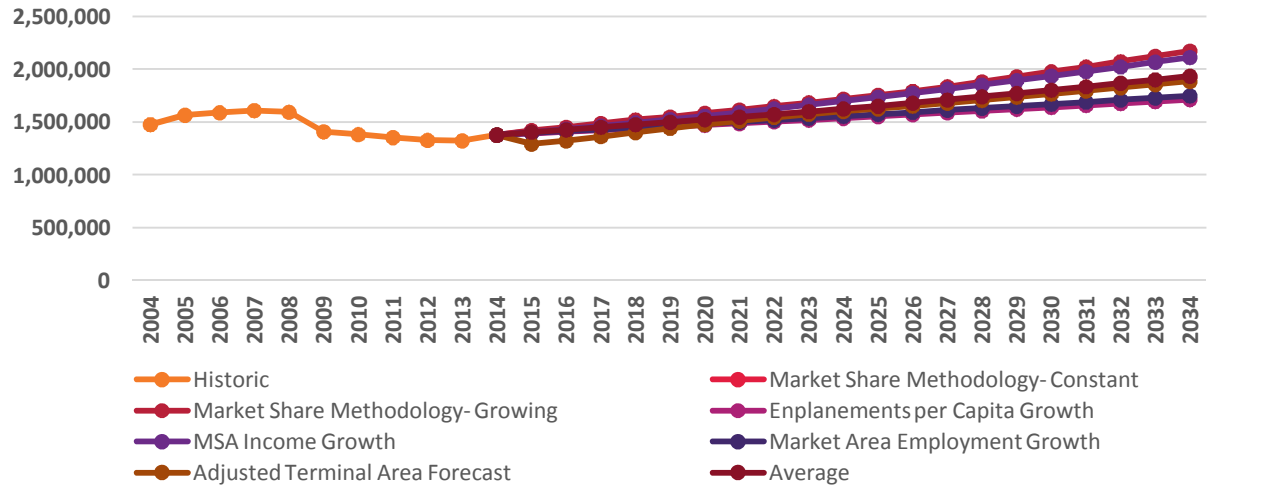
- **Scenario 5: Employment Growth.** This scenario projects enplanements to increase at an average annual rate of growth of 1.2%, equal to the projected employment growth of the 10-county Airport Market Area between 2011 and 2034 as reported by Woods & Poole.

Table B8 **PASSENGER ENPLANEMENT PROJECTIONS**

Year	Scenario 1: U.S. Enpl Constant Market Share	Scenario 2: U.S. Enpl Growing Market Share	Scenario 3: Enpl Per Capita	Scenario 4: Income Growth	Scenario 5: Employ Growth	Average	Adjusted Terminal Area Forecasts[1]
2014	1,375,399	1,375,399	1,375,399	1,375,399	1,375,399	1,375,399	1,375,399
2019	1,501,264	1,547,300	1,452,729	1,521,337	1,462,643	1,497,055	1,439,260
2024	1,615,241	1,715,821	1,534,406	1,695,514	1,553,638	1,622,924	1,600,440
2034	1,924,614	2,171,767	1,711,795	2,111,353	1,747,920	1,933,490	1,883,062
CAGR 2014-2034	1.69%	2.31%	1.10%	2.17%	1.21%	1.72%	1.58%
2034 Variation from TAF	2.2%	13.3%	-10.0%	10.8%	-7.7%	2.6%	0.0%

***SOURCE**: Marr Arnold Planning*
Notes: [1] Calendar year 2014 enplanement data not available in the FAA's Terminal Area Forecasts. The TAF forecast is adjusted by using the actual 2014 enplanements provided by the Airport and applying the growth rates from the TAF projection.

Figure B10 **PASSENGER ENPLANEMENT PROJECTIONS**

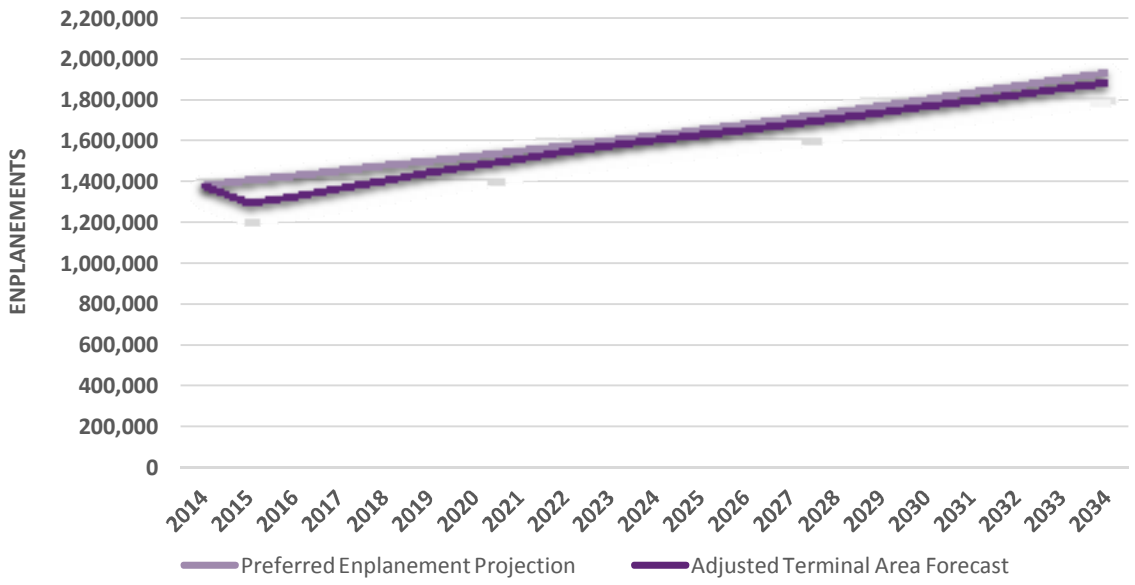


***SOURCE**: Marr Arnold Planning*

Preferred Enplanement Forecast Methodology. The previous section presented enplanement projections from several analytical sources. From these sources, preferred potential future enplanement activity can be established. It is expected that enplanement activity at the Airport will fluctuate over the next 20 years. The average of the five methodologies has been chosen as the preferred enplanement forecast scenario. This scenario assumes that the Airport's market share grow at an average annual rate of 1.72%. This average is just slightly higher than the Scenario 1- Constant Market Share of U.S. Enplanements methodology. The average is not only consistent with national enplanement projections, but also reflects 1) the growth in 2014, despite the lifting of the Wright Amendment and continued slow economic recovery, 2) the entrance of Allegiant Airlines in the market, potentially spurring additional seasonal leisure travel in the next few years 3) high load factors in existing markets and 4) projected economic growth for the Airport Market Area.

As shown in the following table entitled *PREFERRED PASSENGER ENPLANEMENT PROJECTION* this growth is just slightly higher than the growth forecasted by FAA in the Terminal Area Forecasts (TAF) published in January 2015. The 2034 projection of 1.93 million annual enplanements is just 2.6% higher than the TAF 2034 projection of 1.88 million enplanements. It is important to note that the TAF projections have been adjusted to 2014 actual enplanements reported by the Airport.

Figure B11 **PREFERRED PASSENGER ENPLANEMENT PROJECTION**



SOURCES: *Marr Arnold Planning, FAA Terminal Area Forecasts*

Commercial Service Aircraft Operations

The level of commercial aviation operations is an aggregate function of passenger demand and the types of aircraft to be utilized to accommodate the commercial service enplanement projections presented above. When developing the commercial service operations projections, it is important to also consider the airline fleet mix that could potentially serve the airport.

As stated previously, airlines have plans in the next 10 years to retire a significant portion of their small regional jet fleet. Small regional jet flying has become economically infeasible for airlines since oil prices spiked in 2008. Subsequently, airlines have been quickly reducing these aircraft from their fleets. The small regional jet made up 39% of the departures at the Airport in 2014. Given this, the Airport will need to produce high load factors with higher yielding passengers on larger aircraft going forward. This, in turn, has the potential to impact long term forecasts. The airlines are transitioning to larger fleet types in the 70-120 seat range, with an emphasis in the 100-120 seat range.

The commercial service aircraft operations projections were developed utilizing the Boarding Load Factor (BLF) Methodology. This methodology calculates a boarding load factor based on the total seats available divided by the total passenger boardings. The historic BLFs for the Airport for 2009-2014 are presented in the following table entitled *HISTORIC COMMERCIAL SERVICE AIRCRAFT OPERATIONS AND BOARDING LOAD FACTORS*. Based on 2014 enplanements from airport records and the 2014 actual departures from the U.S. DOT T-100 airline database, the Airport recorded a BLF of 72.9%.

Table B9 **HISTORIC COMMERCIAL SERVICE AIRCRAFT OPERATIONS AND BOARDING LOAD FACTORS**

	2009	2010	2011	2012	2013	2014
Operations	**44,886**	**42,874**	**41,626**	**41,234**	**39,936**	**39,530**
Narrow Body Jets	20,598	19,524	18,704	18,392	18,972	17,674
66+ Seat Regional Jets	2,140	5,770	6,918	6,094	5,188	6,404
37-50 Seat Regional Jets	21,562	17,214	14,068	16,108	15,776	15,452
Turboprop	586	366	1,936	640	0	0
Boarding Load Factor						
Average Seats Per Departure	91.9	93.9	94.5	94.3	96.7	95.4
Enplanements	1,407,678	1,380,055	1,352,692	1,325,563	1,322,015	1,375,399
Boarding Load Factor (BLF)	68.2%	68.5%	68.8%	68.2%	68.5%	72.9%

***SOURCES**: Total commercial service operations, operations by equipment percentages and average seats per departure- Diio Mi T-100, Enplanements- airport records.*

It is important to note that the actual load factors at TUL are higher than the BLF presented in the table below. As stated above, in 2014, the actual load factor reported by the airlines was 76%. The difference is that the BLF is calculated based on total enplanements divided by operations at TUL, while the actual load

factor is based on total onboard passengers. Onboard passengers include the passengers that were on "through" flights on the same aircraft, making a stop in TUL. This frequently occurred on Southwest flights that began and ended at Love Field in Dallas, where service was restricted to adjacent states by the Wright Amendment. For example, if someone wanted to fly from Love Field to Denver, they could stop at TUL but stay on the same aircraft enroute to Denver. In 2013, an estimated 62,000 passengers (5% of the total onboard passengers) where considered to be "through" passengers and not counted as an enplanement at TUL. In November and December of 2014, after the Wright Amendment was lifted, the number of "through" passengers at TUL dropped to less than 1% of the total onboard passengers. In 2015 and throughout the forecast period, while it is anticipated that there will always be a small amount of "through" passengers, the number of onboards and enplanements at TUL should be closer aligned.

In addition to enplaned passengers and "through" passengers, non-revenue passengers also fill additional seats at TUL. A non-revenue passenger is considered airline staff that is often flying for free or at a discounted rate. As the home of the American Airlines Aircraft Maintenance Base, there is a significant number of non-revenue passengers that fly in on American to do work at the base at TUL. In 2014, it was estimated that an additional 40,000 non-revenue passengers flew each way to and from TUL. This translates to an estimated 110 passenger enplanements per day. Non-revenue passengers are not accounted for in the passenger enplanement projections or the load factor for TUL. But it is important to note, that these passenger are filling up the airplanes and the actual departing load factor is probably somewhat higher than shown in Tables B6 and B7.

Based on industry trends, the BLF and the average number of seats per departure will increase just slightly over the forecast period. The average seats per departure is projected to increase from 95.4 in 2014 to 100.0 in 2034 based largely on the retirement of 50 seat regional jets (RJs) and the projected replacement with 66+ seat RJs in airline fleets. Most of the retirements will occur in the next five years. The BLF is projected to increase to 75.9% is by 2034. Average seats per departure and the BLF will each increase at an average annual rate of 0.2% over the 20-year forecasts period. These rates of growth are in line with FAA projections.

Based on these assumptions, commercial service operations are projected to reach 50,687 by 2034, resulting in a CAGR of 1.3%. These projections are presented in the following table entitled *PROJECTED COMMERCIAL SERVICE AIRCRAFT OPERATIONS*. As seen in the table, the average seats per departure is anticipated to increase over the forecast period due to an increase in the narrow body jet and large 66+ seat regional jet operations, and a decline in small 37-50 seat regional jet operations. The BLF is also projected to grow as airlines try to keep capacity aligned with demand and add service cautiously.

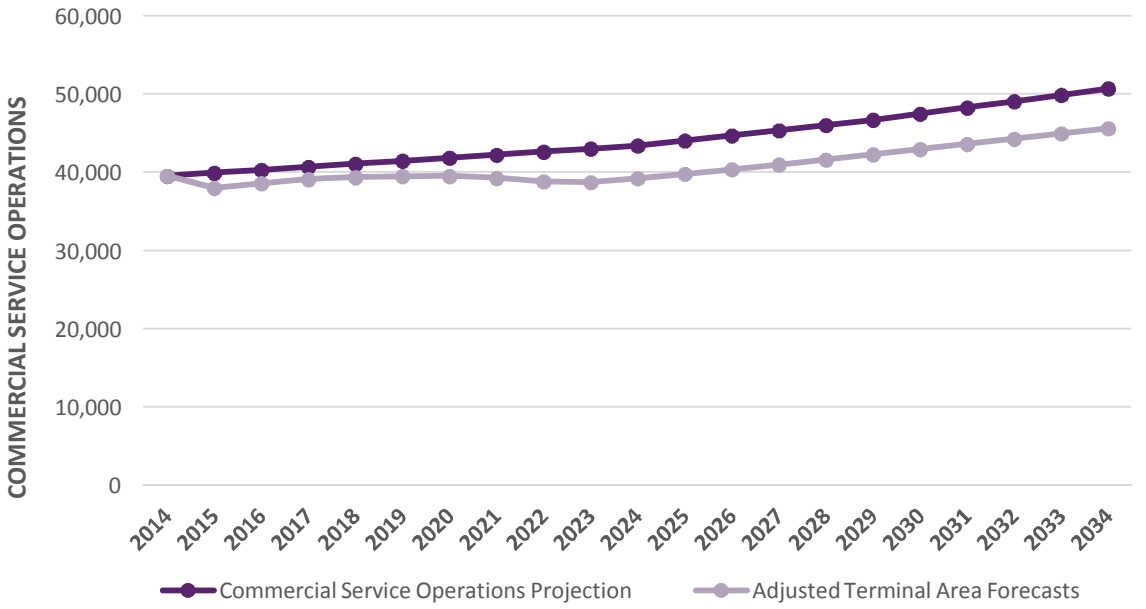
Table B10 **PROJECTED COMMERCIAL SERVICE AIRCRAFT OPERATIONS**

	2014	2019	2024	2029	2034	CAGR 2014-34
Commercial Service Operations	**39,530**	41,459	43,398	46,691	50,687	1.3%
Narrow Body Jets	17,674	20,466	23,653	25,447	27,639	2.3%
66+ Seat Regional Jets	6,404	13,509	17,205	19,454	21,130	6.2%
37-50 Seat Regional Jets	15,452	7,484	2,541	1,789	1,918	-9.9%
Turboprop (incl. Q300)	0	0	0	0	0	0.0%
Boarding Load Factor						
Average Seats Per Departure	95.4	97.8	99.3	99.8	100.0	0.2%
Enplanements	1,375,399	1,501,264	1,615,241	1,759,617	1,924,614	1.7%
Boarding Load Factor (BLF)	72.9%	74.0%	75.0%	75.5%	75.9%	0.2%
Comparison to TAF						
TAF (Adjusted based on 2014 actual From T-100)	39,530	39,487	39,220	42,265	45,602	0.7%
Difference From TAF	---	4.8%	9.6%	9.5%	10.0%	---

***SOURCE**: Marr Arnold Planning*

The commercial service operations projections for the Airport are close to the FAA's TAF forecast. When the TAF growth rate projections are applied and operations are adjusted based on 2014 actual operations, the 2034 forecast of operations presented here is just 10% higher than FAA projection of 45,602 commercial service operations in 2034. This is graphically depicted in the following figure entitled *COMMERCIAL SERVICE AIRCRAFT OPERATIONS PROJECTION*.

Figure B12 **PREFERRED COMMERCIAL SERVICE AIRCRAFT OPERATIONS PROJECTION**



***SOURCE**: Marr Arnold Planning*

Air Cargo Operations and Freight/Mail

In 2014, 4,790 air cargo operations were performed at TUL. This equates to 13.1 daily operations by all-cargo carriers. Federal Express accounted for the 39% of the annual operations, operating an average of 5.1 daily operations between TUL and mainly their hub in Memphis, typically with wide-body Airbus A300 or DC 10 aircraft. UPS, Martinaire, and Ameriflight each operated an average of two daily cargo flights (one takeoff and one landing) at TUL. UPS flies A300s and B757-200s, Martinaire operates Cessna 208s; and Ameriflight operates Beech 1900 turboprop aircraft.

The recent economic recession dramatically decreased shipping demand nationwide after years of fairly steady growth. The slow economic recovery has started in 2010 and was reflected in slow growth in air cargo operations, similar to the air carrier airlines. FedEx and UPS will continue to rely on trucking to offset the loss of domestic air capacity that has resulted from reduced fleet size and the shift of wide-body airplanes from domestic to international markets as well as rising fuel costs. As shown in the figure entitled *PROJECTED OPERATIONS ON ALL-CARGO CARRIER OPERATIONS PROJECTIONS*, annual operations by all-cargo carriers are projected to grow 1.2% per year on average through the 20-year forecast period. This reflects the growth projected by the FAA in its *Aerospace Forecast Fiscal Years 2015-2035* and is the same CAGR as projected for commercial service operations.

Table B11 **ALL-CARGO CARRIER OPERATIONS PROJECTIONS**

Year	All-Cargo Operations
2014 (Actual)	4,790
2019	5,084
2024	5,397
2034	6,081
CAGR 2014-2034	1.2%

***SOURCE**: Airport PASSUR data, Marr Arnold Planning*

Air cargo data by type (air freight/mail) is reported by commercial carriers (airlines, as well as, FedEx, UPS, and smaller all-cargo companies) to the Airport. Although TUL experienced a decline in air cargo during the recession in 2008 and 2009, air cargo has been growing at a CAGR of 1.8% since 2010. Due to the maturity of the air cargo market and the anticipated slower growth by the FAA in terms of revenue ton miles, the volume of air freight/mail at the Airport is projected to continue to grow at an average annual rate of 1.8%. As shown in the table entitled *AIR FREIGHT/MAIL PROJECTIONS*, total air cargo at the Airport is projected to reach nearly 84,000 tons by 2034. This rate of growth is conservative compared to Airbus' *Global Market Forecast for 2014-2033* and Boeing's *World Air Cargo Forecast 2014-2015*, which predict U.S. air cargo to grow at a CAGR of 3.4% and 2.1% respectively through their 20 year forecasts.

Table B12 **AIR FREIGHT/MAIL PROJECTIONS (IN TONS)**

	Freight	Mail	Total
2014 (Actual)	58,625	2	58,627
2019	64,095	2	64,097
2024	70,075	2	70,077
2034	83,761	2	83,763
CAGR 2014-2034	1.8%	0.0%	1.8%

***SOURCE**: Marr Arnold Planning*

General Aviation Aircraft Operations

Different factors impact the number of general aviation operations at an airport including but not limited to, the total based aircraft, area demographics, activity and policies of neighboring airports, and national trends. These factors were examined and four methodologies were used to develop the general aviation operation projections. The results of these forecasting methodologies are compared and the constant Operations Per Based Aircraft (OPBA) methodology was chosen as the preferred general aviation operations projection. The preferred general aviation aircraft operations projection for Tulsa International Airport will be used with the commercial enplanement and operations projections to conduct a demand/capacity analysis in which the

adequacy of existing airfield facilities is evaluated to determine if capacity-enhancing projects may be required to support future levels of aircraft operations at the airport.

A summary of the methodologies used to develop the general aviation aircraft operations are below and shown in the following table and figure both entitled *GENERAL AVIATION AIRCRAFT OPERATIONS PROJECTIONS*.

- **Scenario 1: Constant Operations Per Based Aircraft (OPBA).** OPBA is calculated by dividing the number of total general aviation operations that occur at an airport by the number of aircraft based at the Airport. Total operations at TUL are projected by applying the 2014 OPBA ratio (217) to the preferred projection of based aircraft (see Based Aircraft Forecast section on page B.43).

- **Scenario 2: Growing OPBA.** The airports average OPBA ratio between 2007 and 2014 was 227. The 2014 OPBA was grown at a CAGR of 0.2% per year through the forecast period. The growing OPBA ration was then applied to the preferred projection of based aircraft.

- **Scenario 3: Constant Market Share of FAA General Aviation Operations at Towered Airports.** In 2014, the Airport's share of total general aviation operations at all towered airports in the U.S was 0.13%. This scenario assumes that the Airport will maintain this share.

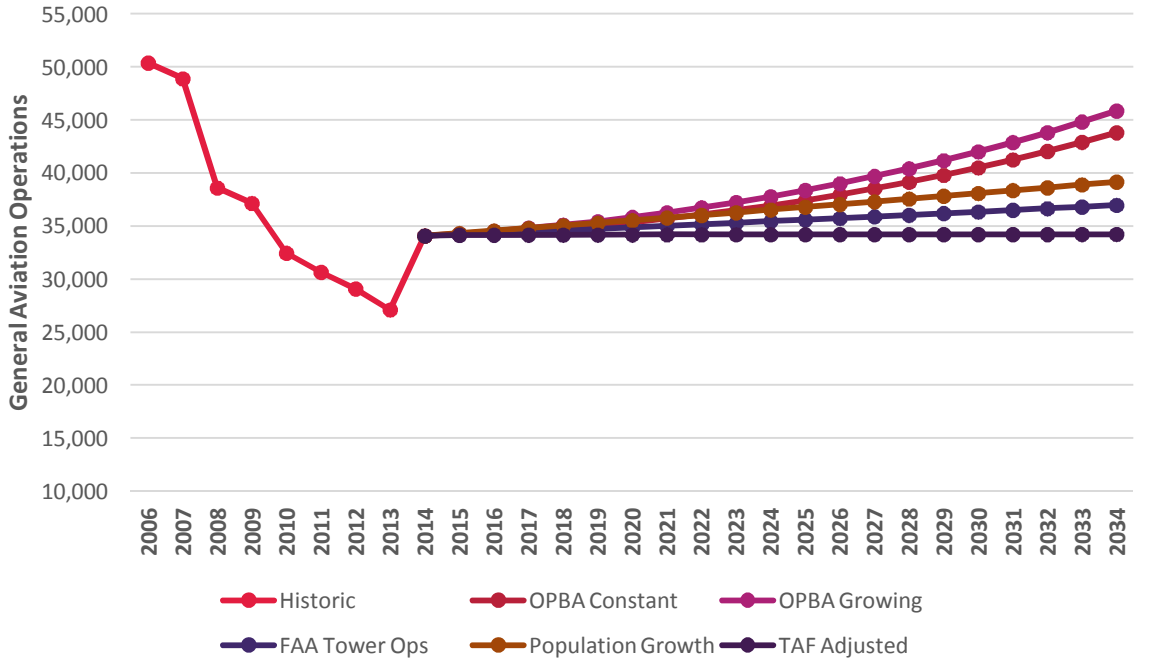
- **Scenario 4: Projected Population Growth.** This scenario projects general aviation operations to increase at an average annual rate of growth of 0.7%, equal to the projected population growth of the Airport Market Area.

Table B13 **GENERAL AVIATION AIRCRAFT OPERATIONS PROJECTIONS**

Year	Scenario 1: OPBA Constant	Scenario 2: OPBA Growing	Scenario 3: Market Share U.S. Towered Ops	Scenario 4: Population Growth	FAA Adjusted TAF
2014 (Actual)	34,061	34,061	34,061	34,061	34,061
2019	35,023	35,425	34,726	35,270	34,168
2024	36,925	37,778	35,437	36,522	34,187
2034	43,805	45,853	36,958	39,160	34,226
CAGR	1.3%	1.5%	0.4%	0.7%	0.0%
2034 variation from TAF	21.9%	25.4%	7.4%	12.6%	---

***SOURCE**: Marr Arnold Planning*
Note: 1 2014 operations data not available in the FAA's Terminal Area Forecasts. The TAF forecast is adjusted by using the actual 2014 tower counts from the ATADS database and applying the growth rates from the TAF projection.

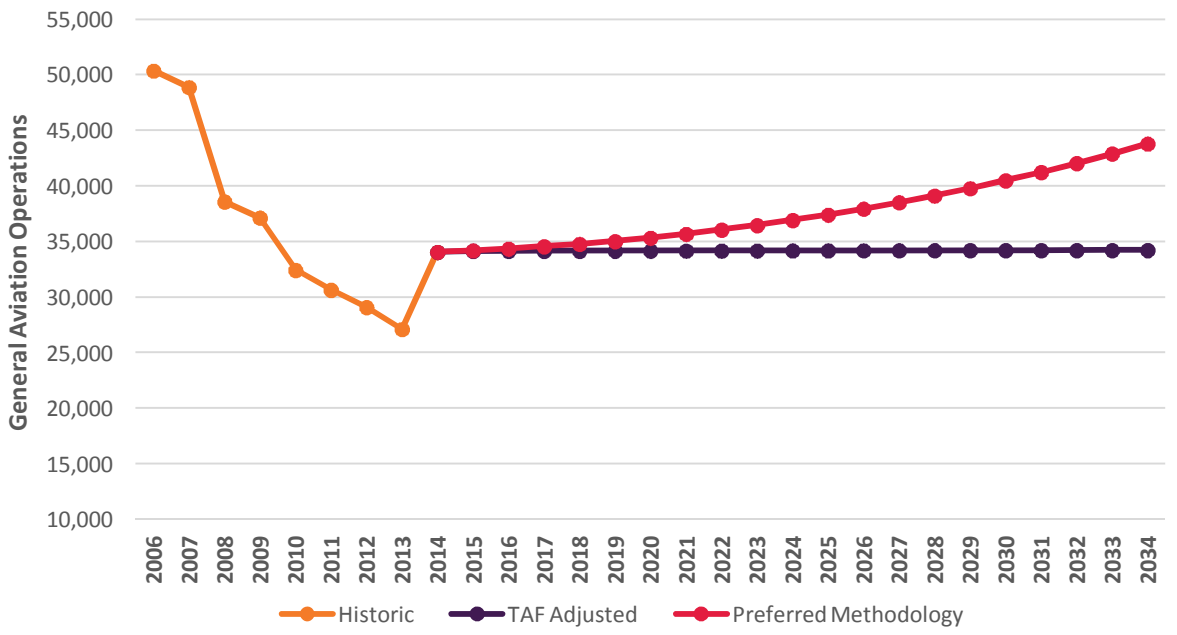
Figure B13 **GENERAL AVIATION AIRCRAFT OPERATIONS PROJECTIONS**



SOURCE: *Marr Arnold Planning*

The results of the four scenarios examined in this analysis were compared to the FAA's TAF projections for the Airport. The FAA's TAF projects only 142 more annual general aviation operations in 2034 than in 2014. This equates to a 0.02% CAGR. Due to the high level of corporate activity occurring at the Airport and the high number of based jets, one of the fastest growing segments of general aviation, it is anticipated that general aviation activity at TUL will experience growth through the forecast period. All forecast scenarios are higher than the FAA's TAF projections. Therefore Scenario 1, the constant OPBA methodology is the preferred forecasts and is shown in the following figure entitled *PREFERRED GENERAL AVIATION AIRCRAFT OPERATIONS PROJECTION*.

Figure B14 **PREFERRED GENERAL AVIATION AIRCRAFT OPERATIONS PROJECTION**



***SOURCE**: Marr Arnold Planning*

Military Aircraft Operations

Military operations over the last 10 years have comprised an average 36% of total operations (excluding air carrier and air taxi operations) at the Airport. However, actual activity has been slowly decreasing from a high of 55,100 military operations in 2002 to 2014's reported 16,817 operations. Over the last three years, the number of annual military operations has remained relatively unchanged. Military operations are projected to remain consistent with 2014 levels as military operations are driven more by state and federal policy than by local decisions. It is assumed that there will be no additional mission changes by the Tulsa Air National Guard and the Army National Guard Base over the forecast period.

Table B14 **MILITARY AIRCRAFT OPERATIONS PROJECTIONS**

	Itinerant	Local	Total Military Operations
Historic			
2002	39,797	15,306	55,103
2003	38,535	14,482	53,017
2004	38,677	14,816	53,493
2005	14,426	15,883	30,309
2006	9,337	12,318	21,655
2007	9,572	11,989	21,561
2008	10,285	12,086	22,371
2009	9,893	11,915	21,808
2010	10,700	11,817	22,517
2011	9,423	10,858	20,281
2012	9,601	6,766	16,367
2013	8,639	7,695	16,334
2014	10,377	6,440	16,817
Projected			
2019	10,500	6,500	17,000
2024	10,500	6,500	17,000
2034	10,500	6,500	17,000

***SOURCE**: FAA ATADS database, Marr Arnold Planning*

Operations Forecast by Aircraft Type

With the total number of aircraft operations projected for each category of user, the next step in the forecasting process involves the individual and collective use of the Airport by various types of aircraft. The types of aircraft expected to use the Airport assist in determining the amount and type of facilities needed to meet the aviation demand.

The following table, entitled *SUMMARY OF OPERATIONS FORECAST BY AIRCRAFT TYPE, 2014-2034*, depicts the approximate level of use by aircraft types that are projected to use the Airport. As can be noted, total annual operations are anticipated to increase during the planning period. As a percentage of total operations, commercial service aircraft operations are expected to increase from 41.5% in 2014 to 43.1% in 2034; general aviation aircraft operations are projected to increase from 35.8% to 37.2%; and, military aircraft operations are forecast to decrease from 17.7% to 14.4%.

Table B15 **SUMMARY OF OPERATIONS FORECAST BY AIRCRAFT TYPE, 2014-2034**

Operation By Type	2014	2019	2024	2034
Commercial Service	**39,530[1]**	**41,459**	**43,398**	**50,687**
Narrow Body Jets	17,674	20,466	23,653	27,639
66+ Seat Regional Jets	6,404	13,509	17,205	21,130
37-50 Seat Regional Jets	16,452	7,484	2,541	1,918
Turboprop	0	0	0	0
Cargo	**4,790[1]**	**5,110**	**5,450**	**6,202**
Multi-Engine Piston	42	45	48	55
Turboprop	2,823	3,012	3,212	3,655
Jet	1,925	2,053	2,190	2,492
General Aviation	**34,061[1]**	**35,023**	**36,925**	**43,805**
Single Engine Piston	7,237	7,442	7,847	9,307
Multi-Engine Piston	2,527	2,599	2,740	3,251
Turboprop	5,169	5,316	5,605	6,648
Business Jet	19,070	19,609	20,674	24,525
Helicopter	57	56	59	74
Military	**16,817[1]**	**17,000**	**17,000**	**17,000**
Total	**95,198[1]**	**98,592**	**102,773**	**117,694**

SOURCE: *Mead & Hunt.* [1] *Actual*

In the commercial service category of operations, the percentage of narrow body jets, and 66+ Seat Regional jets compared to 37-50 Seat Regional Jets will increase. Regarding general aviation operations, it is forecast that the Airport will continue to experience a significant amount of business jet operations relative to other aircraft types. This is the result of a higher percentage of use for business-related purposes and a lower percentage of use for training and pleasure flying.

Local and Itinerant Operations Forecast

Forecasts of operations have also been categorized accordingly into local and itinerant operations. TUL will certainly remain a principal commercial service airport for the northeastern part of the State of Oklahoma. Therefore, itinerant operations will continue to be the dominant aircraft activity at the Airport. Approximately 90% itinerant operations were recorded at the Airport in 2014, along with 10% local operations. Over the last three year TUL has experience an average split of 88.5% itinerant, and 11.5% local operations. It is expected that the Airport will maintain a similar operational profile throughout the planning period. Based on these assumptions, forecasts of local and itinerant operations are shown on the following table entitled *SUMMARY OF LOCAL AND ITINERANT OPERATIONS, 2014-2034*.

Table B16 **SUMMARY OF LOCAL AND ITINERANT OPERATIONS, 2014-2034**

Year	Local	Percentage	Itinerant	Percentage	Total
2014[1]	9,353	10%	85,845	90%	95,198
2019	11,338	11.5%	87,254	88.5%	98,592
2024	11,819	11.5%	90,954	88.5%	102,773
2034	13,535	11.5%	104,159	88.5%	117,694

SOURCE: *Mead & Hunt.* [1] *Actual*

Peak Period Forecast

An additional element in assessing airport use and determining various capacity and demand considerations to ascertain peak period activities. According to Air Traffic Control (ATC) records, the peak month for aircraft activity in 2014 was July, with 9,383 operations. This translates to approximately 303 operations during an average day during the peak month, and roughly 30 peak hour operations. Based upon FAA statistics and assumptions from airports with similar activity and operational characteristics, peak period forecasts have been projected. The peak period operational activities are illustrated in the following table entitled *PEAK PERIOD AIRCRAFT OPERATIONS, 2014-2034*.

Table B17 **PEAK PERIOD AIRCRAFT OPERATIONS, 2014-2034**

Year	Annual	Peak Month	Average Day of Peak Month	Peak Hour/Average Day Ratio	Peak Hour
2014	95,198	9,383	303	10.0%	30
2019	98,592	9,718	313	10.5%	33
2024	102,773	10,130	327	11.0%	36
2034	117,694	11,600	374	11.0%	41

SOURCE: *FAA AC 150/5300-13A, Airport Design, Change 1, February 2014*

Based Aircraft

Estimating the number and type of aircraft expected to be based at the Airport over the next 20 years impacts the planning for future facility and infrastructure requirements. Based aircraft at the Tulsa International Airport was projected using several methodologies. The results of these forecasting methodologies are compared and the U.S. market share by equipment type was chosen as the preferred based aircraft projection. The preferred based aircraft projection for the Airport is carried forward in the master planning process and is used to examine future airport facility needs.

A summary of the methodologies used to develop based aircraft projections are below and shown in the following table and figure both entitled *BASED AIRCRAFT PROJECTIONS.*

- **Scenario 1: Constant Market Share of US Active General Aviation and Air Taxi Fleet.** In 2014, the Airport's share of the total US Active General Aviation and Air Taxi Fleet was 0.08%. This scenario assumes that the Airport will maintain this share and results in an average annual growth rate of 0.33%.

- **Scenario 2: Constant Market Share of US Active General Aviation and Air Taxi Fleet, By Equipment Type.** The FAA expects jet aircraft to grow at a much higher rate than the piston fleet. Jet aircraft comprise 47% of TUL's based fleet. This scenario assumes that the Airport's share of U.S. jet aircraft will remain constant throughout the forecast period and will grow at a CAGR of 2.7%. The share of single engine and multi-engine aircraft will also remain the same, allowing for a drop in piston aircraft over the forecast period. Overall, this scenario assumes an average annual growth rate of 1.3%

- **Scenario 3: Population Growth.** This scenario assumes that based aircraft will grow at a similar rate as population through 2034, as projected by Woods & Poole. Using this methodology, total based aircraft at the Airport are projected to increase 0.7% annually between 2014 and 2034.

- **Scenario 4: General Aviation Hours Flown.** The FAA project that general aviation hours flown will grow at a CAGR of 1.4% over this 20-year forecast period. This scenario applies this rate of growth to future based aircraft at the Airport.

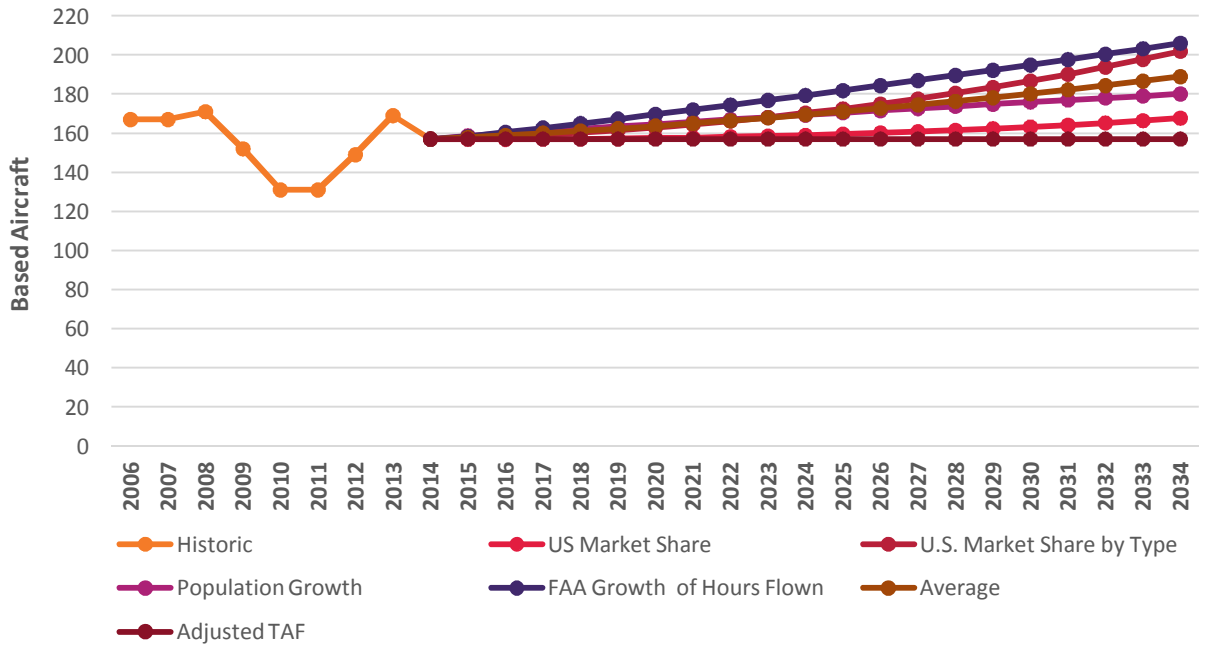
Table B18 **BASED AIRCRAFT PROJECTIONS**

Year	Scenario 1: U.S. Market Share	Scenario 2: U.S. Market Share by Aircraft Type	Scenario 3: Market Area Population Growth	Scenario 4: GA Hours Flown	Average[1]	FAA Adjusted TAF[2]
2014 Actual	157	157	157	157	157	157
2018	157	161	163	167	162	157
2023	159	170	169	179	169	157
2033	168	202	180	206	189	157
CAGR	0.33%	1.27%	0.69%	1.37%	0.93%	0.0%
2034 variation from Adjusted TAF	6.4%	22.2%	12.8%	23.8%	16.9%	

***SOURCE**: Marr Arnold Planning*

***Notes**: 1The average result of other four scenarios.*
2 The FAA's TAF, issued January 2014 uses a 2013 based aircraft figure of 169.The actual based aicrcraft in 2014 were used and the TAF growth rate through 2034 was applied (0.0%).

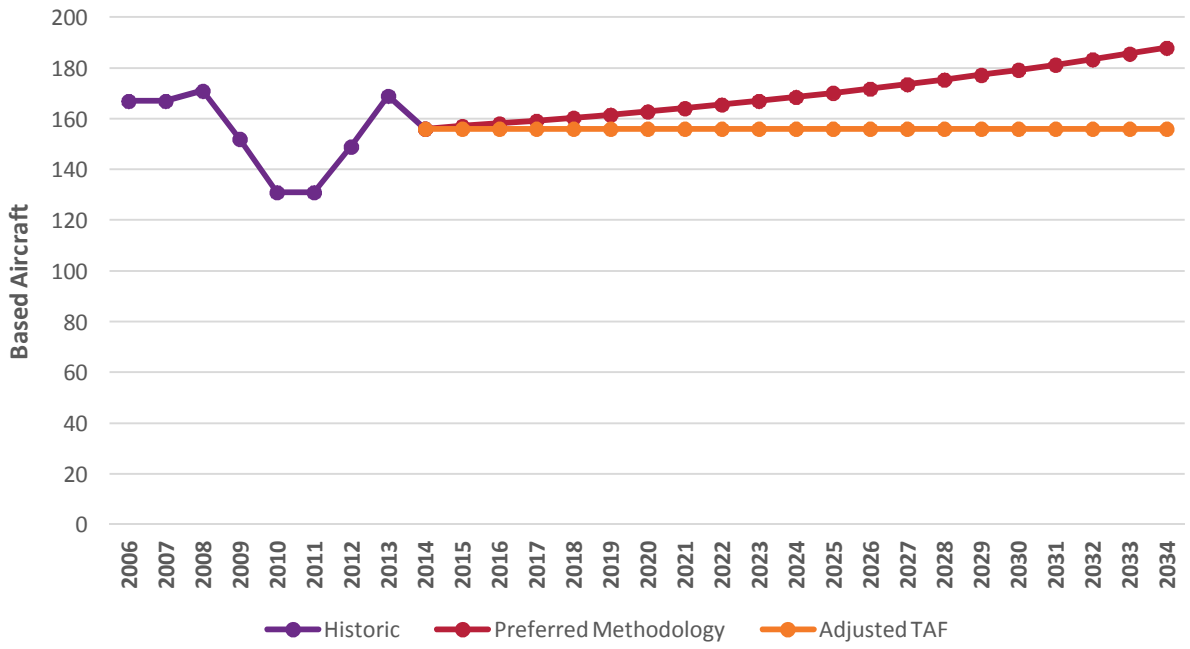
Figure B15 **BASED AIRCRAFT PROJECTIONS**



***SOURCE**: Marr Arnold Planning*

The results of the four scenarios examined in this analysis were compared to the FAA's TAF for TUL. The FAA projects no growth in based aircraft over the 20-year forecast period, therefore all scenarios are higher than the FAA's TAF projections. In its Aerospace forecasts, the FAA does project much higher growth in jet aircraft compared to single engine and multi-engine piston aircraft. Since jet aircraft make up the majority of the based aircraft fleet at the Airport, it is can be assumed that the Airport will see more based aircraft growth than shown in the FAA's TAF. In addition, TUL accommodates the majority of large corporate jet aircraft operations in the Airport Market Area and this is anticipated to continue due to the Airport's facilities and services available for general aviation users. When all methodologies are considered, Scenario 2, U.S. Market Share by Aircraft Type takes this national projected growth in jet aircraft into considerations. Therefore, this scenarios is the preferred forecast and is shown in the following table *PREFERRED BASED AIRCRAFT PROJECTION.* It is projected that TUL will accommodate 202 based aircraft by 2034.

Figure B16 **PREFERRED BASED AIRCRAFT PROJECTION**



***SOURCE**: Marr Arnold Planning*
***NOTE**: TAF Adjusted figures reflect adjusting the base year figure from the TAF to match actual data figures. TAF growth rates are then applied to the actual data figure for the duration of the planning period.*

Fleet Mix

Total based aircraft projected for the Airport over the planning period using the preferred based aircraft projection were allocated to five aircraft categories – single-engine, multi-engine, jet, helicopter, and other – to develop a projection of the Airport's based aircraft fleet mix through the planning period. The fleet mix projections were developed based on the fleet mix percentages exhibited at the Airport in April 2015 and the *FAA Aerospace Forecast, Fiscal Years 2015-2035* projections of active general aviation aircraft by type. The preferred based aircraft fleet mix projects are shown in the following table entitled *PROJECTED BASED AIRCRAFT FLEET MIX*. As shown, jet aircraft will experience the greatest growth through the forecast period and piston aircraft, both single engine and multi-engine will decline, following national trends.

Table B19 **PROJECTED BASED AIRCRAFT FLEET MIX**

	2014	2019	2024	2034	CAGR 2014-34
Based Aircraft	**157**	**161**	**170**	**202**	**1.27%**
Single-Engine	47	44	43	41	**-0.68%**
Multi-Engine	35	34	33	32	**-0.45%**
Jet	74	82	92	127	**2.73%**
Helicopter	1	1	2	2	**3.53%**
Other	0	0	0	0	--

***SOURCE**: Marr Arnold Planning*

Summary

It is anticipated that Tulsa International Airport will see some growth in all activity areas during the 20-year planning period. By 2034, approximately 1.93 million enplanements and nearly 118,000 operations are projected to occur. The following table entitled *SUMMARY OF AVIATION ACTIVITY FORECASTS 2014-2034* summarizes the projections contained in this chapter.

Table B20 **SUMMARY OF AVIATION ACTIVITY FORECASTS 2014-2034**

	2014	2019	2024	2034	CAGR 2014-2034	% Difference from TAF
Passenger Enplanements	**1,375,399**	**1,497,055**	**1,622,924**	**1,933,490**	**1.7%**	**4.0%**
Operations						
Commercial Service	*39,530*	*41,459*	*43,398*	*50,687*	*1.3%*	*10.0%*
Narrow Body Jets	17,674	20,466	23,653	27,639	2.3%	
66+ Seat Regional Jets	6,404	13,509	17,205	21,130	6.2%	
37-50 Seat Regional Jets	15,452	7,484	2,541	1,918	-9.9%	
Turboprop	0	0	0	0	0.0%	
General Aviation+ Air Taxi	*34,061*	*35,023*	*36,925*	*43,805*	*1.3%*	*17.2%*
Military	*16,817*	*17,000*	*17,000*	*17,000*	*0.0%*	*0.0%*
Air Cargo	*4,790*	*5,110*	*5,450*	*6,202*	*1.3%*	NF
Total Operations	**95,198**	**98,592**	**102,773**	**117,694**	**1.1%**	**8.8%**
Based Aircraft (excl. military)	**157**	**161**	**170**	**202**	**1.3%**	*22.2%*
Air Cargo (tons)	**58,627**	**64,097**	**70,077**	**83,763**	**1.8%**	*NF*

***SOURCE**: Marr Arnold Planning*
***Note**: NF=Not forecasted*

Runway Design Code (RDC)/Critical Aircraft Analysis

Knowledge of the types of aircraft currently using, and those that are expected to use TUL provides insight concerning the Runway Design Code (RDC). FAA Advisory Circular 150/5300-13A, Change 1, *Airport Design*, provides guidance for this determination. The RDC is based on the "Design Aircraft" that is determined the most critical aircraft, or group of aircraft, using or projected to use a runway on a regular basis. A number of FAA guidance documents define regular basis as 500 or more annual operations (landing and takeoffs are considered as separate operations). It is important to note that the 500 annual operations "substantial use" threshold is not a cap or limit on aircraft operations, but rather a planning metric for consideration of the potential need to upgrade airport facilities. The identified design aircraft can either be one aircraft, or a composite of more than one aircraft, representing the highest Aircraft Approach Category (AAC) and Airplane Design Group (ADG).

The selected AAC and ADG are combined to form the Runway Design Code (RDC) of a particular runway, and the RDC determines the dimensional criteria standards that are applicable to that runway. The first component, depicted by a letter, is the AAC and relates to the aircraft approach speed. The second component, depicted by a roman numeral, is the ADG and relates to the aircraft wingspan, and tail height. The AAC and ADG are presented in the following tables entitled *AIRCRAFT APPORACH CATEGORY (AAC)* and *AIRPLANE DESIGN GROUP (ADG)*.

Table B21 **AIRCRAFT APPROACH CATEGORY (AAC)**

AAC	V_{Ref}/Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

SOURCE: *FAA AC 150/5300-13A, Airport Design, Change 1, February 2014*

Table B22 **AIRPLANE DESIGN GROUP (ADG)**

ADG	Tail Height	Wing Span
I	Less than 20 Feet	Less than 49 Feet
II	Greater than 20, but less than 30 Feet	Greater than 49, but less than 79 Feet
III	Greater than 30, but less than 45 Feet	Greater than 79, but less than 118 Feet
IV	Greater than 45, but less than 60 Feet	Greater than 118, but less than 171 Feet
V	Greater than 60, but less than 66 Feet	Greater than 171, but less than 214 Feet
VI	Greater than 66, but less than 80 Feet	Greater than 214, but less than 262 Feet

SOURCE: *FAA AC 150/5300-13A, Airport Design, Change 1, February 2014*

A total of the current number of operations by RDC is presented in the following table entitled *SUMMARY OF OPERATIONS BY RDC*, 2014. This operational data was collected from the Tulsa International Airport using the Passur Aerospace data tool. The data collection tool records a variety of information (both aircraft specific and operational) on most of the civilian aircraft operating at TUL. Thus, the Passur data collected at the Airport provides more detailed information on the operations, compared to the more general data collected by the FAA. However, the Passur data is not 100 percent complete, and the areas where data is missing are noted in the charts below.

It should also be noted that the distribution of aircraft operations recorded on the three runways at TUL in 2014 were significantly influenced by a reconstruction project on the primary runway (Runway 18L/36R)

during the months of February through May. Therefore, the allocation of aircraft operations to the runways (i.e., the runway utilization by aircraft) have been adjusted for 2014 to reflect the runway use recorded during the months of June through December, following the completion of the Runway 18L/36R reconstruction project. This aircraft operation/runway utilization adjustment has been reflected in the following tables (Tables B23 through B28).

Table B23 **SUMMARY OF OPERATIONS BY RDC, 2014**

RDC	Runway 8/26		Runway 18R/36L		Runway 18L/36R		Runway Not Assigned	
A-I, B-I	607	(23.7%)	6,870	(42.3%)	1,807	(3.3%)	1,957	(30.6%)
A-II, B-II	444	(17.3%)	2,833	(17.4%)	2,982	(5.5%)	966	(15.6%)
A-III, B-III	0	(0.0%)	36	(0.2%)	58	(0.1%)	12	(0.2%)
C-I, C-II	543	(21.2%)	2,554	(15.7%)	21,891	(40.8%)	1,767	(27.6%)
D-I, D-II	159	(6.2%)	2,501	(12.6%)	1,784	(3.3%)	362	(5.6%)
C-III, D-III	567	(22.2%)	113	(0.7%)	18,455	(34.4%)	838	(13.1%)
C-IV, C-V, C-VI	21	(0.8%)	9	(0.05%)	2,953	(5.5%)	91	(1.4%)
D-IV, D-V, D-VI	7	(0.2%)	0	(0.0%)	382	(0.7%)	15	(0.2%)
Helo	12	(0.4%)	7	(0.04%)	14	(0.02%)	31	(0.4%)
Unknown	195	(7.6%)	1,304	(8.0%)	3,332	(6.2%)	315	(4.9%)
Total	**2,556**	**(3.2%)**	**16,226**	**(20.6%)**	**53,658**	**(68.1%)**	**6,385**	**(8.1%)**

SOURCE: *TUL Passur Data, Mead & Hunt, Inc.*

The following table entitled *SUMMARY OF OPERATIONS BY AIRCRAFT TYPE, 2014* indicates the operations for each aircraft type.

Table B24 **SUMMARY OF OPERATIONS BY AIRCRAFT TYPE, 2014**

RDC	Runway 8/26	Runway 18R/36L	Runway 18L/36R	Runway Not Assigned
Commercial Service				
Jet	840	99	34,229	1,596
Turboprop	0	2	2	2
Cargo				
Jet	10	9	1,882	45
Turboprop	48	45	1,210	261
Multi-Engine Piston	0	5	9	2
General Aviation				
Jet	456	5,437	8,621	1,381
Turboprop	96	1,916	593	427
Multi-Engine Piston	15	651	70	110
Single Engine Piston	91	1,589	245	854
Helicopter	7	2	2	21
Military	0	5	5	0
Unknown	974	6,294	6,631	1,661
Total	**2,556**	**16,226**	**53,658**	**6,385**

SOURCE: *TUL Passur Data, Mead & Hunt, Inc.*

The following table, entitled *SUMMARY OF AIRCRAFT OPERATIONS BY AIRPORT REFERENCE CODE (ARC), 2014-2034*, provides an estimate of the breakdown of aircraft operations by Airport Reference Code. The existing estimate and percentages are derived by using the operation data from Passur, and applying operational totals from the FAA ATADS operational data. As illustrated in the table, it is projected that the most critical aircraft regularly utilizing the Airport will be represented by aircraft within ARC D-IV.

Table B25 **SUMMARY OF AIRCRAFT OPERATIONS BY AIRPORT REFERENCE CODE (ARC), 2014-2034**

ARC	Percentage	2014	2019	2024	2034
A-I	8.82%	8,394	8,693	9,062	10,377
A-II	1.75%	1,668	1,728	1,801	2,063
A-III	0.12%	110	114	118	136
B-I	5.44%	5,181	5,366	5,594	6,406
B-II	7.45%	7,094	7,347	7,658	8,770
B-III	0.02%	19	19	20	23
C-I	1.21%	1,151	1,192	1,243	1,423
C-II	32.73%	31,162	32,273	33,642	38,526
C-III	22.96%	21,859	22,639	23,599	27,025
C-IV	3.89%	3,701	3,833	3,996	4,576
C-V	0.01%	10	11	11	13
D-I	5.81%	5,531	5,728	5,971	6,838
D-II	0.29%	273	283	295	338
D-III	2.38%	2,263	2,343	2,443	2,797
D-IV	0.51%	482	500	521	596
D-V	0.002%	2	2	2	3
D-VI	0.004%	4	4	4	5
Helicopter	0.08%	77	79	83	95
Unknown	6.53%	6,216	6,438	6,711	7,685
Total	**100.0%**	**95,198**	**98,592**	**102,773**	**117,694**

SOURCE: *TUL Passur Data, and FAA ATADS*

Runways

Runway 18L/36R (Primary). Runway 18L/36R, the Airport's primary runway, has a RDC of D-IV, with the most critical aircraft being a combination of a commercial service jets. The design aircraft for Runway 18L/36R is a combination of the Boeing 757-200, the Airbus A-300, and the Airbus A-310. Each of the aircraft has an ADG of IV and an AAC of D. The operations per each aircraft are depicted in the following table entitled, *RUNWAY 18L/36R CRITICAL AIRCRAFT OPERATIONS, 2014.*

Table B26 **RUNWAY 18L/36R CRITICAL AIRCRAFT OPERATIONS, 2014**

Aircraft	Operations
Boeing 757-200	1,452
Airbus A-300 & 310	1,332
Total	**2,784**

SOURCE: *TUL Passur Data, Mead & Hunt, Inc.*

Runway 8/26 (Crosswind). Runway 8/26, the Airport's crosswind runway, has a RDC of C-III, with the most critical aircraft being a combination of a commercial service aircraft and a general aviation aircraft. The design aircraft for Runway 8/26 is a combination of the Boeing 737-300 & 700, MD-80s, CRJ-900 and a variety of Bombardier Learjets. The commercial service aircraft have an ADG of III, while the Learjets have an AAC of D. The operations per each aircraft are depicted in the following table entitled, *RUNWAY 8/26 CRITICAL AIRCRAFT OPERATIONS, 2014.*

Table B27 **RUNWAY 8/26 CRITICAL AIRCRAFT OPERATIONS, 2014**

Aircraft	Operations
Boeing 737-700	286
MD-80s	72
CRJ-900	37
Boeing 737-300	104
Bombardier Learjets	142
Total	**641**

SOURCE: *TUL Passur Data, Mead & Hunt, Inc.*

Runway 18R/36L (Secondary). Located on the west side of the Airport, the Airport's secondary parallel runway (Runway 18R/36L) has a RDC of D-II, with the most critical aircraft being a combination of general aviation business jet aircraft (i.e., Learjet's, Challenger's, and Cessna's). The design aircraft for Runway 18R/36L is a combination of the Boeing 737-700 and the Lear 45. These aircraft have an ADG of III, and an AAC of C & D. The operations per each aircraft are depicted in the following table entitled, *RUNWAY 18R/36L CRITICAL AIRCRAFT OPERATIONS, 2014.*

Table B28 **RUNWAY 18R/36L CRITICAL AIRCRAFT OPERATIONS, 2014**

Aircraft	Operations
Bombardier Learjets	2,302
Challenger 300 & 600	486
Cessna Citation X	492
Cessna Excel	389
Total	**3,669**

SOURCE: *TUL Passur Data, Mead & Hunt, Inc.*

Aircraft depicting various RDCs at TUL are presented in the following figure entitled *REPRESENTATIVE AIRCRAFT BY RUNWAY DESIGN CODE (RDC)*.

Forecast Approval

In accordance with language specified in Aviation Forecast Guidance APP-400, local aviation forecasts are approved by regional airports division offices or airports district offices (ADOs). Local forecasts that are consistent with the FAA's Terminal Area Forecast (i.e., the local forecast differs by less than 10% in the first five years, differs by less than 15% in the remaining forecast periods, and does not affect the timing or scale of an airport project) do not need to be coordinated with APP-400 and APO-110. Local forecasts that are not consistent with the TAF, but which do not affect the timing or scale of an airport project and do not impact the analysis of a National Environmental Policy Act (NEPA) document or Benefit Cost Analysis (BCA), may be accepted (not approved) for information purposes by the regional office/ADO without APP/APO coordination. As noted on the following tables, entitled *SUMMARY OF AIRPORT & TAF FORECAST COMPARISON, 2014-2029* and *TAF SUMMARY OF AIRPORT PLANNING FORECASTS*, the MP Update forecasts for total operations are less than, or within, the specified TAF thresholds for acceptance. In addition, the actual FAA templates for these two tables have been completed and are presented for reference in Appendix Two of this document.

Figure B17 **REPRESENTATIVE AIRCRAFT BY RUNWAY DESIGN CODE (RDC)**

Table B29 **SUMMARY OF AIRPORT & TAF FORECAST COMPARISON, 2014-2029**

	Year	Airport Forecasts	Adjusted TAFF [1]	AF/TAF (% Difference)
Passenger Enplanements				
Base yr.	2014	1,375,399	1,375,399	0.0%
Base yr. + 5yrs.	2019	1,497,055	1,439,260	3.9%
Base yr. + 10yrs.	2024	1,622,924	1,600,440	1.4%
Base yr. + 15yrs.	2029	1,769,307	1,735,115	1.9%
Commercial Operations				
Base yr.	2014	39,530	39,530	0.0%
Base yr. + 5yrs.	2019	41,459	39,487	4.8%
Base yr. + 10yrs.	2024	43,398	39,220	9.6%
Base yr. + 15yrs.	2029	46,691	42,265	9.5%
Total Operations				
Base yr.	2014	95,198	95,198	0.0%
Base yr. + 5yrs.	2019	98,592	95,225	3.4%
Base yr. + 10yrs.	2024	102,773	94,896	7.7%
Base yr. + 15yrs.	2029	109,870	98,834	10.0%

SOURCE: *Mead & Hunt, Inc.*

Note: *TAF data is based on the U.S. Government fiscal year basis (October through September)*

[1] *Since more recent data is available than reported in the TAF, the TAF growth rates have been applied to 2014 actual enplanement and operations data.*

[2] *TAF projections of commercial operations include air cargo operations and some general aviation air taxi operations. The airport forecasts include only operations on commercial service airlines. For the purpose of this master plan, air cargo operations have been developed separately and air taxi operation have been included in general aviation operations projections.*

Table B30 **TAF SUMMARY OF AIRPORT PLANNING FORECASTS**

						Average Annual Compound Growth Rates			
	Base Yr. (2014)	Base Yr. +1yr. (2015)	Base Yr. +5yrs. (2019)	Base Yr. +10yrs.. (2024)	Base Yr. +15yr. (2029)	Base yr. to +1 (2015)	Base yr. to +5 (2019)	Base yr. to +10 (2024)	Base yr. to +15 (2029)
Passenger Enplanements[1]	1,375,399	1,403,112	1,497,055	1,622,924	1,769,307	2.0%	1.7%	1.7%	1.7%
Operations[2]									
Air Carrier	17,674	18,232	20,466	23,653	25,447	3.2%	3.0%	3.0%	2.5%
Commuter	21,856	21,683	20,993	19,745	21,244	-0.8%	-0.8%	-1.0%	-0.2%
Total Commercial Operations	39,530	39,916	41,459	43,398	46,691	1.0%	1.0%	0.9%	1.1%
Air Cargo	4,790	4,854	5,110	5,450	5,814	1.3%	1.3%	1.3%	1.3%
General Aviation	34,061	34,253	35,023	36,925	40,365	0.6%	0.6%	0.8%	1.1%
Military	16,817	17,000	17,000	17,000	17,000	1.1%	0.2%	0.1%	0.1%
Total Operations	95,198	96,023	98,592	102,773	109,870	0.9%	0.7%	0.8%	1.0%
Local	9,353	9,750	11,338	11,819	12,677	4.2%	3.9%	2.4%	2.0%
Itinerant	85,845	86,127	87,254	90,954	97,557	0.3%	0.3%	0.6%	0.9%
Instrument Operations	71,432	72,017	73,944	77,080	82,403	0.8%	0.7%	0.8%	1.0%
Peak Hour Operations	30	31	34	39	46	2.7%	2.5%	2.7%	2.8%
Cargo/Mail (enplaned + deplaned tons)	58,627	59,682	64,097	70,077	76,615	1.8%	1.8%	1.8%	1.8%
Based Aircraft									
Single Engine (Nonjet)	47	46	44	43	42	-1.3%	-1.3%	-0.9%	-0.7%
Multi-Engine (Nonjet)	35	35	34	33	33	-0.6%	-0.6%	-0.6%	-0.5%
Jet Engine	74	76	82	92	110	2.2%	2.1%	2.2%	2.6%
Helicopter	1	1	1	2	2	0.0%	0.0%	7.2%	4.7%
Other	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Total	157	158	161	170	186	0.5%	0.5%	0.8%	1.1%

Table B30 **TAF SUMMARY OF AIRPORT PLANNING FORECASTS (CONTINUED)**

						Average Annual Compound Growth Rates			
	Base Yr. (2014)	Base Yr. +1yr. (2015)	Base Yr. +5yrs. (2019)	Base Yr. +10yrs.. (2024)	Base Yr. +15yr. (2029)	Base yr. to +1 (2015)	Base yr. to +5 (2019)	Base yr. to +10 (2024)	Base yr. to +15 (2029)
Average Aircraft Seat Size (seats)	95.4	95.9	97.8	99.3	99.8	---	---	---	---
Average boarding load factor	72.9	73.1	74.0	75.0	75.5	---	---	---	---
GA operations per based aircraft	217	217	218	217	217	---	---	---	---

SOURCE: *FAA ATADS database*

[1] *Includes enplanements on both air carrier and commuter airlines.*

[2] *The commercial operations forecasts include only operations on commercial service airlines. In the TAF projections, the FAA includes air cargo operations and some general aviation air taxi operations in the Commuter/Air Taxi category. For the purpose of this master plan, air cargo operations have been developed separately and air taxi operation have been included in general aviation operations projections.*

Appendix One

Appendix Two