



KYTC Department of Aviation Aircraft Maintenance Technician (AMT) Program Optimization

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Kentucky Transportation Center
College of Engineering, University of Kentucky, Lexington, Kentucky

in cooperation with
Kentucky Transportation Cabinet
Commonwealth of Kentucky

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Research Report

KTC-24-11

KYTC Department of Aviation Aircraft Maintenance Technician (AMT) Program Optimization

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16. Abstract The aviation industry is a linchpin of Kentucky's economy. Major firms such as UPS, Amazon, and DHL have major hubs at Louisville Muhammad Ali International Airport (SDF) and Cincinnati/Northern Kentucky International Airport (CVG). As of December 2022, 4,570 aircraft mechanics and service technicians (AMTs) were employed in the state. Demand in this sector is poised to grow. As such, it is critical to understand what resources Kentucky has available to train the next generation of professionals and the number of people the aviation industry is likely to employ statewide over the next decade. Kentucky and the surrounding states are home to 35 programs that train AMTs. Most of Kentucky's AMTs graduate from Jefferson Community and Technical College and Somerset Community College (Maysville Community and Technical College is launching an AMT program), schools in southern Ohio, or arrive from out of state. Each year, Kentucky adds over 300 AMTs through immigration to Kentucky and graduates from AMT programs. AMT programs are critical sources of workers, but schools struggle to keep faculty on staff, with turnover in the 30-40% range due to low pay. Based on historical data, two mathematical models were developed to forecast the number of AMT jobs Kentucky will add between 2023 and 2035. These models suggest the number of AMTs will increase to a range between 2,311 and 3,027. Based on these projections, supply and demand for AMTs will reach equilibrium in 2027. To ensure Kentucky avoids a shortage of AMTs, expanding the number of training and certification programs and running programs at or near their capacity is critical.			
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Executive Summary

The aviation industry is a growing sector in Kentucky and is critical for bolstering the state’s long-term economic prospects. Estimates show the demand for aviation workers — including Aircraft Mechanics and Service Technicians (AMTs) — will far outpace the supply of workers in the coming decade. AMTs play a key role in the aviation industry; they diagnose, adjust, repair, or overhaul aircraft engines and assemblies.¹ Boeing predicts 132,000 new maintenance technicians will be needed across North America over the next 20 years to meet operator and maintenance, repair and overhaul (MRO) demand. Understanding the future demand for AMTs and the ability of programs to train the next generation of aviation professionals is important for creating and implementing strategies to fill employment shortfalls.

Many prospective AMTs receive training at community colleges and technical schools. Some high schools and 4-year colleges and universities also have programs. Nationwide, 192 AMT programs are operational, 35 of which are in Kentucky and the surrounding states. Kentucky’s two AMT programs are located at Jefferson Community and Technical College (JCTC) and Somerset Community College (SCC). JCTC enrolls 150 students in its AMT program and has a waitlist of 100 students. SCC enrolls 72 students and has a program capacity of 100 students.² As of the Fall 2023 semester, Maysville Community and Technical College launched an AMT program that will accommodate up to 15 students per year, bringing the total number of programs in Kentucky to three. These programs are key sources of AMTs, however, they alone do not produce enough graduates to fulfill the state’s demand for workers. One struggle many schools confront is the retention of qualified faculty. At JCTC, the average turnover rate for faculty is 30% to 40%, due to industry jobs offering more lucrative pay than it is able to. The schools and colleges that house AMT programs need to determine how they can compete for and retain faculty in a bustling employment market. Failure to do so will imperil the continued growth of Kentucky’s aviation sector.

Table E1 Quick Facts About AMTs in Kentucky

AMT Worker Count	4,570 (December 2022)
Median AMT Wage	\$66,670
AMT Location Quotient	2.65 (Values > 1.0 indicate worker concentrations above the national average)
Number of Certified AMTs Graduating from Kentucky Programs	151 per year
Projected AMT Employment in 2035	6,000 – 6,350
Major AMT Employers In KY	UPS, Amazon, DHL, Polar Air Cargo, FEAM Aero, Passenger Airlines

According to the Bureau of Labor Statistics, as of December 2022, 4,570 people worked as AMTs in Kentucky. With aviation industry operations at the Louisville Muhammad Ali International Airport (UPS Worldport) and Cincinnati/Northern Kentucky Airport (Amazon, DHL, Polar Air Cargo, FEMA Aero), demand for AMTs will persist over the next decade and further cement the state as an area with above average concentrations of aviation workers. Each year Kentucky’s AMT programs generate 151 students who earn their Airframe and Power certifications after sitting for FAA-required exams. Combined with the average number of AMTs who move to Kentucky each year (215 workers), about 366 AMTs enter the state’s labor market annually. Based on historical data, two mathematical models were

¹ Bureau of Labor Statistics. Occupational Employment and Wage Statistics. Retrieved from: <https://www.bls.gov/oes/current/oes493011.htm>

² These totals were provided to KTC staff in the AMT Program survey and are different than the FAA reported totals.

developed to forecast the number of AMT jobs Kentucky will add between 2023 and 2035. A linear model predicts Kentucky will add 217 AMTs each year (or 2,605 positions by 2035), while a logarithmic model suggests an increase of 3,027 positions by 2035. Two models were used to net out supply and demand. First, the closed model assumes that all graduates from Kentucky programs and programs based in southern Ohio will find employment in Kentucky; this model also assumes that individuals are only moving into the state to find work as AMTs (215 total workers per year). The closed model predicts that supply and demand for AMTs will reach equilibrium in 2027. Second, the open model assumes that 10% of program graduates will move to other states for work and takes into account the average net migration number of AMTs in Kentucky (a loss of 63 workers per year). This model predicts an average shortage of 1,037 workers each year for AMTs. Since the models rely on historical data and cannot foresee positive or negative economic shocks, their predictions should be viewed as a starting point for understanding emerging employment trends.

While Kentucky's existing AMTs programs — along with people moving to the state — will help meet the demand for aviation workers, adding more programs could mitigate potential labor shortages. Equally important is running these programs at or near capacity. Given the results of the “open” forecast model, worker retention is also a key factor in meeting the demand for AMTs in the Commonwealth. Kentucky is in a strong economic position due to companies such as UPS and Amazon selecting the Louisville and Cincinnati/Northern Kentucky airports as hubs. Ensuring an adequate supply of AMTs is available to meet future needs will help the state become a global economic leader in the Air Transportation sector.

Chapter 1 Introduction and Historical AMT Program Information

1.1 Introduction

Several aviation industry leaders predict an impending shortage of workers within the industry. Estimates show that the demand for aviation workers — including aircraft mechanics and service technicians — will far outpace the supply of workers in the coming decade. To understand what is driving this imbalance in supply and demand, the next section reviews studies specifically related to the demand for Aviation Mechanic Technicians (AMTs) and present historical and current trends within education and employment of AMTs and the aviation industry in the Commonwealth of Kentucky and surrounding states.

1.2 Literature Review

The Government Accountability Office (GAO) outlines three characteristics of an occupation that would indicate a labor shortage:

1. “...a low unemployment rate signaling limited availability of workers in that profession,
2. increases in wages offered to draw people into that profession, and
3. increases in employment due to increases in demand for that occupation.” (GAO, 2020, p. 34)

In their 2018 report, the GAO was tasked with examining the aviation industry at the request of the FAA. The resulting report indicated that, given the state of data collection and warehousing at the time, the FAA does not collect sufficient information that could be used to determine supply shortages in the aviation industry. Specifically, the GAO outlines several challenges to predicting a supply shortage, as the FAA does not track technicians leaving the field and this information is also not readily available by other government agencies that track employment data (e.g., Bureau of Labor Statistics (BLS)). In addition, the GAO highlighted via feedback from workers and administrators within the aviation industry and AMT schools, that the length of the certification process and outdated curriculum and testing standards remain two of the largest challenges drawing people into a career as a certified AMT. Similar to the 2018 report, the GAO published an industry analysis of the demand for pilots and AMTs in the United States based upon data between 2017 and 2021 (May 2023). The authors cited the same indicators of a labor shortage listed above and did not feel that the data available could provide sufficient support for a full demand analysis for AMTs.

Several aviation industry leaders have produced reports in recent years forecasting challenges to the aviation industry. Boeing predicts in their Pilot and Technician Outlook (2023-2042) report (2021) that “...over the next 20 years, 626,000 new maintenance technicians will be needed [across the globe] to meet operator and maintenance, repair and overhaul (MRO) demand” (p. 4). This amounts to 132,000 technicians in North America (United States and Canada) across the 20-year span (Boeing, 2021, p. 7).

The Aviation Technician Education Council (ATEC) produces an Annual Pipeline Report that details the national market demand for AMTs. In addition, it coordinates an annual survey with vocational schools and programs who train and certify AMTs across the country. In the most recent pipeline report, ATEC cites several factors that have contributed to the overall shortage of AMTs, such as the aging worker population and the impact of the COVID pandemic on graduation and certification of new AMTs. ATEC recommends not only increasing enrollment in current programs but also expanding the number of these programs, in order to increase the overall number of certified AMTs into the employment market by 20% (ATEC Pipeline Report, 2022, p. 3); they also recommend increasing awareness of AMT programs within high schools by creating high school pipeline programs into the community and technical college systems in states throughout the US. ATEC also reports that many graduates of aviation technician programs do not sit for the AMT certification exams. In its most recent pipeline report, ATEC reported from its survey

of AMT programs that “42% of aviation technician school graduates do not take the exam necessary to receive FAA mechanic certification” (ATEC Pipeline Report, 2022, p. 13). Conversely, this results in only 58% of graduates taking and passing the exams necessary for certification.

In addition to the current and increasing shortage of AMTs across the globe, ATEC outlines several other challenges that accrediting schools highlight in their annual survey. From a program administration perspective, the number of instructors has become an issue for most programs, with the salary paid to instructors being much less than these individuals can make in the standard job market. As a result, many individuals work part time as instructors in AMT/Airframe and Powerplant (A&P) programs while maintaining their industry-based position. From the students’ perspective, ATEC includes feedback from students who state the main barriers to certification are:

- Lack of preparation/fear of testing;
- Life distraction;
- High test costs;
- Mechanic certificate not required for job offer;
- Lack of Designated Mechanic Examiners (DMEs) (ATEC Pipeline Report, 2022, p. 13).

Given the predicted shortage and current challenges facing AMT schools across the country, the next sections unpack the intricacies of trends among AMT schools and certification rates, employment trends of AMTs, and the demand for these skilled workers within the Commonwealth and across the country.

1.3 Historical AMT Program Information

Replacing the aging workforce and meeting the domestic demand for AMTs relies heavily upon schools training and certifying technicians. Over the past 20 years, the number of schools with AMT programs in the US has increased by 15% (Figure 1.1).

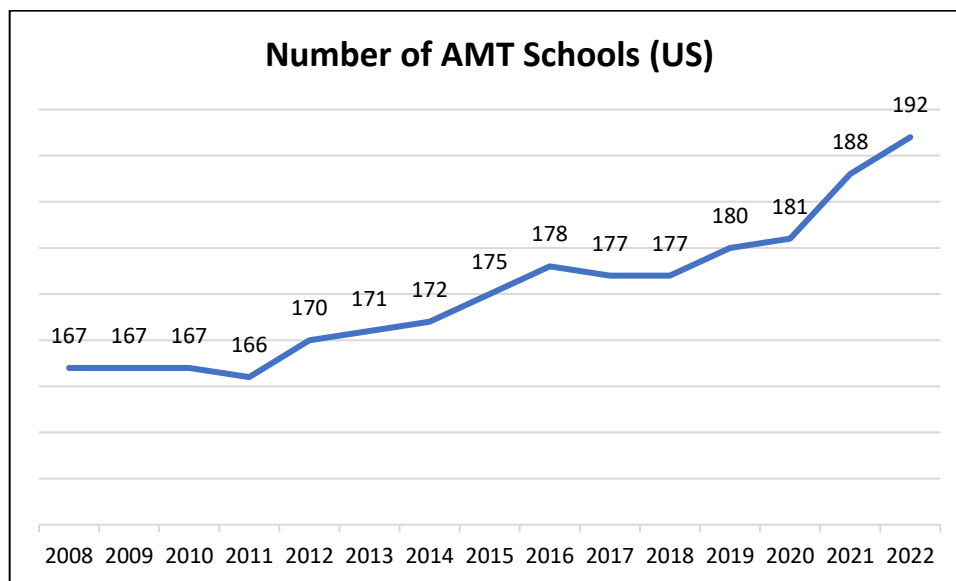


Figure 1.1 Total AMT Schools in US (2008-2022)

Source: ATEC Pipeline Data (2008-2022)

The number of schools varies widely across states in the US, and the overall number of schools correlates to population centers across the country, with Florida, New York, Texas and California having the largest number of

schools and enrolled students (ATEC Pipeline Report, 2022, p. 12). In Kentucky and the surrounding states, Ohio leads the way with ten total programs, while Kentucky and West Virginia have the fewest with 2 in each state³. Figure 1.2 (below) displays the number of AMT programs by State in Kentucky and surrounding states (2022).

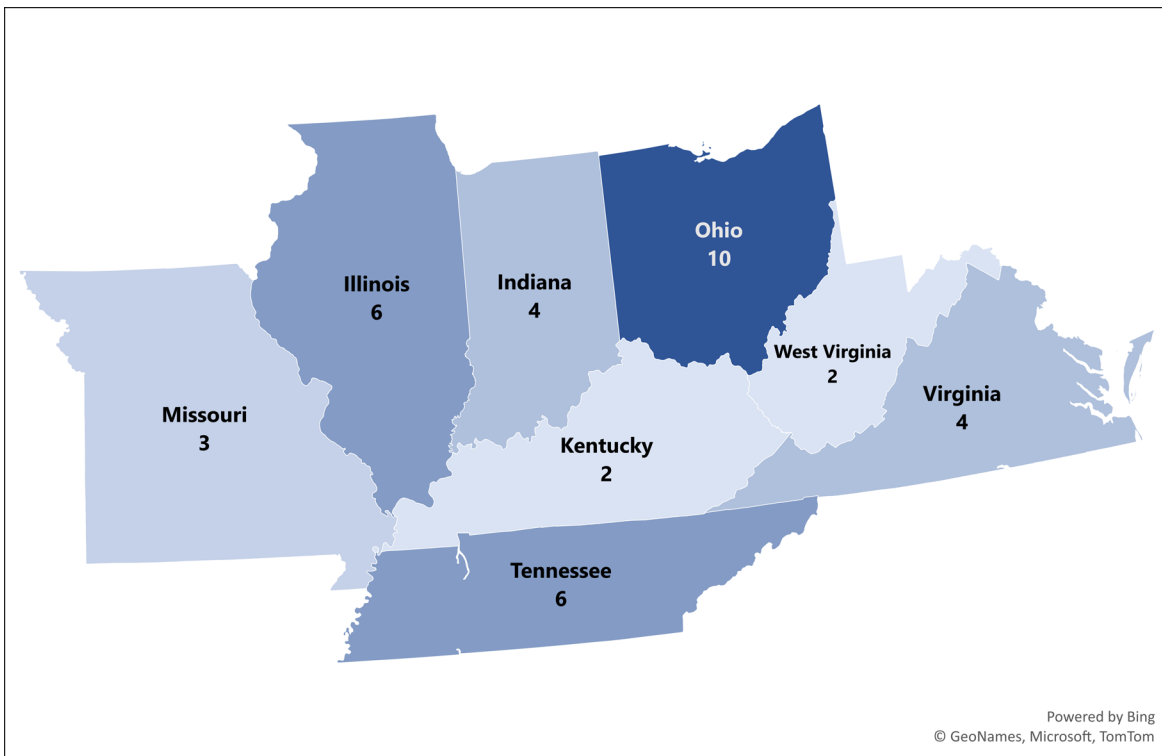


Figure 1.2 Number of AMT Programs by State for Kentucky and Contiguous States (2022)

Source: FAA, Maintenance Schools Database (2022)

The volume of schools or programs does not necessarily equate to the largest overall student enrollment numbers. Historically, Indiana has enrolled the greatest number of students up until 2022, averaging approximately 670 enrolled students per year between 2018 and 2022. In 2023, this designation flipped to Ohio, who reported 611 students enrolled in AMT programs in the most recent academic year, with Indiana (583 enrolled students) and Illinois (576 enrolled students) rounding out the states with the highest enrollment numbers.

According to the FAA, Kentucky’s enrollment numbers have held steady at 125 students per year for the data available from Jefferson Community and Technical College and Somerset Community College (data in the most recent year were submitted and validated on 6 April 2023). Figure 1.3 (next page) displays the total student enrollment by state for AMT programs between 2018 and 2023. Overall, enrollment has decreased across the years included. However, enrollment within several states increased during the pandemic years (2020-2022) and began to taper in 2023. We can postulate a greater number of individuals enrolled in AMT programs during the economic downturn of 2020-2021, due to job loss or pursuing a higher education, and have either completed their degree and certification, returned to the workforce, or pursued other opportunities. Without student level data, it is impossible

³ Kentucky currently has three AMT programs that are open and operational, but the newest program at Maysville Community and Technical College has not been added to the FAA database.

to state this with 100% certainty, but the data at hand does tell an interesting story, showing that enrollment did increase during the pandemic.

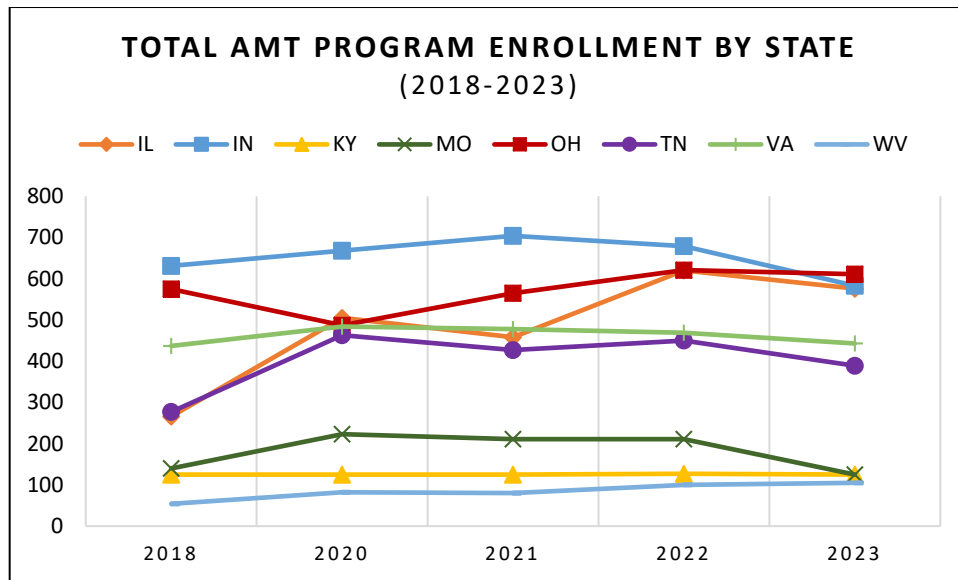


Figure 1.3 Historical Enrollment in AMT Programs by State (2018-2023)
Sources: ATEC Pipeline Data (2018, 2020-2022), FAA Mechanic School Enrollment (2023)

Total enrollment by state and/or school partially informs the narrative of AMT program output. According to the FAA, most schools are not filling all available seats in these programs for a variety of reasons. In Kentucky, both AMT programs are reported to be operating at a 50% enrollment capacity per the FAA data; however, KTC research found that in many programs, enrollment is much higher than is reported in the FAA data. This will be further discussed in the AMT Program Survey section (Chapter 2).

Only three AMT programs in this regional cohort are at or above enrollment capacity per the FAA (100% or greater): Great Oaks Joint Vocational School (Wilmington, OH) – 100%; Tennessee Colleges of Applied Technology (Memphis, TN) – 100%; and Green County Career Center (Xenia, OH) – 124% (FAA, Mechanic School Enrollment database, 2023). Table 1.1 (next page) lists the institution name, city, current enrollment, total capacity, and enrollment percentage (current enrollment/total capacity) for all schools located in Kentucky and surrounding states. These enrollment numbers were pulled from the FAA Mechanic School Enrollment database in May of 2023.

Table 1.1 Enrollment Rates by School in Kentucky and Contiguous States (2022)

State	Name	City	Enrollment	Capacity	Enrollment Percentage
KY	JEFFERSON COMMUNITY TECHNICAL COLLEGE	Louisville	75	150	50.0%
	SOMERSET COMMUNITY COLLEGE	Somerset	50	100	50.0%
IL	AVIATION INSTITUTE OF MAINTENANCE	Chicago	43	475	9.1%
	COMMUNITY COLLEGE DISTRICT NUMBER 522 - SOUTHWESTERN ILLINOIS COLLEGE	Granite City	33	50	66.0%
	LEWIS UNIVERSITY	Romeoville	163	400	40.8%
	LINCOLN LAND COMMUNITY COLLEGE	Springfield	30	50	60.0%
	ROCK VALLEY COLLEGE AVIATION TECH	Rockford	168	300	56.0%
	SOUTHERN ILLINOIS UNIV AVN TECH	Carbondale	139	325	42.8%
IN	AMERICAN TRANS AIR TRAINING CORPORATION - AVIATION INSTITUTE OF MAINTENANCE	Indianapolis	155	350	44.3%
	IVY TECH COMMUNITY COLLEGE NORTHEAST	Fort Wayne	45	130	34.6%
	PURDUE UNIV SCHOOL OF AVIATION AND TRANSP TECH	West Lafayette	268	400	67.0%
	VINCENNES UNIVERSITY	Indianapolis	115	500	23.0%
MO	GATEWAY INSTITUTE OF TECHNOLOGY	St. Louis	12	50	24.0%
	STATE TECHNICAL COLLEGE OF MISSOURI	Linn	28	80	35.0%
	TECHNICAL EDUCATION SERVICES INC - AVIATION INSTITUTE OF MAINTENANCE	Kansas City	85	300	28.3%
OH	AEROSPACE CENTER	Swanton	52	100	52.0%
	CINCINNATI STATE TECHNICAL AND COMMUNITY COLLEGE	Harrison	91	200	45.5%
	COLUMBUS STATE COMMUNITY COLLEGE	Columbus	65	300	21.7%
	GREAT OAKS JOINT VOCATIONAL SCHOOL	Wilmington	25	25	100.0%
	GREEN COUNTY CAREER CENTER	Xenia	31	25	124.0%
	MAHONING COUNTY CAREER AND TECHNICAL CENTER	Canfield	37	50	74.0%
	MIAMI VALLEY CAREER TECHNOLOGY CENTER	Clayton	24	75	32.0%
	PITTSBURGH INSTITUTE OF AERONAUTICS	Vienna	100	150	66.7%
	SINCLAIR COMMUNITY COLLEGE	Dayton	186	225	82.7%

Source: FAA Mechanic School Database (2022)

State	Name	City	Enrollment	Capacity	Enrollment Percentage
TN	DEPT OF AEROSPACE MIDDLE TENNESSEE	Murfreesboro	90	100	90.0%
	NORTH CENTRAL INSTITUTE	Clarksville	50	150	33.3%
	NORTHEAST STATE COMMUNITY COLLEGE	Blountville	22	50	44.0%
	TENNESSEE COLLEGE OF APPLIED TECHNOLOGY MORRISTOWN	Morristown	26	50	52.0%
	TENNESSEE COLLEGE OF APPLIED TECHNOLOGY, NASHVILLE	Nashville	51	75	68.0%
	TENNESSEE COLLEGES OF APPLIED TECHNOLOGY-MEMPHIS	Memphis	150	150	100.0%
VA	BLUE RIDGE COMMUNITY COLLEGE	Weyers Cave	23	25	92.0%
	LIBERTY UNIVERSITY	Lynchburg	40	100	40.0%
	TECHNICAL EDUCATION SERVICES INC - AVIATION INSTITUTE OF MAINTENANCE	Manassas	157	300	52.3%
	TRAINING SERVICES INC	Norfolk	223	440	50.7%
WV	MARSHALL UNIVERSITY AVIATION MAINTENANCE TECHNOLOGY	Huntington	25	100	25.0%
	PIERPONT COMMUNITY AND TECHNICAL COLLEGE	Bridgeport	80	130	61.5%

Source: FAA Mechanic School Database (2022)

All programs face attrition and dropout as students encounter various barriers that inhibit program completion. The same is true within AMT programs. The ATEC Pipeline Report (2022) states that the average graduation rate of students enrolled in AMT programs is 68 percent (p. 12). This rate is based upon an annual survey of AMT schools across the country and the results are annually published in the ATEC Pipeline Report. Of those that graduate, ATEC estimates that only 58% sit for the FAA administered AMT exams (ATEC Pipeline Report, 2022, p. 13). Using the FAA Mechanic School Enrollment and Capacity data, we can project the estimated number of certified mechanics, based upon the most recently available enrollment number and total capacity of each program (detailed tables in Appendix A.1 (Estimates by Current Enrollment) and Appendix A.2 (Estimates by Program Capacity)). From this, we produce two estimates: estimated certified AMTs based upon the *current FAA enrollment numbers* and the estimated certified AMTs based upon *current program capacity*. These estimates are produced using the following equation:

$$\text{Estimated Certified AMTs} = [(\text{Total by State (either enrollment or capacity)} * (\text{Graduation Rate or 68\%})) * (\text{Certification Rate or 58\%})] \text{ (Eq. 1)}$$

The table below outlines the two estimates for *potential* certification based upon the most recent enrollment amount and total program capacity using the FAA Mechanic School enrollment data by state (2022). In all states, we see that increasing enrollment to fill current program capacity would dramatically increase the number of certified AMTs entering the job market. Kentucky could increase its output by 100% by increasing enrollment to the total number of seats available in current programs.

Table 1.2 Estimated State Totals of Certified AMTs

State	Number of Programs	Total AMT Program Enrollment by State	Total AMT Program Capacity by State	Estimated # of Certified AMTs Produced Based Upon Current Enrollment (FAA)	Estimated # of Certified AMTs Produced Based Upon Current Program Capacity (FAA)	% increase in Certified AMTs if Enrollment Increased to Program Capacity
IL	6	576	1,600	227	631	177.8%
IN	4	583	1,380	230	544	136.7%
KY	2	125	250	49	99	100.0%
MO	3	125	430	49	170	244.0%
OH	9	611	1,150	241	454	88.2%
TN	6	389	575	153	227	47.8%
WV	2	105	230	41	91	119.0%
VA	4	443	865	175	341	95.3%
Totals	36	2,957	6,480	1,166	2,556	119.1%

Source: FAA Mechanic School Database (2022), Authors' Calculations

Chapter 2 KTC AMT Program Survey

Many of the trends discussed above are from the FAA Mechanic School Database and the ATEC Pipeline Report. Both rely upon a survey of AMT programs across the country. Looking specifically at the Kentucky data provided in these resources, they report very little change across time, which does not follow the more dynamic trends seen in surrounding states. To capture a complete picture of AMT program information and production, KTC staff conducted an online survey of all AMT programs located in Kentucky and contiguous states that are currently operational and gathered information for the most recent academic year (August 2022-May 2023). Of the 36 programs contacted, 22 program coordinators completed the survey and provided updated information supplementary to the FAA Mechanic School database. The following section reports these results and compares them to the national resources previously discussed.

2.1 Student Origin

With the concentration of schools varying across Kentucky and surrounding states, it is important to understand the location where students live or reside before enrolling in a program. This will show us competition between programs for student populations. All 22 program respondents provided student origin information in their survey responses. Students at AMT programs in Kentucky and surrounding states originate from: Alabama, Arizona, Colorado, Florida, Georgia, Illinois, Indiana, Kentucky, Michigan, New Mexico, New York, North Carolina, Ohio, Oregon, South Carolina, Tennessee, Virginia, Washington, and West Virginia. Table 2.1 (below) shows the program location versus the student origin information reported in the survey by the program administrators.

Table 2.1 Student Origin Information by AMT Program

Program	Program Location	Student Origin
Lincoln Land Community College	Illinois	Illinois
Southern Illinois University	Illinois	Illinois
Southwestern Illinois College	Illinois	Illinois
Ivy Tech Community College	Indiana	Illinois
		Indiana
		Michigan
		Ohio
Vincennes University	Indiana	Indiana
<i>Jefferson Community and Technical College</i>	<i>Kentucky</i>	Indiana
		Kentucky
		Ohio
<i>Somerset Community College</i>	<i>Kentucky</i>	Kentucky
		Tennessee
Sinclair Community College	Ohio	Ohio
Greene County Career Center	Ohio	Ohio
Cincinnati State Technical and Community College	Ohio	Indiana
		Kentucky
		Ohio
Pittsburgh Institute of Aeronautics (PIA)	Ohio	Ohio
Columbus State Community College	Ohio	Ohio
Miami Valley Community and Technical College	Ohio	Ohio
Great Oaks CDC	Ohio	Ohio
Mahoning Community and Technical College	Ohio	Ohio

Program	Program Location	Student Origin
Middle Tennessee State University	Tennessee	Tennessee
Tennessee College of Applied Technology (Nashville)	Tennessee	Kentucky
		Tennessee
Tennessee College of Applied Technology (Morristown)	Tennessee	Tennessee
		Virginia
North Central Institute	Tennessee	Arizona
		Colorado
		Florida
		Georgia
		Kentucky
		Ohio
		Tennessee
Pierpont Community and Technical College	West Virginia	West Virginia
Marshall University	West Virginia	Kentucky
		West Virginia
Blue Ridge Community College	Virginia	Alabama
		Florida
		New Mexico
		New York
		North Carolina
		Oregon
		South Carolina
		Tennessee
		Virginia
		Washington
West Virginia		

Source: KTC AMT Program Survey, August 2023

Kentucky residents are enrolled in Kentucky-based AMT programs as well as at programs in Ohio, Tennessee, and West Virginia. Conversely, Kentucky programs also attract out-of-state students from Indiana, Ohio, and Tennessee.

2.2 Waitlists

Of the 22 respondents, only 10 indicated that they have a waitlist to begin their AMT program. The waitlists range in size and duration across the respondents. Jefferson Community and Technical College (KY) reported the largest waitlist with 100 students awaiting admission into the program. Miami Valley Community and Technical College (OH) reported the smallest waitlist of 5 students. The waitlists range from six months to one year in length. Table 2.2 (next page) lists the programs with waitlists by the size of the waitlist (largest to smallest); it also includes the length of time students typically wait before program admission.

Table 2.2 AMT Program Waitlist by Program and State

Program	State	Size	Length
Jefferson Community and Technical College	KY	100	6-12 months
Tennessee College of Applied Technology (Nashville)	TN	40	6-8 Months
Tennessee College of Applied Technology (Morristown)	TN	40	1 year
Great Oaks CDC	OH	30	1 year
Pierpont Community and Technical College	OH	8	1 semester
Ivy Tech Community College	IN	8	1 year
Lincoln Land Community College	IL	6	1 semester
Blue Ridge Community College	VA	6	<i>Varies</i>
Somerset Community College	KY	5	1 semester
Miami Valley Community and Technical College	OH	5	<i>Not provided</i>

Source: KTC AMT Program Survey, August 2023

2.3 Enrollment and Capacity

Enrollment and program capacity seem to be the two variables with the greatest variation between the FAA reported data and current program data collected by KTC. The following tables present the KTC collected data AMT programs in Kentucky and the surrounding states, which in some cases sharply contrasts with the FAA program information presented in Chapter 1.

2.3.1 Enrollment

To compare information across programs, it was vital to understand the degree offerings of each institution and the enrollment therein. This will enrich the information we can use as an input for the full regional demand model. Programs surveyed were asked to provide the number of enrolled students in classes to obtain an A&P License only (less than 2 years of enrollment), an A&P with an associate degree (approximately 2 years of enrollment), a bachelor’s degree (4-year enrollment), or Other. Because most programs are housed in community colleges, enrolled students typically attend institutions for two years or less. But a handful of programs — primarily in Ohio and Indiana — are at 4-year institutions or connected to a high school program. Table 2.3 (next page) summarizes enrollment information for the 2022-2023 academic year.

Our survey counted 1,844 students enrolled across all programs — 749 in AMT-license-only programs, 746 in an associate degree program, 275 in a bachelor’s degree program (A&P license), and 74 enrolled in another type of program. For the two programs with enrolled students list as “other”:

- The program at Mahoning Community and Technical College (OH) is a high school program where juniors and seniors can enroll in and receive their A&P license upon graduation.
- The program at North Central Institute (TN) is an Aviation Maintenance Technology certificate program (under FAA part 65).

Table 2.3 Program Reported Enrollment Information for 2022-2023 Academic Year

State	Program	A&P License Only	A&P with Associate Degree	A&P with Bachelor's Degree	Other
IL	Lincoln Land Community College	26	5		
	Southern Illinois University	5		150	
	Southwestern Illinois College	50			
IN	Ivy Tech Community College		36		
	Vincennes University		120		
KY	Jefferson Community and Technical College	40	110		
	Somerset Community College	37	35		
OH	Cincinnati State Technical and Community College	10	180		
	Columbus State Community College	65	15		
	Great Oaks CDC	110			
	Greene County Career Center	32			
	Mahoning Community and Technical College				33
	Miami Valley Community and Technical College	50			
	Pittsburgh Institute of Aeronautics (PIA)	115			
	Sinclair Community College	62	69		
TN	Middle Tennessee State University			125	
	North Central Institute	23	21		41
	Tennessee College of Applied Technology (Morristown)	24			
	Tennessee College of Applied Technology (Nashville)	70			
VA	Blue Ridge Community College		10		
WV	Marshall University		45		
	Pierpont Community and Technical College	30	100		
TOTAL		749	746	275	74

Source: KTC AMT Program Survey, August 2023

2.3.2 Capacity

Physical space, equipment availability, and certified instructors all influence program capacity. Currently, programs in the Kentucky Region have a total capacity of 2,545 students. Multiple program administrators commented that physical space is limited, both in terms of classroom space and hangar space. However, several also highlighted that recent improvements to physical spaces have allowed them to expand program capacity. Another challenge is that many programs cannot retain faculty because instructor and staff salaries are far below full-time industry salaries. As a result, faculty retention is low and many programs have a large rotation of part-time instructors.

The number of students in both of Kentucky's AMT programs exceeds FAA-reported totals. JCTC reported a 100% enrollment rate for the most recent academic year (the FAA-reported rate was 50%). SCC reported a 72% enrollment

rate (the FAA-reported rate was 50%). Table 2.4 lists the program enrollment and capacity for survey respondents for the most recent academic year.

Table 2.4 Enrollment Capacity for Program Respondents (2022-2023 Academic Year)

State	Program	Total Enrollment	Program Capacity	% Enrollment
IL	Lincoln Land Community College	31	50	62.0%
	Southern Illinois University	155	200	77.5%
	Southwestern Illinois College	50	50	100.0%
IN	Ivy Tech Community College	36	60	60.0%
	Vincennes University	120	400	30.0%
KY	Jefferson Community and Technical College	150	150	100.0%
	Somerset Community College	72	100	72.0%
OH	Cincinnati State Technical and Community College	190	200	95.0%
	Columbus State Community College	80	100	80.0%
	Great Oaks CDC	110	125	88.0%
	Greene County Career Center	32	50	64.0%
	Mahoning Community and Technical College	33	50	66.0%
	Miami Valley Community and Technical College	50	50	100.0%
	Pittsburgh Institute of Aeronautics (PIA)	115	150	76.7%
	Sinclair Community College	131	150	87.3%
TN	Middle Tennessee State University	125	90	138.9%
	North Central Institute	85	195	43.6%
	Tennessee College of Applied Technology (Morristown)	24	50	48.0%
	Tennessee College of Applied Technology (Nashville)	70	70	100.0%
VA	Blue Ridge Community College	10	25	40.0%
WV	Marshall University	45	100	45.0%
	Pierpont Community and Technical College	130	130	100.0%

Source: KTC AMT Program Survey, August 2023

2.4 Graduation and Certification

We collected additional information on graduation and certification to validate the ATEC’s numbers and to see if its percentages hold up for programs in Kentucky and surrounding states.

2.4.1 Graduation

At surveyed programs during the 2022-2023 academic year, 957 of 1,844 students graduated with an A&P license and/or a concurrent degree (472 license only, 380 associate degrees, 68 bachelor’s degrees). All 22 survey respondents provided graduation metrics for the most recent academic year. Table 2.5 lists the number of graduating students by license and degree type. JCTC had 150 total graduates — 50 received only their A&P license; 100 graduated with an associate degree— and reported a 100% graduation rate. SCC had 70 graduates, with 35 receiving just their A&P license and 35 an associate degree.

Table 2.5 Number of Graduating Students by License or Degree for Program Respondents (2022-2023 Academic Year)

State	Program	A&P License Only	A&P with Associate Degree	A&P with Bachelor's Degree	Other	Total
IL	Lincoln Land Community College	18	5			23
	Southern Illinois University			28		28
	Southwestern Illinois College	35				35
IN	Ivy Tech Community College		12			12
	Vincennes University		60			60
KY	Jefferson Community and Technical College	86	16			102
	Somerset Community College	35	35			70
OH	Cincinnati State Technical and Community College	6	40			46
	Columbus State Community College	25	5			30
	Great Oaks CDC	43	10			53
	Greene County Career Center	18				18
	Mahoning Community and Technical College					0
	Miami Valley Community and Technical College	50				50
	Pittsburgh Institute of Aeronautics (PIA)	75				75
	Sinclair Community College	15	10			25
TN	Middle Tennessee State University			36		36
	North Central Institute	13	18		41	72
	Tennessee College of Applied Technology (Morristown)	14				14
	Tennessee College of Applied Technology (Nashville)	60				60
VA	Blue Ridge Community College		10			10
WV	Marshall University		45			45
	Pierpont Community and Technical College	15	30			45
Total by License or Degree		508	296	64	41	909

Source: KTC AMT Program Survey, August 2023

2.4.2 Certification

Once completing the license or degree requirements, students can sit for the Airframe (A) and Powerplant (P) certification exams (A&P certification). Certification information was provided by 19 of the 22 survey respondents. Table 2.6 (next page) displays the total number of students sitting for each certification by state and school. Kentucky schools had 230 total students sit and pass the A&P examinations in the most recent academic year. JCTC listed 86 students taking the Airframe and Powerplant exams, respectively; SCC listed 65 students taking each exam in the most recent year. Many AMT job postings do not require that the applicant hold an A&P certificate. This may be influencing the lower number of students sitting for the exams. Also, many programs stated that with the limited number of faculty it makes certifications more difficult as one or two faculty (full time or part time) are Designated

Mechanic Examiners (DMEs); these faculty can proctor the exams. Many programs do not have this resource and students must travel for the examination to complete certification.

Table 2.6 Number of Students Sitting for A&P Certification Exams by Program (2022-2023 Academic Year)

State	Program	Airframe	Powerplant
IL	Lincoln Land Community College	19	19
	Southern Illinois University	25	25
IN	Ivy Tech Community College	11	11
KY	Jefferson Community and Technical College	44	42
	Somerset Community College	65	65
OH	Cincinnati State Technical and Community College	50	50
	Columbus State Community College	18	18
	Great Oaks CDC	40	25
	Greene County Career Center	5	0
	Mahoning Community and Technical College	5	5
	Miami Valley Community and Technical College	10	10
	Pittsburgh Institute of Aeronautics (PIA)	75	75
	Sinclair Community College	10	15
TN	Middle Tennessee State University	24	24
	North Central Institute	48	45
	Tennessee College of Applied Technology (Morristown)	14	14
	Tennessee College of Applied Technology (Nashville)	60	60
VA	Blue Ridge Community College	10	10
WV	Pierpont Community and Technical College	33	33
TOTAL		566	546

Source: KTC AMT Program Survey, August 2023

2.5 Faculty

As discussed above, many program administrators identified faculty retention as a challenge facing AMT programs. Dallas King, program coordinator for the JCTC AMT program commented regarding faculty related challenges the program in Louisville faces: “[we have] on average, a 30%-40% turnover rate for faculty members. [Also,] Pay within the KCTCS system is much lower than industry trends and keeping quality personnel is extremely challenging.” Most of the survey respondent cadre provided information regarding their faculty (21 of the 22 respondents) and these responses are displayed in Table 2.7 (next page). JCTC reported 11 faculty, with 7 full-time and 4 part-time instructors; SCC reported 6 faculty, with 4 full-time and 2 part-time instructors. Both of Kentucky’s AMT programs have mid-range student-to-faculty ratios, with JCTC at 14:1 and SCC at 12:1.

Table 2.7 Number of Full time and Part time Faculty by Program (2022-2023 Academic Year)

State	Program	Full Time	Part Time	Total Faculty	Exact Student-to-Faculty Ratio	Estimated Student-to-Faculty Ratio
IL	Lincoln Land Community College	2	6	8	31:8	4:1
	Southern Illinois University	8	0	8	155:8	19:1
	Southwestern Illinois College	4	0	4	25:2	13:1
IN	Ivy Tech Community College	2	0	2	18:1	
	Vincennes University	5	4	9	40:3	13:1
KY	Jefferson Community and Technical College	7	4	11	150:11	14:1
	Somerset Community College	4	2	6	12:1	
OH	Cincinnati State Technical and Community College	5	8	13	190:13	15:1
	Columbus State Community College	4	4	8	10:1	
	Great Oaks CDC	4	2	6	55:3	18:1
	Greene County Career Center	1	1	2	16:1	
	Mahoning Community and Technical College	2	2	4	33:4	8:1
	Miami Valley Community and Technical College	2	0	2	25:1	
	Pittsburgh Institute of Aeronautics (PIA)	6	1	7	115:7	16:1
Sinclair Community College	4	6	10	131:10	13:1	
TN	Middle Tennessee State University	6	3	9	125:9	14:1
	North Central Institute	3	1	4	85:4	25:1
	Tennessee College of Applied Technology (Morristown)	2	0	2	12:1	
	Tennessee College of Applied Technology (Nashville)	3	1	4	35:2	18:1
WV	Marshall University	7	2	9	5:1	
	Pierpont Community and Technical College	7	0	7	130:7	19:1

Source: KTC AMT Program Survey, August 2023

2.6 Student Placement

Ultimately, the goal of programs is to educate and certify students so that they can earn wages as AMTs in their future career. We asked survey respondents about post-graduation employment and/or certification and received responses from 13 programs. Most students remain in the region where they earn their degree and/or certification and work at large companies. Many former JCTC students work at Republic Airways (Louisville), UPS Airlines Worldport (Louisville), or PSA Airlines (Erlanger). Cincinnati State Technical and Community College listed 11 employers, all located at the Cincinnati/Northern Kentucky International Airport (CVG).

Figure 2.1 maps AMT programs and the locations of employers where their students have found jobs. Each gray point represents an employment location. Each line is color-coded to match the school that trained the students (e.g., JCTC connections are in green). Program reach varies. For example, schools close to CVG connect students to a larger percentage of employers at the airport, but schools such as the Pittsburgh Institute of Aeronautics (PIA) and

Marshall University connect students with more distant employers (e.g., in Bridgeport, WV, Lexington, KY, and Nashville, TN).

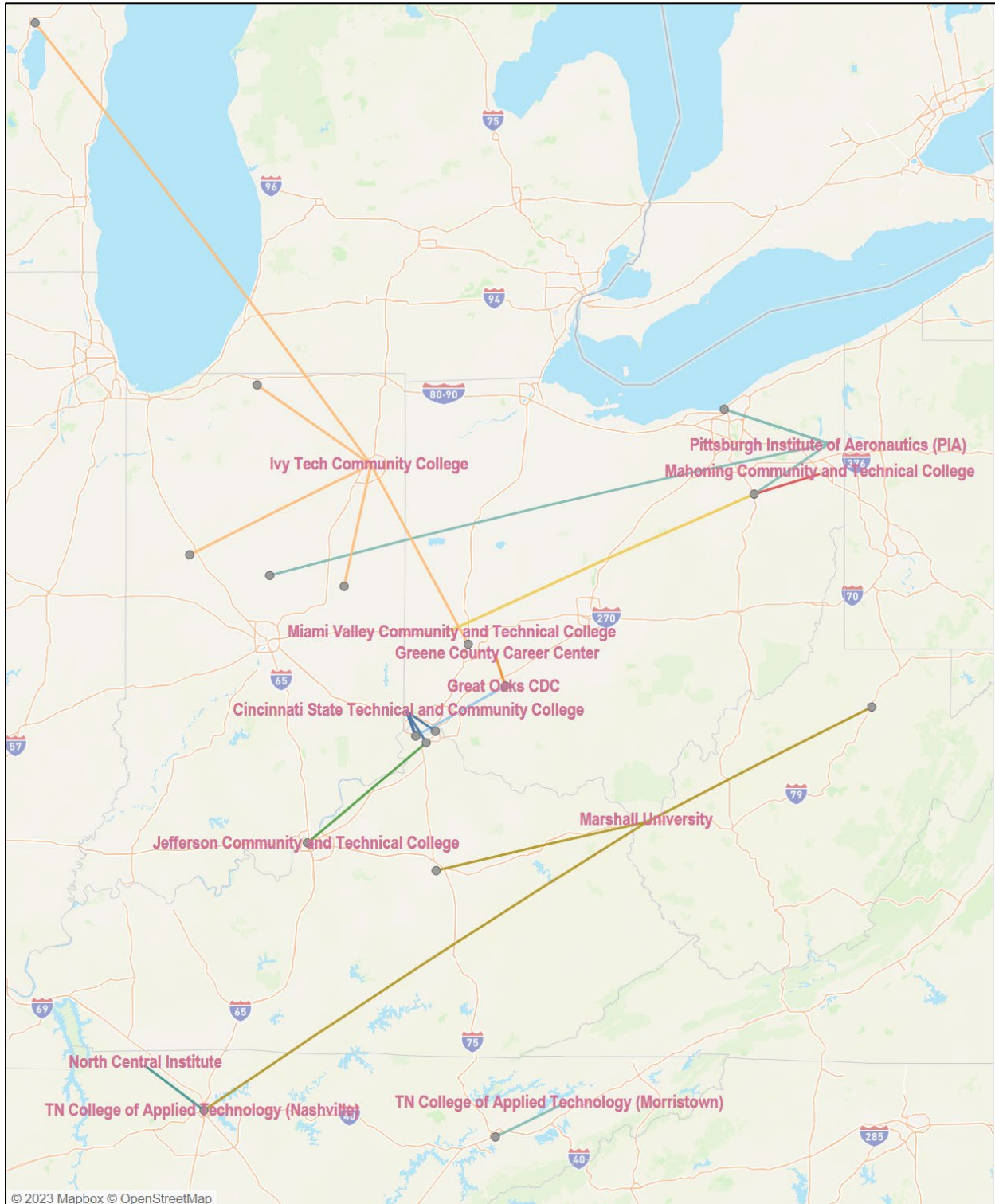


Figure 2.1 AMT School Location and Student Employment Location

Source: KTC AMT Program Survey, August 2023

Our survey validated and improved on the FAA-reported data about student enrollment, program capacity, graduation numbers, and career placement. Kentucky AMT programs are operating nearer to capacity than FAA data suggest. Currently, JCTC's program is operating at 100% capacity and will increase its capacity by 50 students in the spring semester of 2024; SCC's program is operating at 72% capacity and producing 65 certified students per year.

Chapter 3 Certified Technicians

The FAA maintains a list of all mechanics and repairmen who are certified and have a US residential address. The agency does not record if individuals are employed or considered active, and a person is only removed from the list upon reaching the age of 90, if they die, or if their certificate is revoked.⁴ Using these data, we will estimate the number of active, certified mechanics, using ATEC’s assumption that “...80 percent of the current mechanic population under age 65 is actively engaged as an aircraft mechanic.” (ATEC Pipeline Report, 2021, p. 6).

As of December 2022, the FAA Civil Airmen Statistics database listed 298,916 technicians in the US, which equates to a total *estimate* of 239,133 active and working technicians. The Kentucky Region had 43,909 total technicians, of which we estimate 35,127 were active. Table 3.1 summarizes data on certified technicians and estimated active technicians by location. Estimates are based on the physical address a technician submits upon certification, which may differ from their current address. Addresses are only updated once a technician provides updated information. As the FAA Airmen Database does not provide the age of the mechanics and repairmen listed in the database, the estimate of active technicians potentially includes individuals over the age of 65.

Table 3.1 Number of Estimated Active Technicians by Geographic Location (2022)

Location	Certified Technicians	Active Technicians (Estimated)
US	298,916	239,133
Kentucky Region	43,909	35,127
IL	7,444	5,955
IN	6,120	4,896
KY	3,513	2,810
MO	5,131	4,105
OH	7,700	6,160
TN	7,087	5,670
VA	5,492	4,394
WV	1,422	1,138

Source: FAA, Civil Airman Statistics (31 December 2022), plus Authors’ Calculations

Figure 3.1 (next page) maps the density of technicians as of May 2023 according to the FAA Airman Certification Database. Individuals may opt out of this dataset. *As a result, state-level numbers do not match totals from the Civil Airman Statistics data.* From 2017 through 2022, the number of active technicians increased 12% in the US. Kentucky added 472 technicians — a 20% increase.

⁴ The data reviewed and estimates created in this chapter are not used in the final demand analysis and conclusions, as the total certified technicians represented in the FAA, Airman Certification Database do accurately represent the population or match the officially published FAA totals in the Civil Airman Statistics.

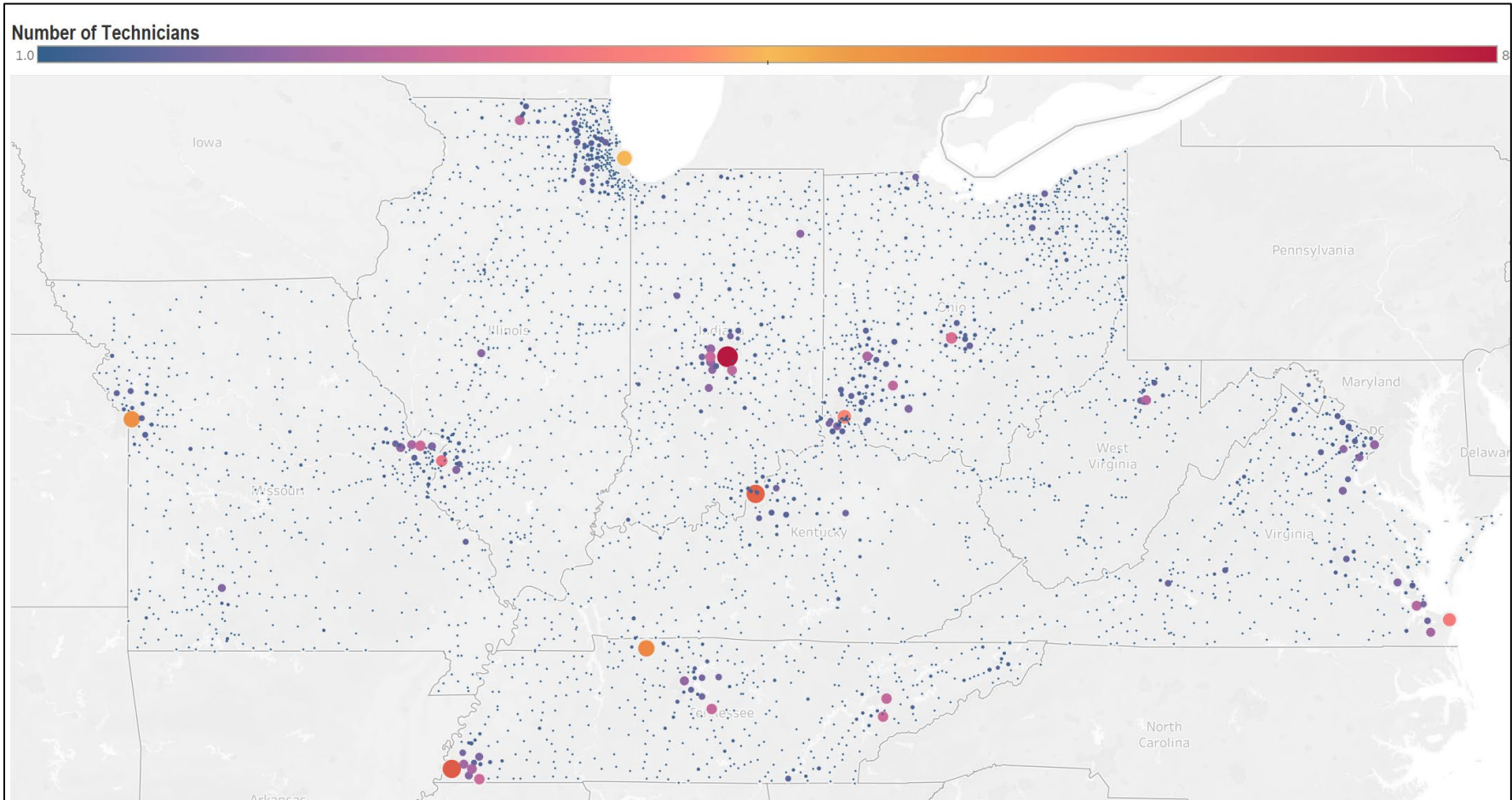


Figure 3.1 Number of AMT Technicians by Geographic Location of Certification Registry (Kentucky Region)

Source: FAA, Airman Certification Database, Accessed on 12 April 2023

Despite the economic slowdown during the pandemic in March 2020, the number of AMTs has grown steadily across time. Since 2017, the number of active technicians has increased by 12 percent in the U.S. Kentucky added 472 technicians between 2017 and 2022, which amounts to a 20% increase in the number of technicians in the state. Table 3.2 (below) lists the total number of active technicians in 2017 and 2022 and the percentage change between those two years for the nation, Kentucky, and its contiguous states. Across the entire panel, Kentucky has the greatest increase in active AMTs followed by 16.18% in West Virginia, 15.97% in Tennessee, and 14.13% in Virginia.

Table 3.2 Number of Active Technicians and Percentage Change between 2017 and 2022

State	Active Technicians (2017)	Active Technicians (2022)	Percentage Change Between 2017 and 2022
US	213,347	239,133	12.09%
Kentucky Region	31,273	35,127	12.33%
IL	5,489	5,955	8.50%
IN	4,406	4,896	11.13%
KY	2,338	2,810	20.23%
MO	3,823	4,105	7.37%
OH	5,500	6,160	12.00%
TN	4,889	5,670	15.97%
VA	3,850	4,394	14.13%
WV	979	1,138	16.18%

Sources: FAA, Civil Airman Statistics (2022), Authors' Calculations

This shows several trends: 1) the location of certification may correlate with the location of the school or certifying institution of the individual; 2) population centers are correlated with higher levels of AMTs; 3) AMT concentration is correlated with locations with higher concentrations of repair stations and airport related activities (passenger and cargo).

Chapter 4 AMT Employment Trends

This chapter analyzes AMT employment patterns at the national, regional, state, and metropolitan levels. We evaluated the number of people employed as AMTs, where they are employed, and industry of employment. Trends and statistics discussed here set the foundation for the demand analysis presented in Chapter 5.

4.1 Employment

The Bureau of Labor Statistics (BLS) reports that 149,000 workers are actively employed as “Aircraft Mechanics and Service Technicians” in the United States as of December 2022 in the Current Population Survey. This occupation peaked in 2011 and 2018 with 164,000 individuals employed in the United States. Figure 4.1 (below) displays the total number of employed Aircraft Mechanics and Service Technicians in the US between 2010 and 2022.

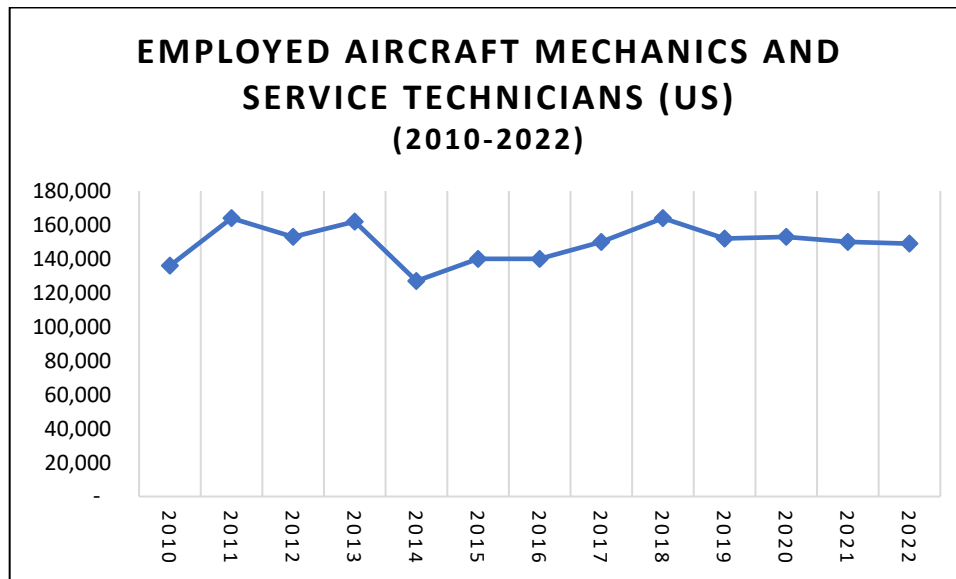


Figure 4.1 Employed - Aircraft Mechanics and Service Technicians – 16 years and over (not seasonally adjusted) (2010-2022)

Source: Bureau of Labor Statistics – Current Population Survey – Series LNU02038541 (2010-2022)

This total varies greatly state by state, with Texas, California, and Florida (respectively) employing the greatest number of AMTs within their borders. Again, this is to be expected with these states also being three of the most populous in the country, while also having the largest number of repair stations by volume (1,532 of the 3,696 total repair stations) (FAA Repair Station database, 2023). One interesting exception to this is New York, who the BLS reported only having 3,220 employed AMTs in 2022 but are ranked fourth in terms of population by state (20,114,745 in 2021) (U.S. Census). Figure 4.2 (next page) displays the total number of employed AMTs (2022) by state in the United States.

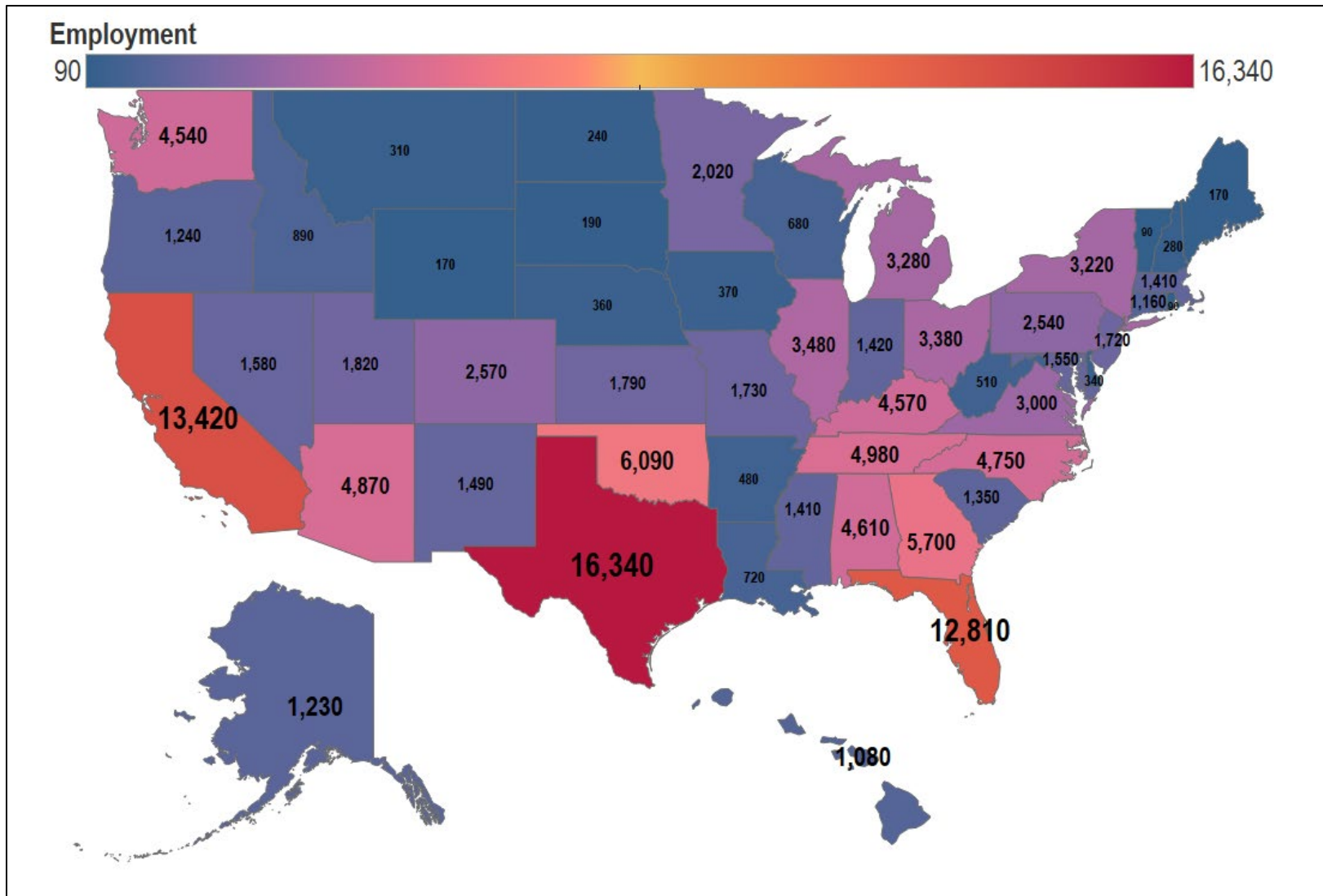


Figure 4.2 AMT Employment by State (2022)

Source: Bureau of Labor Statistics, Occupational Employment and Wage Statistics (2022)

4.1.1 Repair Station Employment

ATEC (2022) reported that 31% of AMT graduates work at repair stations, 17% at a regional airline, 14% at major passenger airlines, and 10% at major cargo airlines. The remaining 28% worked in the general aviation, manufacturing, business aviation, and emerging applications sectors. The FAA collects data on the number of certified technicians, non-certified technicians, and repairmen employed at repair stations by company and location (FAA Repair Stations database). In Kentucky and the surrounding states, 6,115 certified mechanics, 7,985 non-certified mechanics, and 2,051 repairmen worked at repair stations (2022).

Table 4.1 lists employment by state for certified mechanics, non-certified mechanics, and repairmen who are employed at repair stations. The table is sorted by number of certified mechanics (largest to smallest). In Kentucky and the surrounding states, the composition of certified mechanics, non-certified mechanics, and repairmen varies widely. Most employed mechanics in Kentucky are certified. But repair stations in Illinois and Ohio employ mostly non-certified technicians, indicating that certification is not necessarily a requirement to work as an AMT.

Table 4.1 Total Certified Mechanic, Non-Certified Mechanic, and Repairmen Employed at Repair Stations in Kentucky and Surrounding States (2022)

State	Certified Mechanics	Non-Certified Mechanics	Repairmen	Total Employed at Repair Stations	Number of Repair Stations
TN	1,366	550	182	2,098	57
IL	1,281	1,525	388	3,194	99
OH	1,187	3,350	772	5,309	130
IN	562	744	219	1,525	54
KY	484	275	129	888	47
WV	468	280	103	851	10
MO	431	654	184	1,269	57
VA	336	607	74	1,017	50

Source: FAA Repair Station database, Accessed 23 July 2023

Total employment at repair stations is only one component of this story. Another element is the exact location of the repair station and the influence of geographic and economic factors of the headquarters. Specifically, larger population centers with access to a commercial airport will have a greater propensity to attract more repair stations to that locus and simultaneously technicians to the area. Figure 4.3 (next page) shows the total number of certified mechanics at repair stations by county in Kentucky and the surrounding states. This map shows dramatic differences between states in terms of the total number of repair stations and the number of employed mechanics at these stations. States with a smaller overall population (KY & WV) have fewer repair stations and the stations that are located within their borders are concentrated to large population centers or a regional airport with a large industry presence (e.g., Pratt & Whitney in Bridgeport, WV). Strictly looking at the volume of repair stations, we see that Tennessee, Illinois, and Ohio, respectively, have the greatest number of repair stations and the largest number of employed mechanics at these stations.

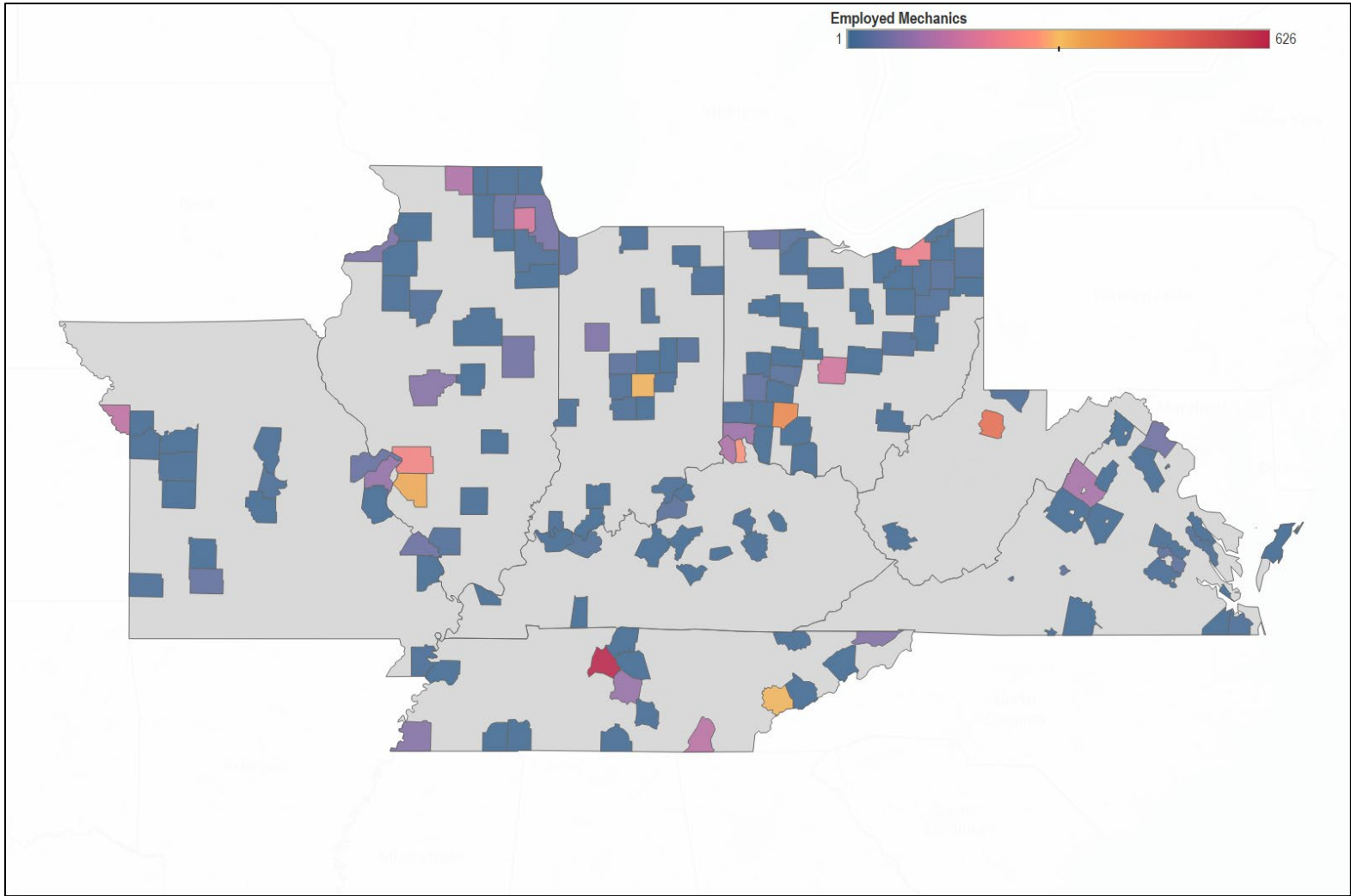


Figure 4.3 Number of Certified Mechanics Employed at Repair Stations by County in Kentucky and Surrounding States

Source: FAA Repair Station database, Accessed 23 July 2023

In terms of the employers themselves, the FAA Repair Station database includes the corporation and contact information for all repair stations located in the United States. Table 4.2 (below) consolidates this information to the top five largest repair stations by employment in Kentucky and the surrounding states; it also includes the company name, number of employed certified mechanics, total employees (certified, non-certified, and repairmen), and percentage of certified mechanics to total repair station employees. This helps to build the argument, state by state, where the demand for certified technicians may be. Looking strictly at the Kentucky repair stations listed, we see that all are above 90% in terms of the percentage of certified mechanics as repair station employees. This will be a strong draw to the area for students graduating and receiving their A&P certifications in Kentucky and surrounding states. The larger states identified above with a greater repair station presence seem to have a much broader range of certified versus non-certified technician employment. For example, Ohio ranges between 43% to 100% certified technician being employed at repair stations with only the five largest employers represented in the sample of the US data.

Table 4.2 Highest Number of Certified Mechanics by Repair Station Owners (Kentucky Region)

State	Repair Station Owner	Certified Mechanics	Total Employed	% Certified Mechanics
IL	GULFSTREAM AEROSPACE SERVICES CORPORATION	310	480	64.60%
	PREMIER AIR CENTER LLC	247	569	43.40%
	FLIGHT CHECK COMMERCIAL AVIATION SERVICES LLC	140	140	100.00%
	STANDARD AERO BUSINESS AVIATION SERVICES LLC	74	115	64.30%
	AAR AIRCRAFT SERVICES	71	311	22.80%
IN	AAR AIRCRAFT SERVICES INC	153	181	84.50%
	GENERAL ELECTRIC COMPANY	65	65	100.00%
	TEXTRON AVIATION INC	44	63	69.80%
	EAGLE CREEK AVIATION SERVICES LLC	41	68	60.30%
	ROLLS-ROYCE CORPORATION	40	47	85.10%
KY	F&E AIRCRAFT MAINTENANCE (MIAMI), LLC (FEAM)	222	226	98.20%
	WHEELS UP PRIVATE JETS LLC	63	67	94.00%
	G E ON WING SUPPORT INC	48	51	94.10%
	ENCOMPASSAIR LLC	40	40	100.00%
	AIRTEGRITY AVIATION LLC	20	20	100.00%
MO	AVIATION TECHNICAL SERVICES INC	73	278	26.30%
	ALTA AERO TECHNIC, LLC	68	156	43.60%
	CENTURION INVESTMENTS INC	41	75	54.70%
	PREMIER AIR CENTER LLC	39	106	36.80%
	CORPAIR SUPPLY CO INC	21	43	48.80%
OH	AIRBORNE MAINTENANCE AND ENGINEERING SERVICES INC	400	918	43.60%
	CONSTANT AVIATION LLC	175	321	54.50%
	NJS145 LLC	122	127	96.10%
	GENERAL ELECTRIC COMPANY	34	34	100.00%

State	Repair Station Owner	Certified Mechanics	Total Employed	% Certified Mechanics
	AIRTECH LLC	31	38	81.60%
TN	EMBRAER AIRCRAFT MAINTENANCE SERVICES LLC	562	628	89.50%
	STANDARD AERO ALLIANCE INC	286	298	96.00%
	WEST STAR AVIATION, LLC	136	265	51.30%
	BELL TEXTRON INC	62	199	31.20%
	CORPORATE FLIGHT MANAGEMENT INC	51	67	76.10%
VA	DYNAMIC AVIATION GROUP INC	119	284	41.90%
	SWISSPORT USA, INC	36	36	100.00%
	FREEDOM AVIATION INC	27	33	81.80%
	AERO INDUSTRIES INC	15	16	93.80%
	SUMMIT HELICOPTERS INC	15	20	75.00%
WV	MHI RJ AVIATION INC	215	366	58.70%
	PRATT AND WHITNEY ENGINE SERVICES INC	149	290	51.40%
	PRATT AND WHITNEY ENGINE SERVICES INC	59	59	100.00%
	ENGINE AND AIRFRAME SOLUTIONS WORLDWIDE LLC	14	15	93.30%
	N1, LLC	12	14	85.70%

Source: FAA Repair Station database, Accessed 23 July 2023

As we see from this dataset, repair stations are a vital component of the AMT employment fabric. Employing 31% of the nation’s AMTs, we can see that they also greatly influence the labor force in the Kentucky region. As airports such as CVG and SDF continue to grow, and companies like FEAM Aero broaden their regional presence, it would be safe to assume that these entities will continue to train and hire AMTs. The next section tackles employment growth projections for Kentucky, the surrounding states, and Metropolitan Statistical Areas (MSAs) within KY, along with the various elements that contribute to attracting new workers and retaining current employees in the state and region.

4.2 Employment Growth

BLS projects the “Aircraft and Avionics Equipment Mechanics and Technicians” occupation (SOC 49-3011) will grow by approximately 6% between 2021 and 2031 across the US. Each year will see an average of 13,100 AMT job openings. The Kentucky Center for Statistics (KYSTATS) estimates the number of AMTs in the state will grow from 2,634 to 3,021 between 2020 and 2030 (about 39 per year). However, the Occupational Employment and Wage Statistics (OEWS) metric collected and estimated by the BLS, shows that Kentucky has surpassed this 10-year projection, with 4,570 individuals employed as aircraft mechanics and service technicians statewide at the end of 2022. Figure 4.4 (next page) shows growth in employment between 2011 and 2022 for all North American Industry Classification System (NAICS) sectors in which AMTs are employed. A list of NAICS sectors included in the cross-industry calculations is located in Appendix B.

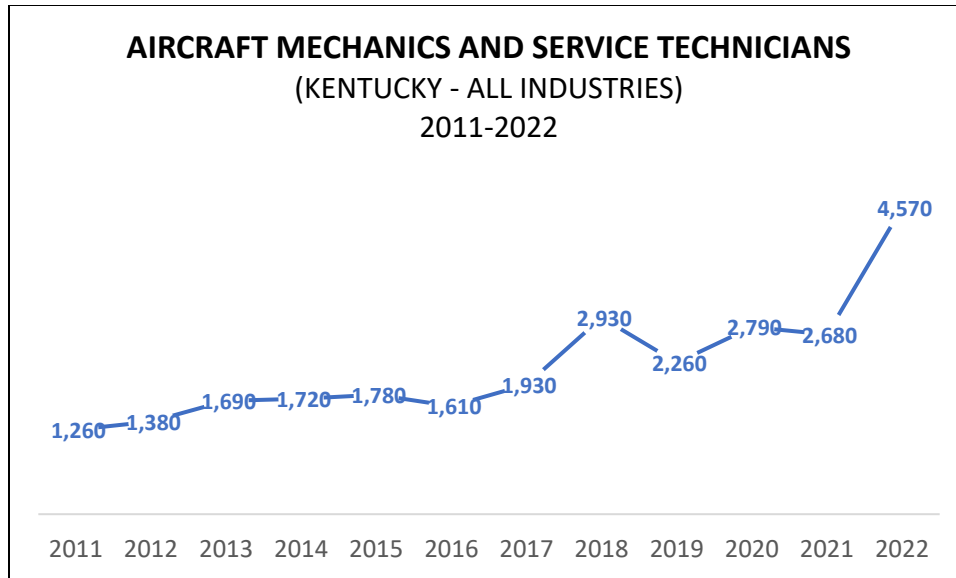


Figure 4.4 Number of Individuals Employed as Aircraft Mechanics and Service Technicians in Kentucky (SOC Code 49-3011) (2011-2022)

Source: BLS, Occupational Employment and Wage Statistics

The main driver of this jump in AMT employment seems to be due to an increase of employed AMTs in and around the Cincinnati-Northern Kentucky Metropolitan Statistical Area (MSA). Between 2021 and 2022, the number of employed AMTs in the Cincinnati MSA increased from 1,240 to 2,370, a 91% increase. This is a 41% increase of pre-pandemic employment levels in this area for AMTs, keeping in mind that this MSA also includes parts of Indiana and Ohio. Figure 4.5 (next page) displays the number of employed AMTs by each MSA in Kentucky.⁵ Kentucky has three (3) MSAs: the greater Cincinnati area (includes counties in Ohio, Indiana, and Kentucky), Louisville/Jefferson County (Kentucky and Indiana), and Lexington-Fayette County. In 2022, 4,170 AMTs were employed in these MSAs. As discussed above and shown in Figure 4.5, Cincinnati has increased the number of AMTs employed within the surrounding MSA by sixfold (2011 to 2022). Despite seeing a decrease in employment during the peak of the pandemic, all three MSAs have matched and surpassed their pre-pandemic employment numbers.

⁵ A Metropolitan Statistical Area is defined by the U.S. Census as an area that "...consists of one or more counties that contain a city of 50,000 or more inhabitants or contain a Census Bureau-defined urbanized area (UA) and have a total population of at least 100,000 (75,000 in New England)." (U.S. Census, Geographic Areas Reference Manual, "Metropolitan Areas: Classification of Metropolitan Areas," Retrieved from: <https://www2.census.gov/geo/pdfs/reference/GARM/Ch13GARM.pdf>).

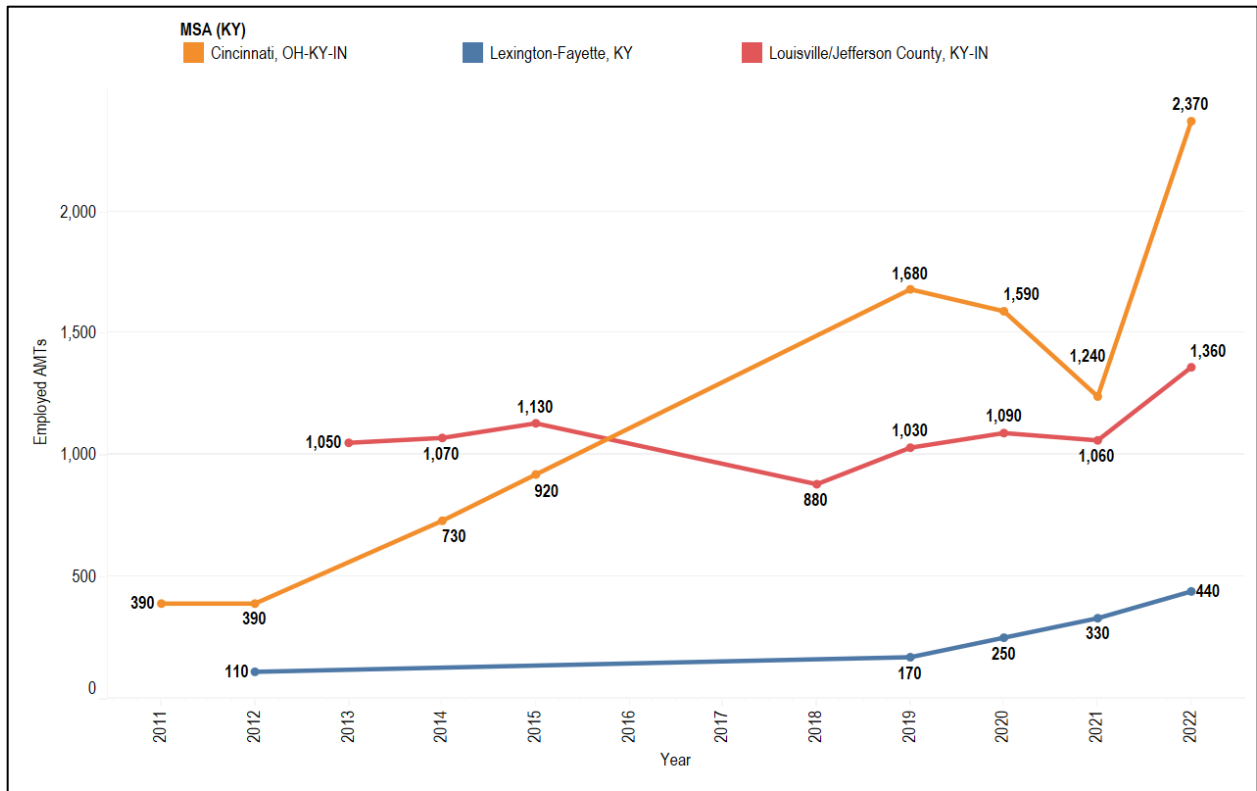


Figure 4.5 Number of Individuals Employed as Aircraft Mechanics and Service Technicians in Kentucky Metropolitan Statistical Areas (MSAs) (2011-2022)

Source: BLS, Occupational Employment and Wage Statistics

4.3 Location Quotient

While the number of active and employed technicians provides the raw numbers by state, region, and nation, it does not describe the concentration of AMTs relative to the general population. The location quotient is a ratio that compares the "...area concentration of occupational employment to the national average concentration" (Bureau of Labor Statistics); values greater than *one* show that a particular occupation or job has a larger share of employment within the designated area than the national average, and the larger the number the more concentrated the occupation. Conversely, if this number is less than one, the local area falls below the national average in terms of total share of employment for that particular occupation.

Figure 4.6 (next page) is a map of location quotients for Aircraft Mechanics and Service Technicians in Kentucky and the surrounding states. Interestingly, states like Illinois and Ohio have more AMTs within the count data, but Kentucky has the highest concentration of AMTs in the region (location quotient: 2.65). This shows that Kentucky is drawing more AMTs to the area than surrounding states. Tennessee also shows this trend with their location quotient (1.76). More than likely, Kentucky's gravitational pull is due largely to the UPS global center in Louisville and the Amazon hub at the Greater Cincinnati Northern Kentucky airport in Boone County; FedEx is currently expanding its presence in Tennessee with a world hub in Memphis, while simultaneously expanding their training center also located near Memphis.

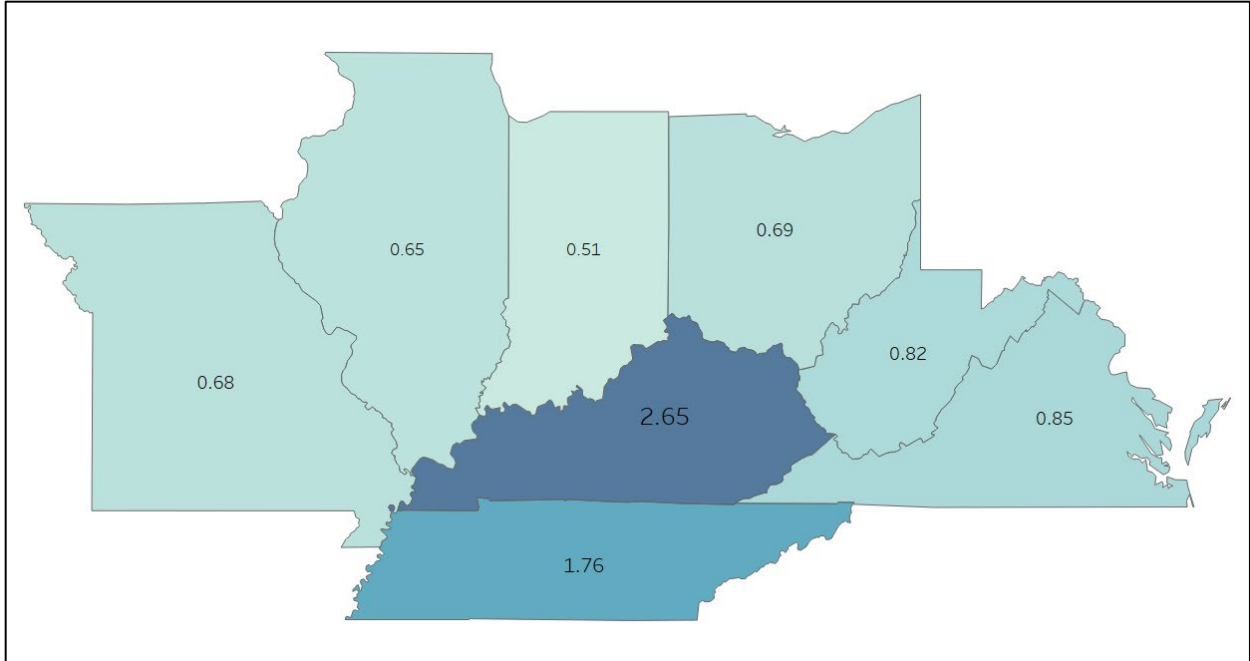


Figure 4.6 Location Quotient for AMTs in Kentucky and Contiguous States (2022)

Source: Bureau of Labor Statistics, U.S. Department of Labor, Occupational Employment and Wage Statistics

Since 2013, the location quotient for AMTs in Kentucky has, for the most part, remained above the national average. Figure 4.7 (below) displays the historical location quotients for AMTs in Kentucky from 2011 until 2022. Despite the economic downturn from the pandemic, the number of employed AMTs in Kentucky still greatly surpasses the national average, showing that this sector is currently experiencing high levels of growth.

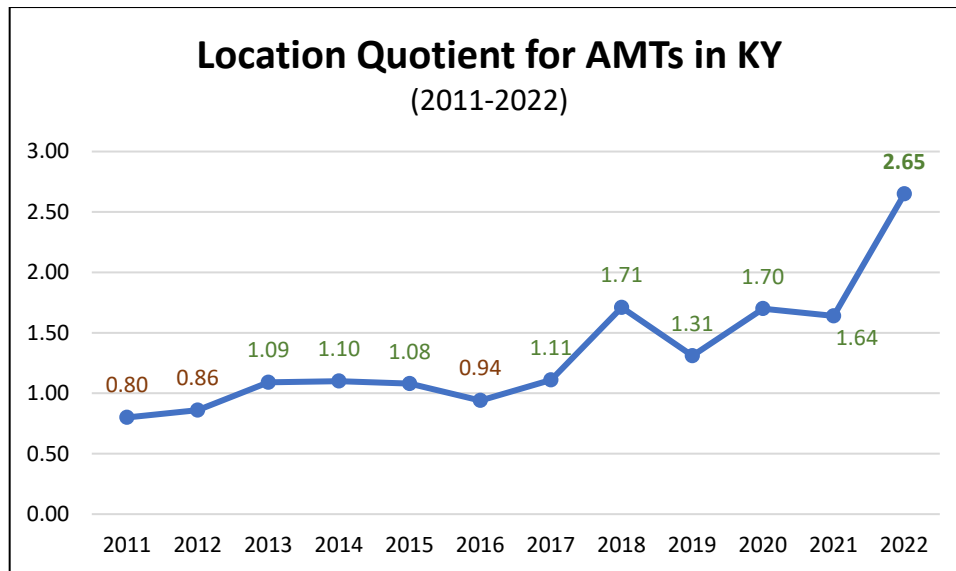


Figure 4.7 Location Quotients for AMTs in Kentucky (2011-2022)

Source: Bureau of Labor Statistics, U.S. Department of Labor, Occupational Employment and Wage Statistics

Looking at these numbers by MSA, the Cincinnati MSA leads the way with a location quotient of 2.47 in 2022, with Louisville/Jefferson County following closely behind at 2.33. The Lexington-Fayette MSA was also above one (1.79)

in 2022. Figure 4.8 (below) shows the location quotient across time for Kentucky’s three MSAs. Cincinnati saw the largest decline during the pandemic but also had the greatest rebound from the economic downturn. Based upon these trends, growth within in this employment sector is strong and seems that it will remain so in the future.

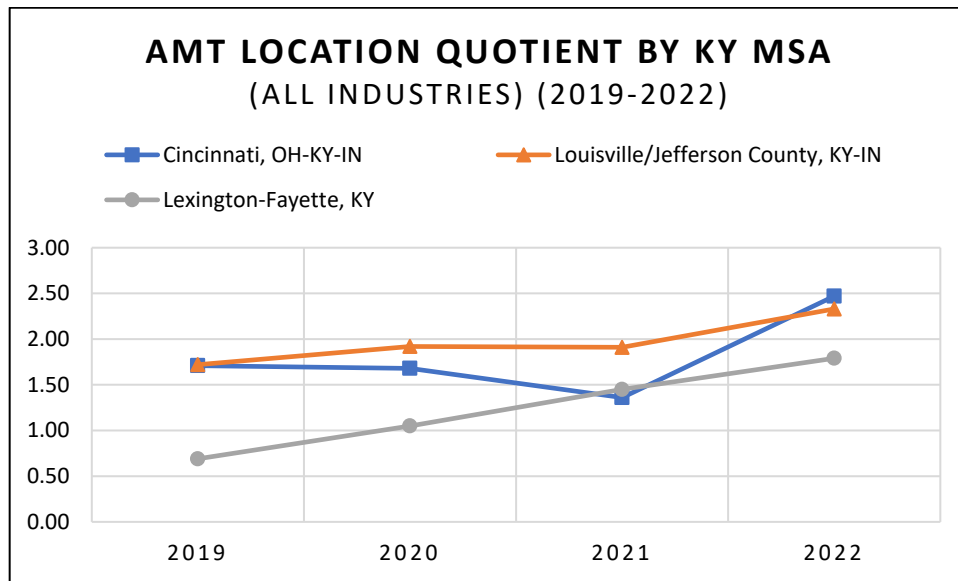


Figure 4.8 Location Quotients for AMTs in Kentucky MSAs (2019-2022)

Source: Bureau of Labor Statistics, U.S. Department of Labor, Occupational Employment and Wage Statistics

4.4 Annual Salaries

Another aspect that influences the growth of an industry is annual salary; this can also serve as a catalyst for growth within an occupational sector or industry. The national average salary for AMTs in 2022 was \$72,640; the median of this same cohort was \$70,010. It is important to take into consideration both measures of central tendency, as the median is the true central value of the data and the average, or arithmetic mean, may be heavily influenced by outliers on either end of the distribution. If the mean is higher than the median, this indicates that there may be extreme values within the higher end of distribution (*e.g.*, most salaries are around \$50,000 but three individuals earn above \$100,000 pulling the mean towards the higher end of the distribution), or that there is a large concentration of higher values within the distribution. The figure below shows the mean and median annual salary of AMTs in the US between 2011 and 2022. The major points of the interquartile range (10%, 25%, 75%, and 90%) are also included to show the full salary distribution across the years included.

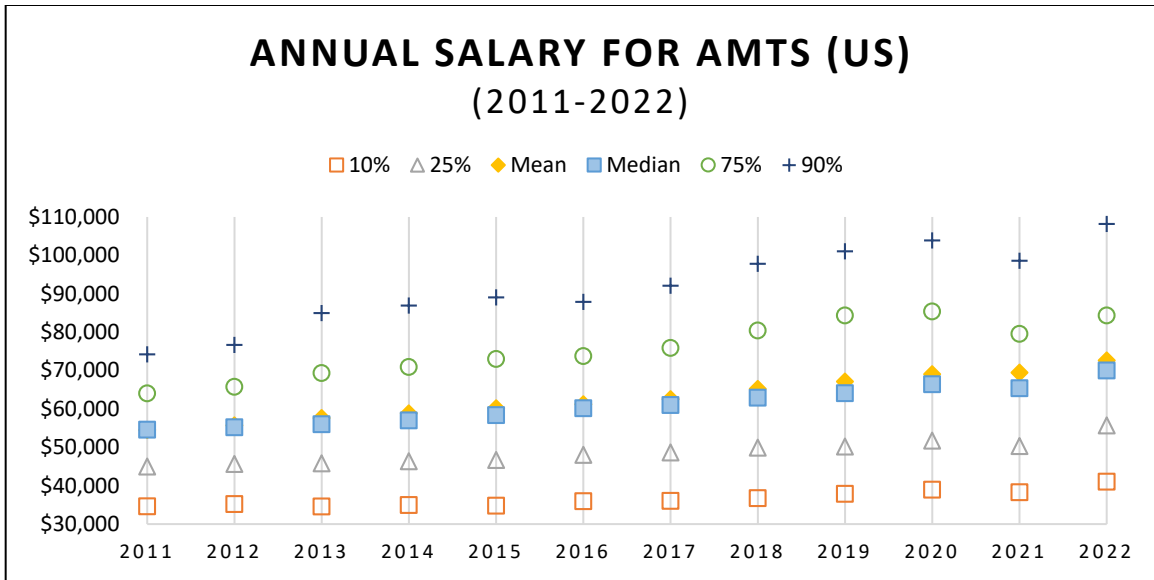


Figure 4.9 Mean and Median Annual Salary for AMTs in the US (2011-2022)

Source: Bureau of Labor Statistics, Occupational Employment and Wage Statistics

The figure above shows the expansion of the interquartile range for AMTs in the US, mainly in the ninetieth percent range. This tells us that the number of individuals earning higher annual salary in the top tiers is increasing, in that this value changed from \$74,210 to \$108,200 between 2011 and 2022. Median earnings increased by 28.2% across this panel of years; similarly, there was a 33% increase in mean earnings. The drop in annual earnings in 2021 can largely be explained by the pandemic layoffs; while we do not have specific wage data on this exodus (higher earners v. lower wage earners leaving), we do know that the number of employed AMTs dropped during that time.

Comparing the median salary of the US to Kentucky, we see that until 2018 Kentucky AMTs earned a higher annual salary than the US equivalent. Since that time, the median salary in Kentucky has dropped below that same measure in the US. Figure 4.10 (next page) displays the US Median Salary and the Kentucky Median and Mean salary for AMTs between 2011 and 2022.

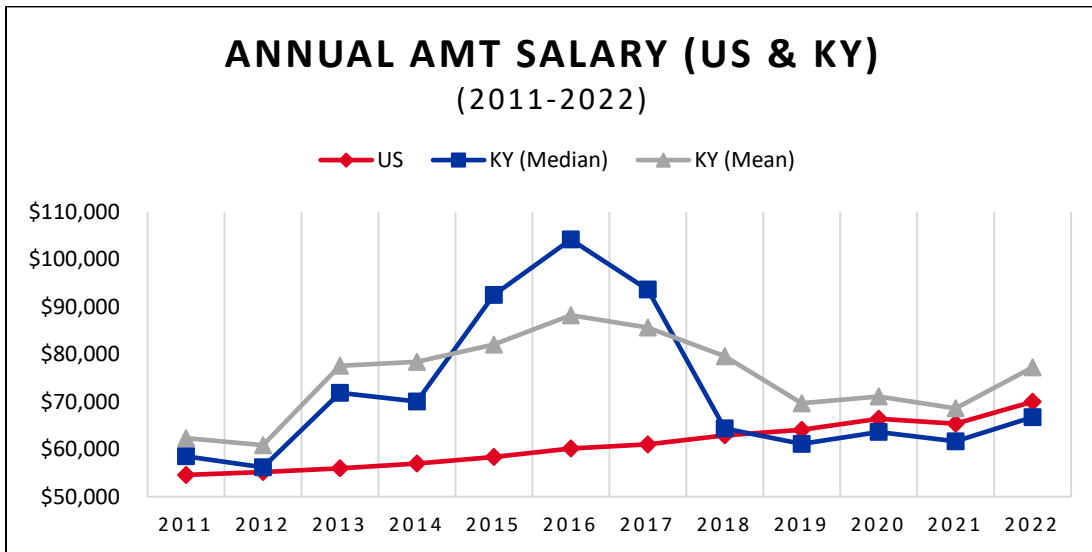


Figure 4.10 Annual Salary of AMTs in the United States (Median) and Kentucky (Mean and Median)

Source: Bureau of Labor Statistics, Occupational Employment and Wage Statistics

Overall, Kentucky has seen dramatic changes in the median annual salary of AMTs between 2011 and 2022. In 2016, median salary spiked to \$104,180 from \$58,520 in 2011, with a corresponding mean in that year of \$88,230. With both the median and mean rising across the panel and spiking within the same time horizon, it is important to see what factors could be driving these changes. Figure 4.11 (below) outlines the median annual salary for AMTs in Kentucky, which also includes the components of an interquartile range. Since the spike in the median wage in 2016, we see an interesting trend emerge in the surrounding data points. Median wage decreases between 2016 to 2022; however, the overall spread of the interquartile range broadens. In 2011, this range from 10% to 90% was \$39,560 to \$90,460; in 2022, this shifted to \$36,590 to \$136,200. This could be the shift in the age of workers, where younger workers are entering the market at a greater rate; older workers may also be earning higher wages over time. Similarly, median wage increased over time. We will discuss the impact of worker age in later sections.

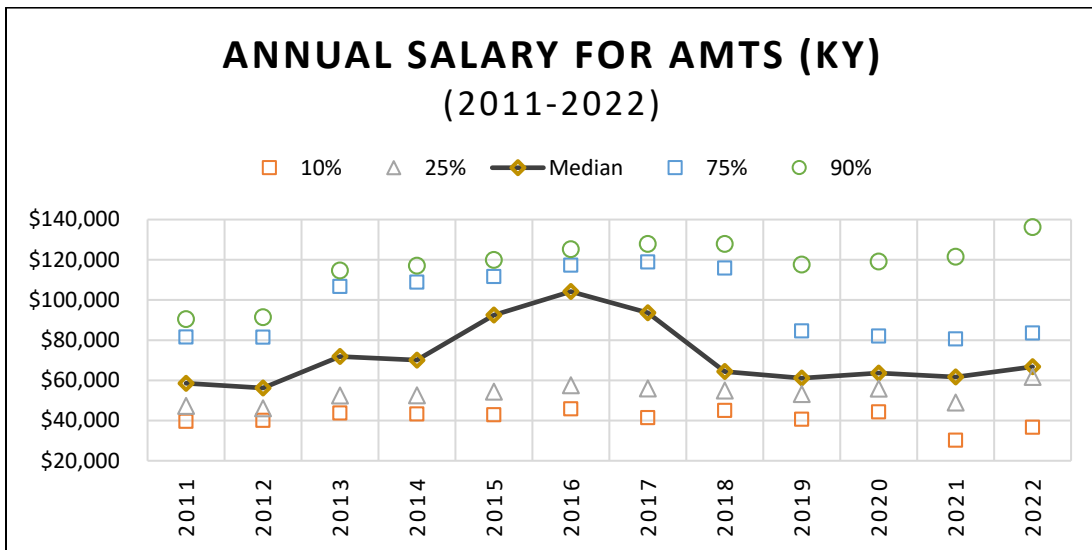


Figure 4.11 Median Annual Salary for AMTs in the Kentucky (including interquartile range) (2011-2022)

Source: Bureau of Labor Statistics, Occupational Employment and Wage Statistics

The COVID-19 pandemic initially brought a widespread economic slowdown. However, this was followed by a quick rebound. As a result, in most geographic areas wages increased. Table 4.3 presents AMT median salary data for the US and the Kentucky Region in 2018 and 2022 along with the percentage change. Although the median salary at the national level increased 11.3%, Kentucky AMTs saw a smaller increase in median salary of 3.7%.

Table 4.3 Percentage Change in AMT Median Salary by State between 2018 and 2022

State	2018	2022	% Change
TN	\$ 57,510	\$ 78,710	36.9%
MO	\$ 60,970	\$ 77,600	27.3%
IN	\$ 47,120	\$ 59,720	26.7%
OH	\$ 59,670	\$ 70,450	18.1%
IL	\$ 63,970	\$ 73,420	14.8%
US	\$ 62,920	\$ 70,010	11.3%
VA	\$ 66,710	\$ 71,940	7.8%
KY	\$ 64,380	\$ 66,760	3.7%
WV	\$ 56,740	\$ 58,520	3.1%

Source: Bureau of Labor Statistics, Occupational Employment and Wage Statistics

As one would expect, salaries for AMTs vary across geographies. The data are not as complete at this geographic level, but since 2018, the data are available for the three major MSAs in Kentucky (Figure 4.12, next page). Significant declines in salaries from 2011 to 2012 are likely attributable to Delta Air Lines cutting back operations at CVG (the airline’s hub was not formally shuttered until 2017). A number of new airlines have entered CVG over the past 10 years (*e.g.*, Allegiant, Frontier, Southwest) while some legacy carriers have expanded their operations considerably (*e.g.*, American). Buoyed by its location, DHL, Amazon, FEAM Aero, and other firms have invested in CVG, resulting in the hiring of both certified and non-certified AMTs. Data for the Louisville MSA are not continuous, but several trends are evident. Median wages from 2013 through 2015 at SDF likely drove up the statewide median salary. Overall, median salaries of AMTs fell between 2018 and 2019 and have gradually increased in the 3 MSAs since.

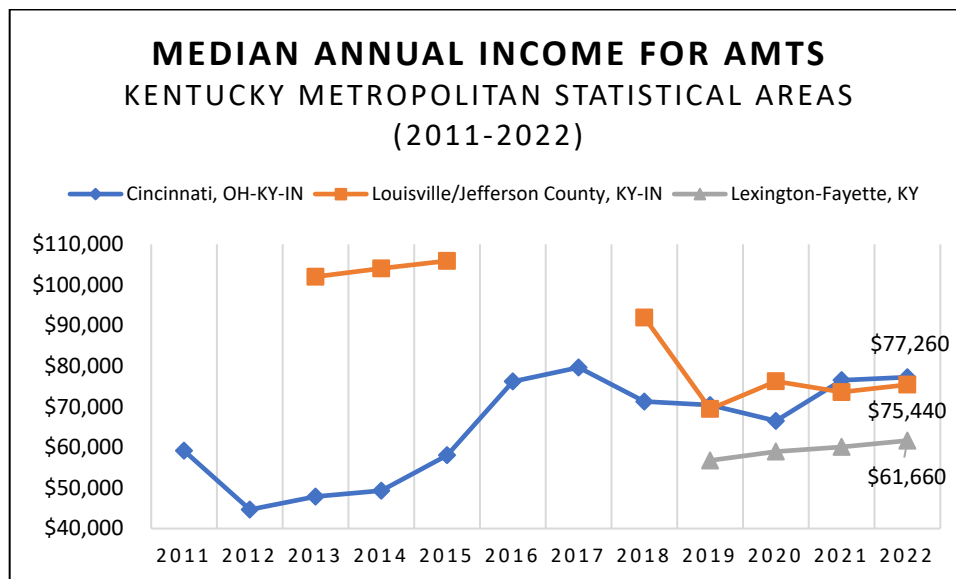


Figure 4.12 Median Annual Income for AMTs in Kentucky Metropolitan Statistical Areas (2011-2022)

Source: Bureau of Labor Statistics, Occupational Employment and Wage Statistics

Overall, wages and salaries of AMTs have increased in Kentucky and the surrounding states between 2011 and 2022. This shows us that this component of the AMT job market is strong.

4.5 Industry Sector

Another aspect of employment is the industry sector, as sectors vary in terms of the number of employees and the wages they earn. The North American Industry Classification System (NAICS) is the classification system maintained by the US Census and is “...the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.”⁶ Industries are first classified by a 2-digit sector (15 total options); nested within these 2-digit sectors are specific industries. The codes go up to six digits. For example, NAICS Sectors 48-49 include all “Transportation and Warehousing” sectors; within this main category are specific industries, such as Scheduled Passenger Air Transportation (481111), Short Line Railroad (482112), Air Traffic Control (488111), etc. Using these sectors, we can see which industries employ more AMTs and how this varies between the US and Kentucky.

The BLS publishes employment by NAICS sector for all occupation codes at the national level. This allows us to see in which NAICS industries AMTs are currently employed. Table 4.4 (below) displays this information for 2022. AMTs are primarily employed in the Transportation and Warehousing sector and the Manufacturing sector across the US, totaling approximately 77.26% of AMTs. AMT employment details for these two sectors (Transportation and Warehousing; Manufacturing) and the subsequent subsectors in the United States are included in Appendices C and D.

Table 4.4 Employed AMTs by 2-Digit NAICS Sector in the US (2022)

NAICS Sectors	Employment ⁷	Proportion (%)
Agriculture, Forestry, Fishing and Hunting (11 to 12)	150	0.11%
Mining (21 to 22)	170	0.13%
Construction (23 to 24)	160	0.12%
Manufacturing (31 to 34)	22,250	16.60%
Wholesale Trade (42 to 43)	1,030	0.77%
Retail Trade (44 to 46)	130	0.10%
Transportation and Warehousing (48 to 49)	81,330	60.66%
Real Estate and Rental and Leasing (53 to 54)	180	0.13%
Professional, Scientific, and Technical Services (54 to 55)	4,610	3.44%
Management of Companies and Enterprises (55 to 56)	930	0.69%
Educational Services (61 to 62)	1,730	1.29%
Health Care and Social Assistance (62 to 63)	2,290	1.71%
Arts, Entertainment, and Recreation (71 to 72)	70	0.05%
Other Services (except Federal, State, and Local (81 to 82)	450	0.34%
Federal, State, and Local Government (OEWS Designation) (99 to 100)	13,860	10.34%

⁶ North American Industry Classification System (NAICS): <https://www.census.gov/naics/>

⁷ BLS employment estimates reported in Table 4.4 do not sum to the total number of employed AMTs reported because “estimates for detailed occupations do not sum to the totals because the totals include occupations not shown separately. Estimates do not include self-employed workers.”

Source: Bureau of Labor Statistics – Occupational Employment and Wage Statistics – May 2022

Unfortunately, the BLS data does not provide industry level employment at the state level. To investigate the employment trends within NAICS sectors at the state level, we used the Integrated Public Use Microdata Series (IPUMS) USA data for 2014 to 2021. Data are based on sample research and totals are estimates derived using survey weights. Nonetheless, they provide an accurate snapshot of information at a state level. As of 2021, the top five industries employing AMTs in Kentucky were air transportation (37.7%), the US Army (21.9%), services incidental to transportation (16.6%), couriers and messengers (7.9%), national security and international affairs (5.5%), and aircraft and parts manufacturing (3.1%).⁸ Figure 4.13 shows employment trends for this period. From this we can see changes in the proportion by industry across time, specifically in 2014, most AMTs were employed within the “Services incidental to transportation” industry, which crosses references to NAICS code 488 – Support Activities for Transportation. This includes specific sub-industries such as airport operations, air traffic control, and other airport operations.

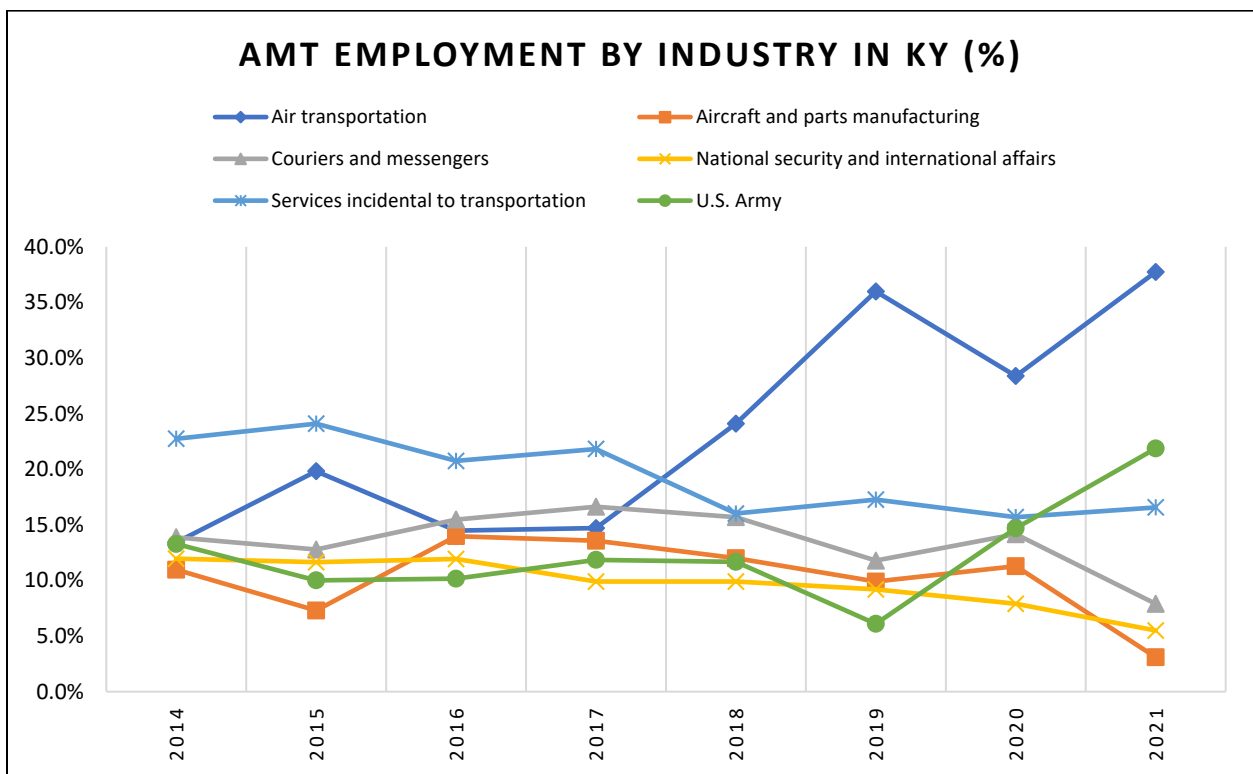


Figure 4.13 Estimated AMT Employment by Industry Sector in Kentucky (%) (2014-2021)

Source: IPUMS 2023⁹, Authors' calculations

4.6 Labor Force Participation

As stated previously, unemployment plays a role in determining the health of an occupation; conversely, a higher proportion of actively employed individuals also indicates a healthy occupational sector. Using IPUMS CPS data, we estimated the proportion of AMTs who are actively employed, in the military, have a job but are not working, are

⁸ IPUMS Industry Codes correlate to the Census industry codes, which are crosswalked to NAICS codes. (Retrieved from: <https://www2.census.gov/programs-surveys/cps/methodology/Industry%20Codes.pdf>)

⁹ NOTE: IPUMS industry codes changed in 2018; https://usa.ipums.org/usa-action/variables/IND#codes_section.

unemployed, or are not in Kentucky’s labor force to understand occupational trends across time. Figure 4.14 (next page) displays the percentage of AMTs in each employment group during the 2014-2021 period. Most were employed, either in the civilian or military sectors (78% in 2021); 16.3% of AMTs were classified as “not in the labor force”. Another 6% said they have a job but are not currently working. Keep in mind these percentages were estimated from data collected in 2021, when the pandemic was greatly impacting the Air Transportation industry, a major employment sector for AMTs.

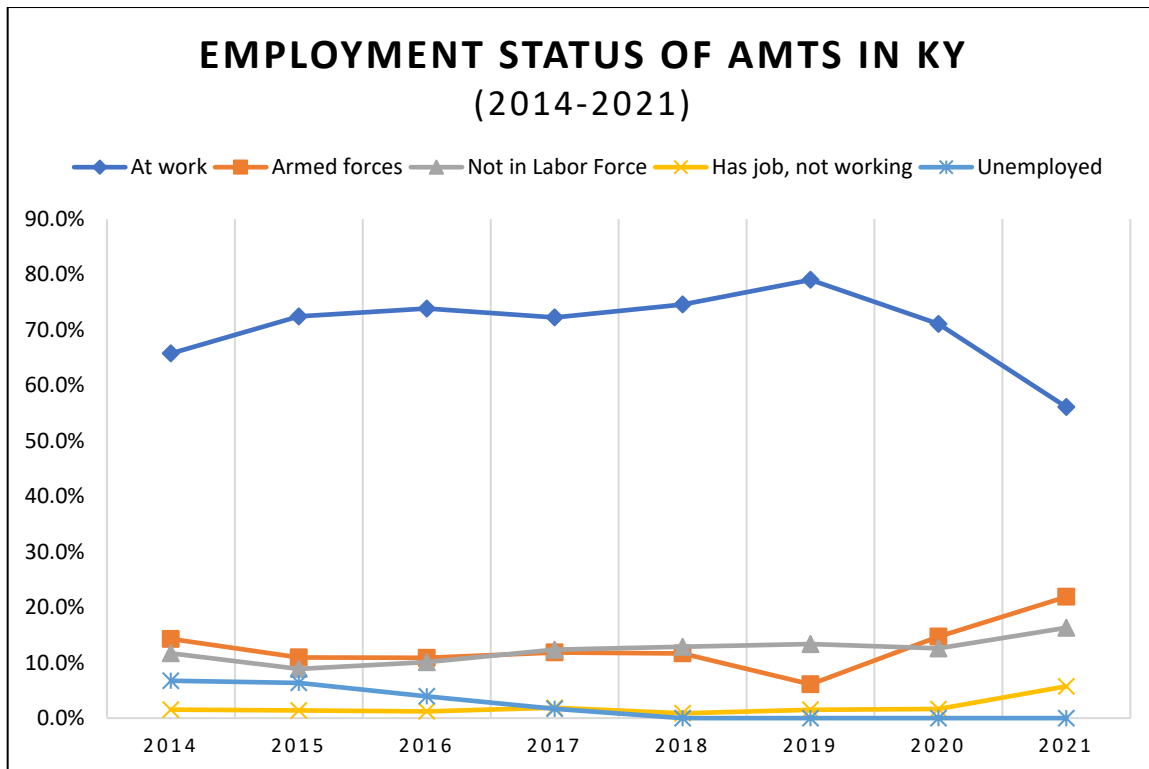


Figure 4.14 Employment Status of AMTs in Kentucky (%) (2014-2021)

Source: IPUMS 2023, Authors’ Calculations

In terms of industry, we know that the majority of AMTs are employed in an air transportation related sector both in Kentucky and the US as civilians or are working on a military base. These data are lacking a point of comparison to the BLS data, in that the IPUMS data do not yet include calendar year 2022. This was the transition point where we saw most sectors recovering from the economic downturn that began during the beginning of the pandemic. The rebound that we see in the BLS data from 2022, in terms of employed AMTs, will more than likely be reflected in the IPUMS data when available.

4.7 Age

As stated at the beginning of the employment section, the Bureau of Labor Statistics estimates that 149,000 Aviation Mechanics and Service Technicians are employed in the United States (2022). They also break this total into age distributions. Figure 4.15 displays the number of AMTs by the following age distributions: 16 to 19 years, 20 to 24 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years and 65 years and over. The BLS does not distinguish between certified and non-certified AMTs with this estimate. Nationally, AMTs aged 25 to 34 comprise the largest group of employed workers (estimated at 37,000 or 24.8% of AMTs), followed closely by those individuals whose ages range between 45 to 54 (34,000 or 22.8%) and 55 to 64 (32,000 or 21.5%). Interestingly, in 2022, there was a dip in the number of workers between the ages of 35 to 44. Most age distributions would show this to be one of the most populated age cohorts, as this falls within the prime working age group.

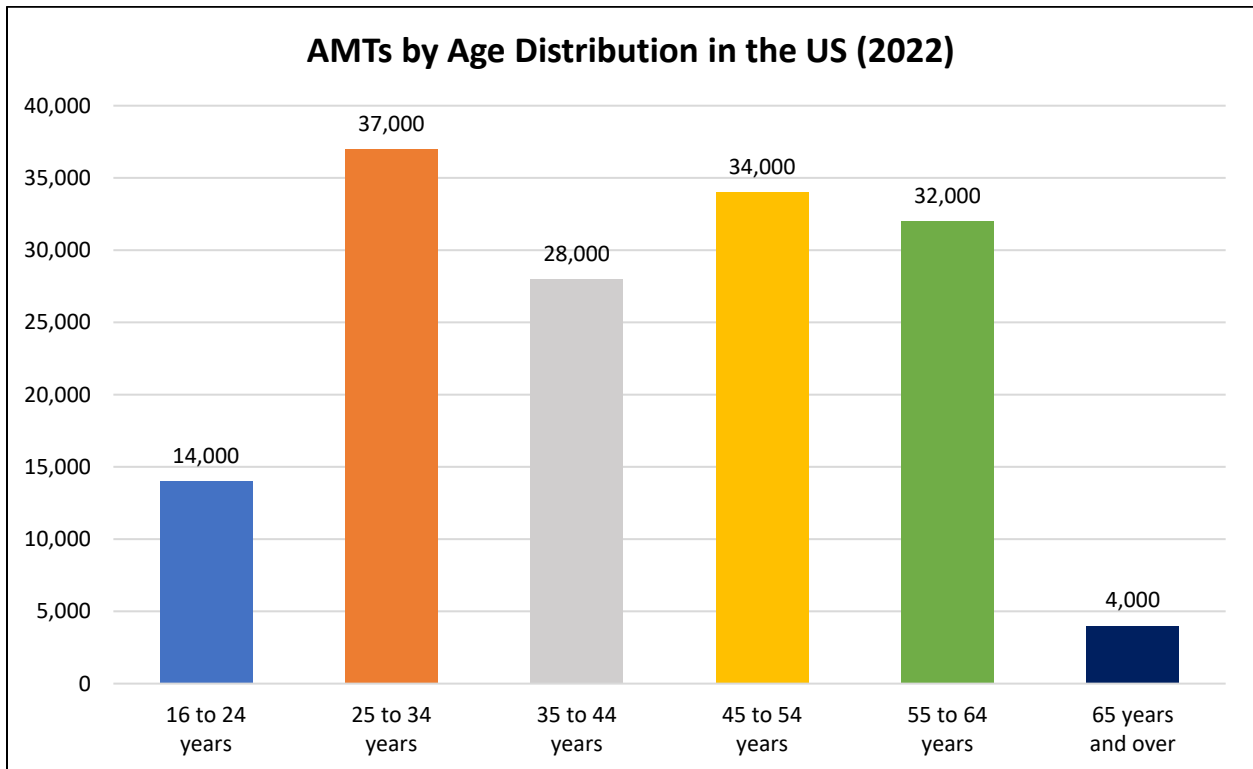


Figure 4.15 AMTs by Age Distribution (US) (2022)

Source: Bureau of Labor Statistics, Household Data and Annual Averages, Table 11b: Employed persons by detailed occupation and age. Retrieved from: <https://www.bls.gov/cps/cpsaat11b.htm>

Figure 4.16 (next page) displays the number of AMTs by age group working in the United States between 2014 and 2022. Two groups stand out — individuals of prime working age (25 to 54) and the oldest and youngest workers (65 and over; 16 to 24 years old, respectively). Prior to 2020, the largest proportion of workers were between the ages of 45 and 54. However, the largest age cohort in 2022 included individuals between the ages of 25 and 34. These categories display inverse trends. As numbers increase in one, numbers for the other decrease. The second cohort — the oldest and youngest workers — expanded between 2020 and 2022, with particularly marked increases in the 20 to 24 age group.

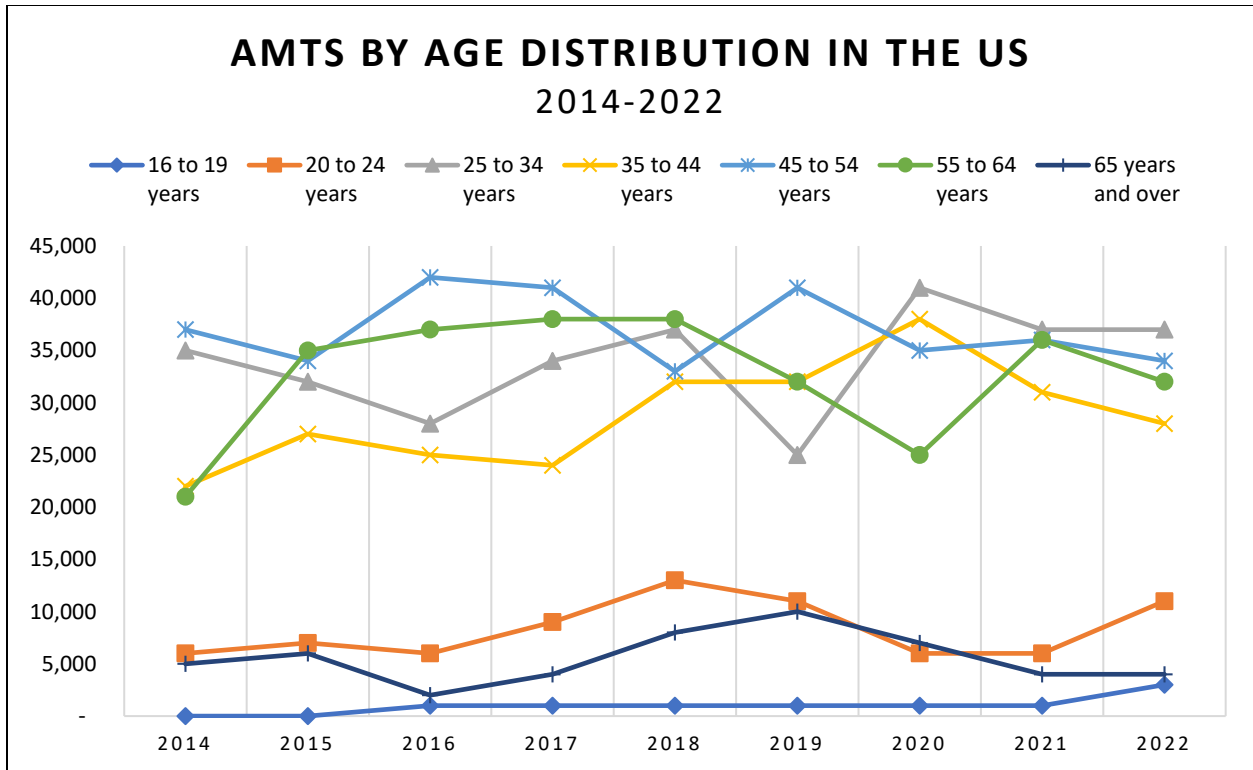


Figure 4.16 AMTs by Age Distribution in the US (2014-2022)

Source: Bureau of Labor Statistics, Household Data and Annual Averages, Table 11b: Employed persons by detailed occupation and age. Retrieved from: <https://www.bls.gov/cps/cpsaat11b.htm> (2014-2022)

At the national level, in 2022, the median age of AMTs was 43.5. Figure 4.17 shows the trend in median age between 2014 and 2022. The median age remained in the 40s, although with slight oscillations over time and a noticeable downward trend. The latter is potentially a result of the 25 to 34 age group adding workers.

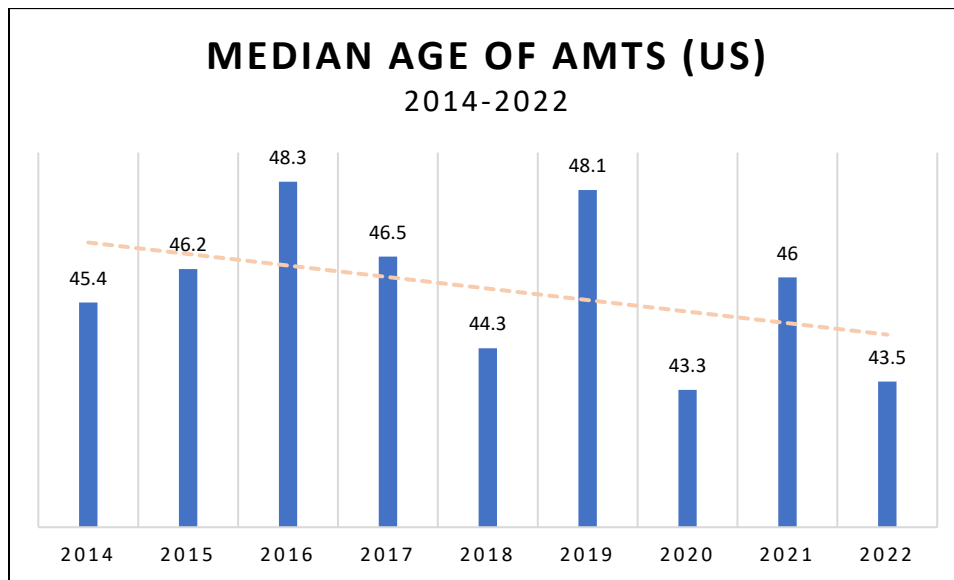


Figure 4.17 Median Age of AMTs in the US (2014-2022)

Source: Bureau of Labor Statistics, Household Data and Annual Averages, Table 11b: Employed persons by detailed occupation and age. Retrieved from: <https://www.bls.gov/cps/cpsaat11b.htm> (2014-2022)

Similar to the US numbers, Kentucky saw a drop in the number of AMTs in the 45 to 54 age cohort during the pandemic. However, this number rebounded in 2021. Unlike the national numbers, the number of AMTs working in the labor force between the ages of 16 to 24 increase by 38.9% between 2020 and 2021, followed by the 45 to 54 age cohort (20.3%), 25 to 34 age cohort (15.0%), and 65 to 84 age cohort (13.6%). The age cohort including individuals between the ages of 35 to 44 decreased by 27.2% between 2020 and 2021.

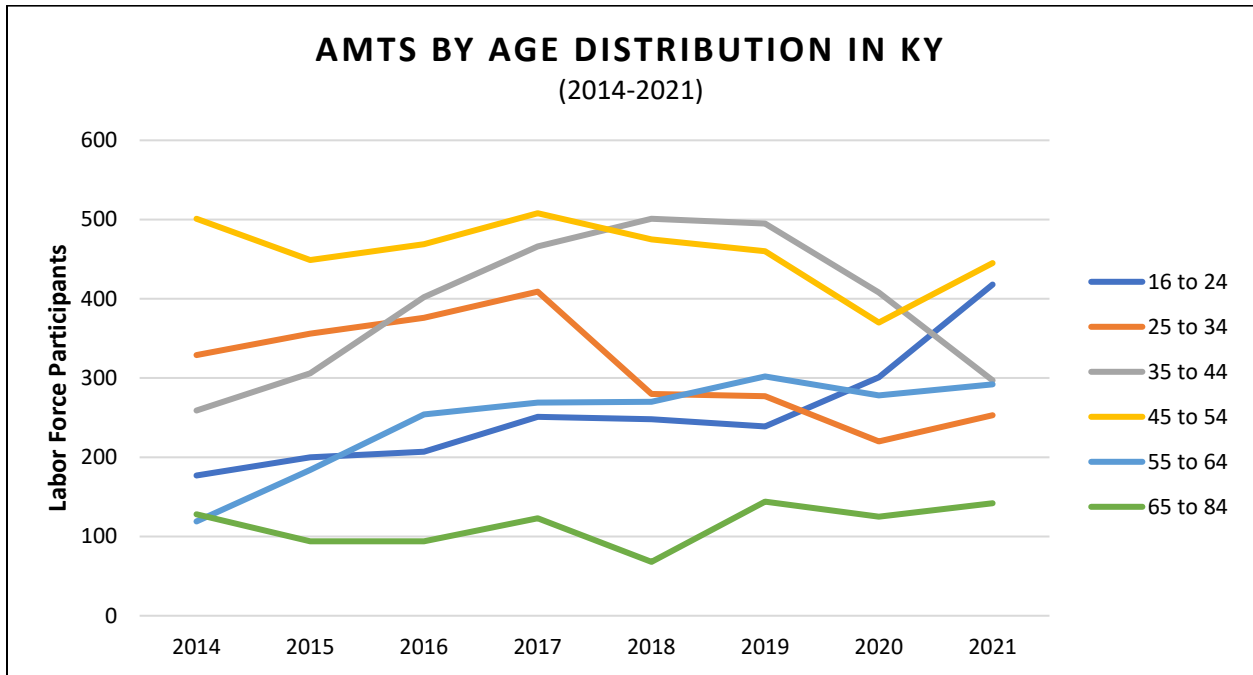


Figure 4.18 AMTs by Age Distribution in Kentucky (2014-2021)

Source: IPUMS 2023, Authors' Calculations

Overlapping the US and Kentucky data from the BLS and IPUMS (respectively), we can see the similarities and differences between the two geographic sectors in 2021 (Figure 4.19, next page). First, the younger cohort (16 to 24 years) comprises almost a quarter of the AMT labor force (22.6%) in Kentucky as of 2021, second to the 45 to 54 year cohort (24.1%). Additionally, it is interesting that the Kentucky AMT population has a higher proportion of 65 and over workers than the US in 2021. Working age adults are typically classified between the ages of 25 to 54, taking into account individuals in their early twenties are pursuing degrees in higher education at a greater rate and individuals 55 and over may be reducing their full-time work or pursuing early retirement. In Kentucky, working age adults (25 to 55 years of age) comprise 53.9% of employed AMTs; of the remaining 46.1% of AMTs, almost half fall within the youngest age cohort; in the US, 69% of AMTs fall within the working age adult cohort. This shows that Kentucky is producing and attracting younger individuals to work within the state.

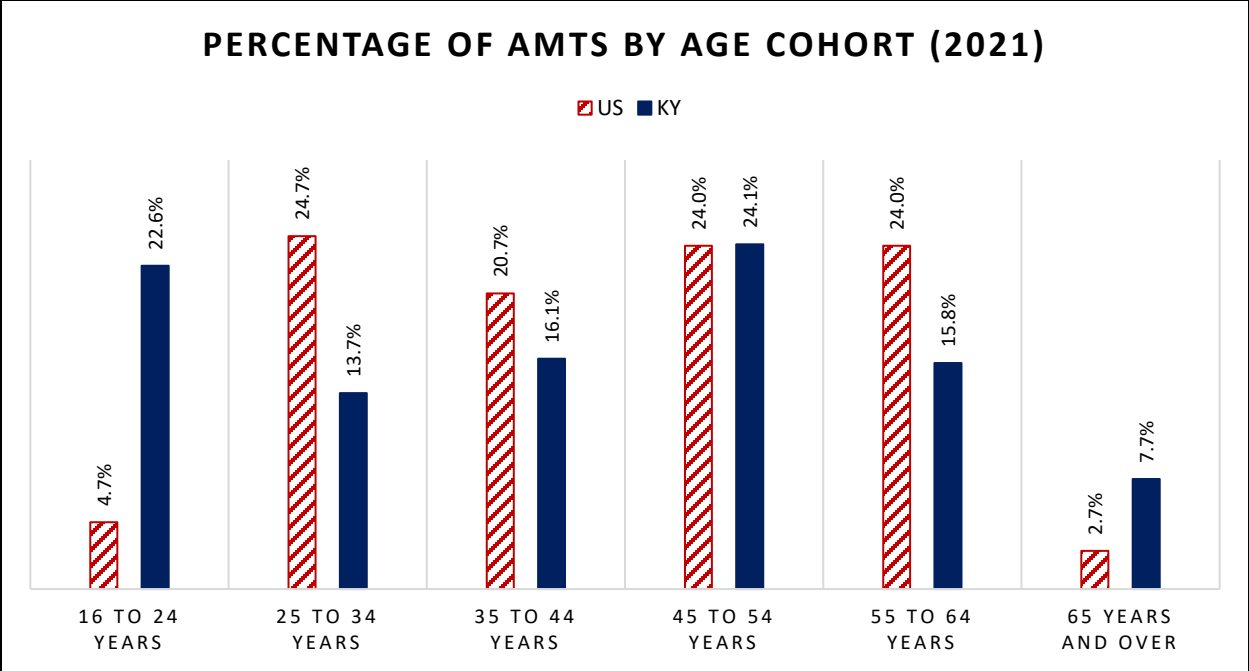


Figure 4.19 Percentage of Employed AMTs by Age Cohort: US v. Kentucky (2021)

Sources: US: BLS, Household Data and Annual Averages, Table 11b: Employed persons by detailed occupation and age. Retrieved from: <https://www.bls.gov/cps/cpsaat11b.htm> (2021) KY: IPUMS 2023, Authors' Calculations

4.8 Job Openings

An important component in understanding employment trends is the number of job openings within an industry. The Bureau of Labor Statistics (BLS) provides monthly updates of job openings with the Job Openings and Labor Turnover Survey (JOLTS). This program supplies information about job openings, recent hires, and employee separations by industry. Unfortunately, the industry specific information is only supplied at the national level and is only disaggregated to the 2-digit NAICS code (*e.g.*, 48-49: Transportation and Warehousing). State level data are aggregated to all job openings, hires, and separations. Figure 4.20 (next page) shows the monthly job openings and hires data for the Transportation, Warehousing, and Utilities industry (NAICS 48-49) in the United States between 2013 and 2023. The numbers presented are seasonally adjusted.

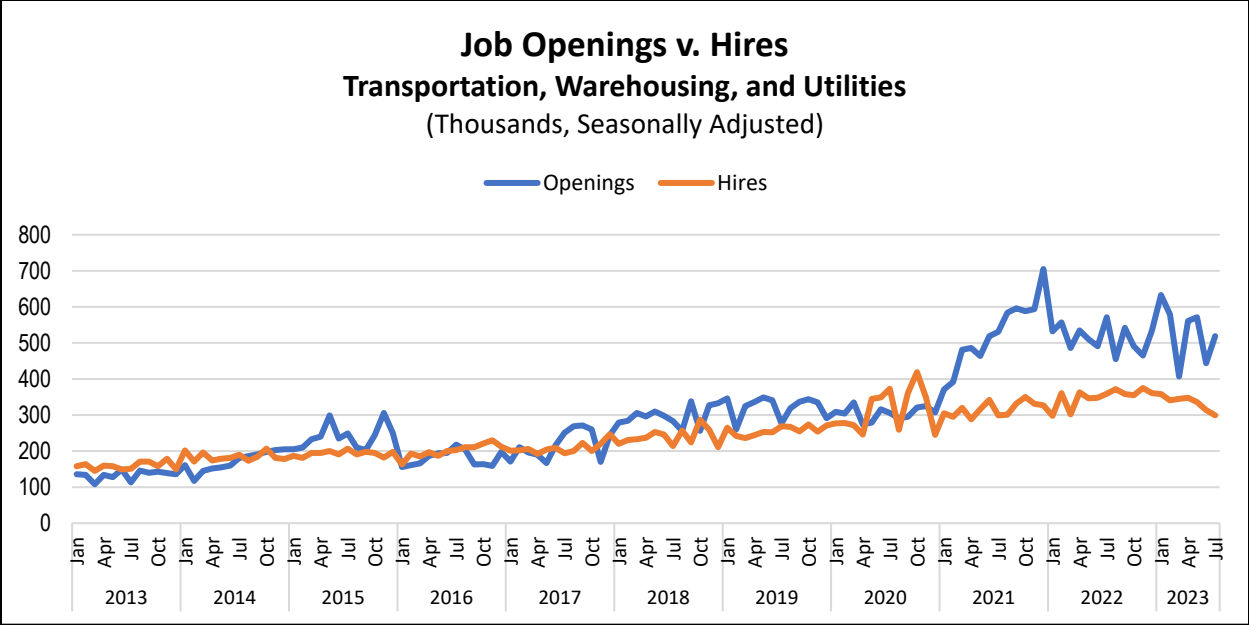


Figure 4.20 US Job Openings in Transportation, Warehousing, and Utilities (2013-2023, seasonally adjusted)

Source: U.S. Bureau of Labor Statistics, Job Openings: Transportation, warehousing, and utilities. Retrieved on 7 Sept 2023.

In the US, we can see a steady increase of both job openings and hires in transportation, warehousing, and utilities between January 2013 and July 2023. Since December 2020, job openings have outpaced hires, a trend that has continued to increase since that time. It is beginning to regulate but the most recent month (July 2023) shows that openings are once again increasing, and hires are decreasing. This indicates that workers may be exiting the job market and companies are reticent to post positions or hire replacements for the vacated position.

Looking at these trends across the entire industry is helpful when estimating the demand for a particular occupation. However, any trends specifically related to an occupation will be muted with the inclusion of other professions. To look at these trends in job openings and hires for AMTs, we look to another data source for the specific job postings for AMTs in Kentucky and the surrounding states between January 2018 and July 2023. Lightcast provides job market analytics for job postings by position and the company hiring. These data serve as a proxy for the data collected in the JOLTS survey and allows us to look specifically at companies hiring AMTs.

Figure 4.21 (next page) displays the total job postings for AMTs by state between 2018 and 2022. The 2023 data were not included in this graphic, as it only includes information between January and July of that year. From this, we can see that companies reduced the number of job postings during 2020 during the economic downturn associated with the pandemic. Specifically in Kentucky, the number of postings dropped by 37.5% between 2019 and 2020. Since that time, most states have recovered, in terms of solicitation for hiring AMTs on job sites. West Virginia has seen a decline in total job postings across the panel. Again, looking at Kentucky, we see that companies are posting significantly more job listings than pre-pandemic levels; 2022 saw a 40.4% increase over the 2019 number of postings in the state.

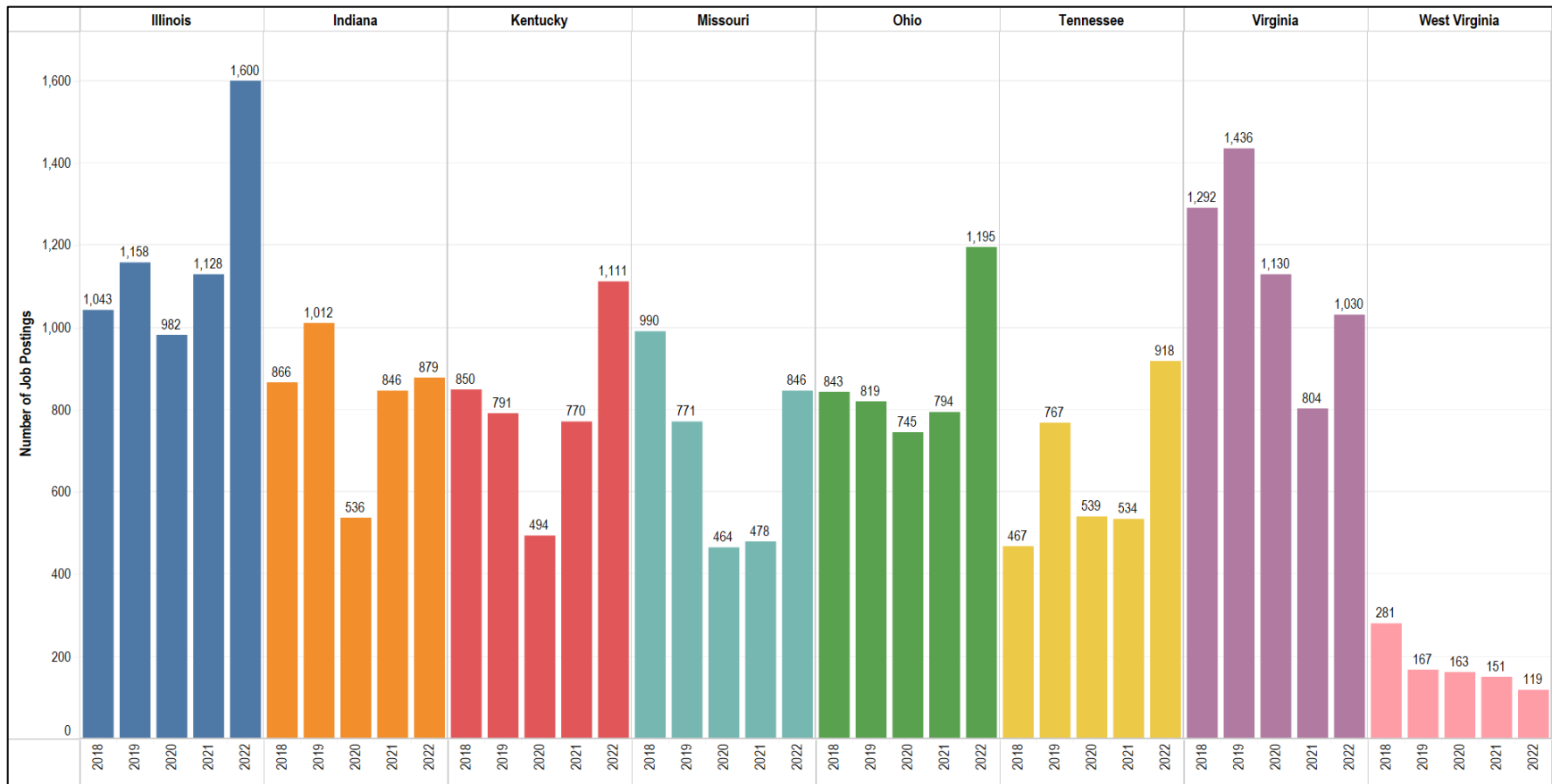


Figure 4.21 Number of Job Postings for AMTs in the Kentucky Region (2018-2022)

Source: Lightcast™, July 2023

As we have previously discussed, specific areas of states are loci for commerce. These areas have a gravitational pull for workers, as they offer greater opportunities because of the volume of workers needed by corporations in those locations. Following the patterns discussed in the Repair Station Employment section, we see that overall job postings for AMTs. Figure 4.22 (next page) displays a series of maps showing the total number of job postings for AMTs by city and year. The point on the map increases in size as the number of postings increases, while simultaneously following the color scale (blue shades representing a smaller number of postings while red represents a larger number). Indianapolis had the largest number of postings overall in 2019 with 621 unique AMT job postings. In terms of Kentucky cities, the number of postings has increased over time in the three MSAs. In fact, the northern Kentucky area has seen the greatest increase in postings within the state. This applies to cities such as Erlanger, Hebron, Elsmere, and Burlington.

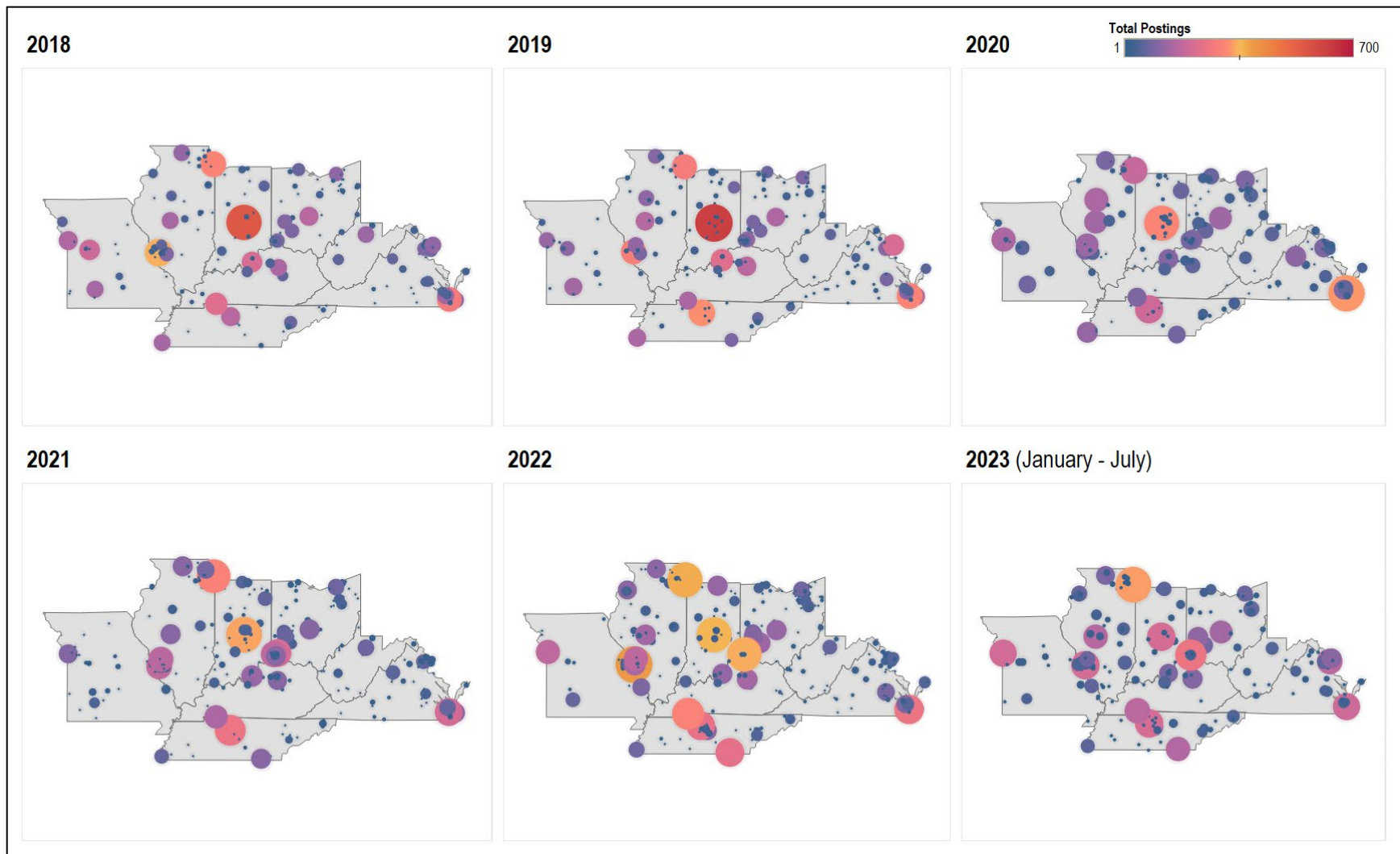


Figure 4.22 Number of Job Postings for AMTs by City and Year (2018-2023)

Source: Lightcast™, July 2023

4.9 Employment Trends Summary

Employment is a complex topic, influenced by a variety of factors including industry, geographic location, salary, and age. AMTs working in Kentucky tend to be younger than the national average, earn a slightly lower median annual salary compared to the rest of the US, and are more highly concentrated than the rest of the US. Looking at these components of employment allows us to forecast and predict future demands for these workers. The next section aligns the data from the AMT program information and employment data into a demand model, which forecasts the need for AMTs moving forward into the next decade in Kentucky.

Chapter 5 Demand for AMTs

Predicting the future demand for workers is a complex task and has several components that can be used as inputs. Much of this depends on the availability of data. In predicting the future demand for AMTs in the Kentucky job market and the job markets of surrounding states, we will aggregate the information presented in the previous two sections to the supply of workers (AMT program graduates and relocating workers) and the demand for those workers. In addition, we will present two forecast models and the theoretical basis for those models in predicting how many workers could potentially be employed as AMTs in Kentucky. Job market growth is cyclical and is heavily influenced by external economic factors, both micro- and macroeconomic. Using these two forecasting models will provide a more inclusive perspective on AMT job growth in the next five to ten years.

5.1 Supply

The supply of workers in this model is twofold: new graduates from AMT programs and relocating workers. Using the information provided by program administrators in the KTC AMT Program survey, we can estimate the number of graduates potentially being employed by Kentucky based companies. Kentucky's two AMT programs produce approximately 172 graduates per year, with 151 students of those students sitting for the A&P certification exams each year. Also pulling in the information for the two programs in southern Ohio that listed CVG/Northern Kentucky as a main source of employment for graduates, an additional 99 graduates would be added to the potential supply of workers, 75 of which would hold an AMT certification. The total number of graduates (2022-2023 academic year) from the Kentucky and Ohio based programs that could be employed in Kentucky is 273, 226 of which obtain the A&P certifications (Table 5.1).

Table 5.1 AMT Supply – New Graduates in Kentucky and Ohio (Current and Maximum Seats)

	School	Graduates	Certified	% Certified	Max Seats	% Increase
KY	JCTC	102	86	84%	200 ¹⁰	96%
	SCC	72	65	90%	100	38%
	TOTAL	174	151		300	72%
OH	CCTC	46	50	100%	200	335%
	Great Oaks CDC	53	25	47%	125	135%
	TOTAL	99	75		325	228%

Source: KTC AMT Program Survey, Authors' Calculations (August 2023)

Increasing these programs to capacity could dramatically impact the supply of workers. For Kentucky based programs, this would result in a 72% increase in the worker supply of AMTs to industry moving from 174 graduates to 300 graduates. In Ohio, if CCTC and Great Oaks CDC increased the number of graduates to equal the maximum number of seats, program output would increase by 228%. Adding up Kentucky and Ohio's totals, the total number of students produced at maximum program capacity would increase to 625 students.

In addition, the Kentucky Community and Technical College (KCTC) system is increasing capacity by opening additional AMT programs in the coming years. Maysville Community and Technical College (MCTC) recently launched an AMT program that enrolls 15 students annually. This program will operate at capacity each year and has a waitlist,

¹⁰ As of January 2024, JCTC will increase its program capacity to 200 seats.

according to Dr. Dana Calland, Chief Academic Officer at MCTC. With these additions, who will graduate in May of 2025, the total number of Kentucky graduates will increase to 189 graduates and potentially 166 newly certified A&Ps. AMT programs may also open in the near future in Madisonville, Bardstown, and Paducah, further adding AMTs to the Kentucky workforce.

5.1.1 Migrating Workers

Estimating the number of relocating workers becomes more difficult as data on this topic is more limited at the local level. However, IPUMS does collect survey information from respondents by asking where they lived one year prior to the date of the survey. This gives us a rough estimate of relocating workers to Kentucky. Looking only at occupation code 49-3011 (Aircraft Mechanics and Service Technicians) in 2021, 275 AMTs reported living in another state one year prior to survey implementation. Looking at these data across time (2014-2021), we see that there has been a gradual increase in the number of AMTs moving to Kentucky from other states (Table 5.2). Conversely, we can also see how many AMTs moved out of Kentucky, as they report Kentucky as the state of residence one year prior to the date of the survey. Prior to the pandemic years, the net value of these two numbers oscillated between a positive and negative value; however, in 2020, we see the net value jump to -254, showing that approximately 250 AMTs moved out of the state between 2019 and 2020. This value moderated a small amount in 2021 to -206, with the number of AMTs moving into Kentucky increasing at a greater rate than those leaving. Across the 8 years of data available, the average net migration in and out of Kentucky is -63 AMTs; this shows us that, on average, each year approximately 63 AMTs move out of Kentucky.

Table 5.2 Total Number of AMTs Moving into Kentucky by Year (2014-2021)

Year	Migrating Into KY	Migrating Out of KY	Net
2014	63	-130	-67
2015	146	-153	-7
2016	183	-133	50
2017	226	-275	-49
2018	318	-227	91
2019	298	-362	-64
2020	213	-467	-254
2021	275	-481	-206

Source: IPUMS 2023, Authors’ Calculations

Looking back at the number of AMTs moving to Kentucky, we can also examine these numbers by state of origin between 2014 and 2021 (Figure 5.1, next page). The composition of state of origin has changed across time. Since 2018, Ohio has become the largest source of migrating AMTs to Kentucky; prior to that, individuals previously living in Georgia comprised the greatest number of relocating workers. Florida has also become a source of AMTs moving to Kentucky; this could largely be explained by FEAM’s expanding presence at CVG, as their headquarters are currently located in Florida. In 2021, the breakdown of these proportions was estimated to be: Ohio - 40.7%, Florida - 28.0%, Massachusetts - 14.2%, Indiana - 7.6%, Missouri & Colorado - 4.7% (each).

The migration numbers in conjunction with the new graduates provide a supply side estimate of the number of AMTs added to the Kentucky workforce. This will be explored further in Section 5.3, where we will pull together the supply of workers with the demand for those workers.

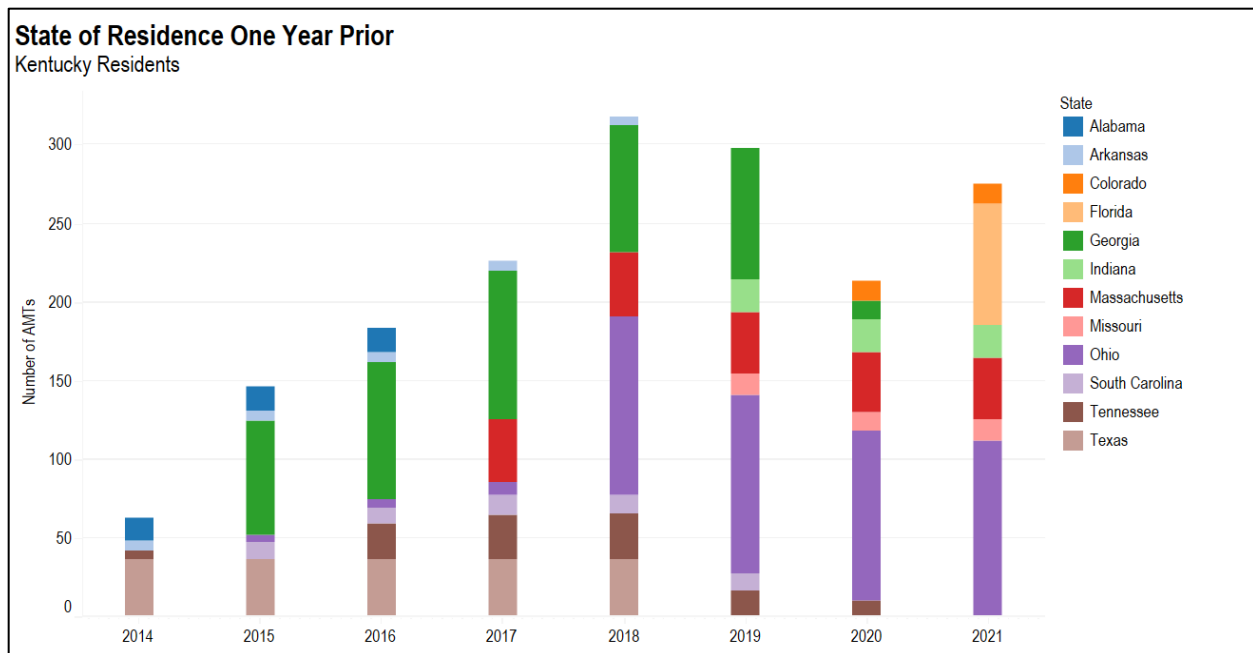


Figure 5.1 Total Number of AMTs Moving to Kentucky by Year and State (2014-2021)

Source: IPUMS 2023, Authors' Calculations

5.2 Demand

The Kentucky Chamber of Commerce projects CVG will need to fill 1,302 new AMT positions and 458 existing positions (1,760 total) between 2022 and 2027 — an average of 352 positions per year. CVG is a major influence on the AMT job market and factors significantly into demand projections for the next five years. To predict future demand, we developed two models, one linear and one logarithmic. The models are based on the historical number of employed AMTs in Kentucky across all industries, as reported by the BLS Occupational Employment and Wage Statistics Program.

5.2.1 Forecast: Linear Function

A linear function smooths out volatility in historical data with a moving average to produce future data points. While linear functions capture growth trajectories based on historical trends, they carry limitations. Most importantly, the demand for jobs does not vary over time, with the same number added each year. Linear functions simplify complex market dynamics; however, they provide a useful baseline for project future demand for AMTs (Figure 5.2, next page). The line of best fit, or linear regression forecast, in Figure 5.2 projects Kentucky will have 4,608 employed AMTs in 2027 (95% CI: 3,471 – 5,745) and 5,912 employed AMTs in 2033 (95% CI: 4,607 – 7,217). Based on this model, Kentucky will add 217 AMTs per year, totaling 1,342 workers over the next 10 years. This model is comparable to what the BLS and KYSTATS use in their 10-year prediction models.

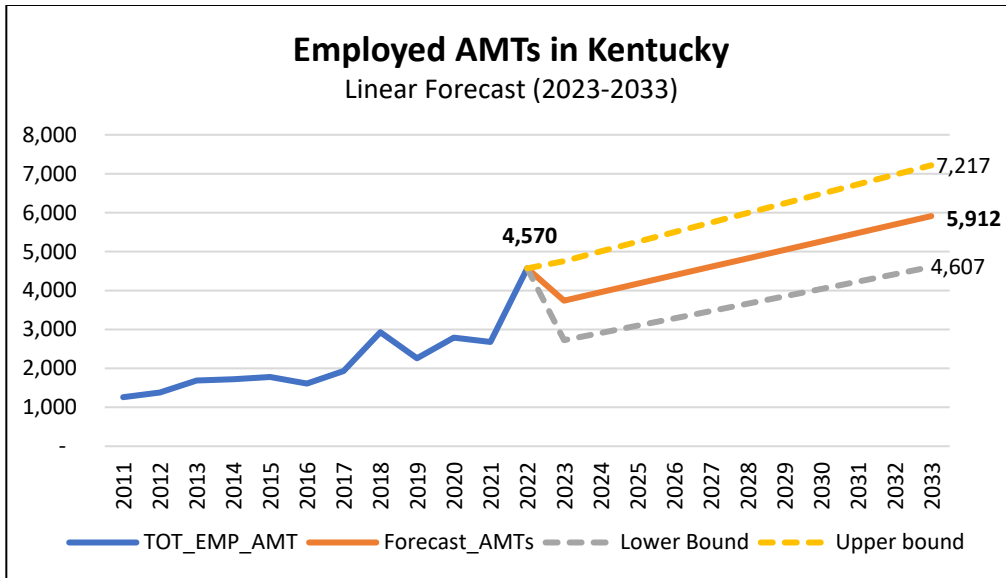


Figure 5.2 Linear Forecast of Employed AMTs in Kentucky (2011-2033)

Source: BLS OEWS Data (2011-2022), Authors' Calculations

5.2.2 Forecast: Logarithmic Function

Linear functions omit the influence of cyclicity or market volatility unless they incorporate a smoothing factor. Using a logarithmic function produces a smoothing effect and accounts for increased growth as the result of market conditions. A logarithmic function takes historical data as its starting point but front loads job growth in the early years of the model. That is, the rate of growth tapers as the market nears saturation. Leveraging historical data on AMT employment from the BLS, we developed the following function to predict employment growth:

$$y = 901.13\ln(x) + 715.74 \quad (\text{Eq. 2})$$

Projected values in Figures 5.3 and 5.4 were generated using Equation 2. Figure 5.3 (next page) displays historical AMT employment data in Kentucky and projects growth through 2033. Figure 5.4 indicates how many AMTs will be employed each year from 2023 through 2035, shifting the base year of the model to 2023. For the base year 2023, we averaged employment numbers from 2021 and 2022 to mitigate rehiring spikes at the tail end of the COVID-19 pandemic. This produced a model that is more comparable to the linear model and generates a more conservative estimate.

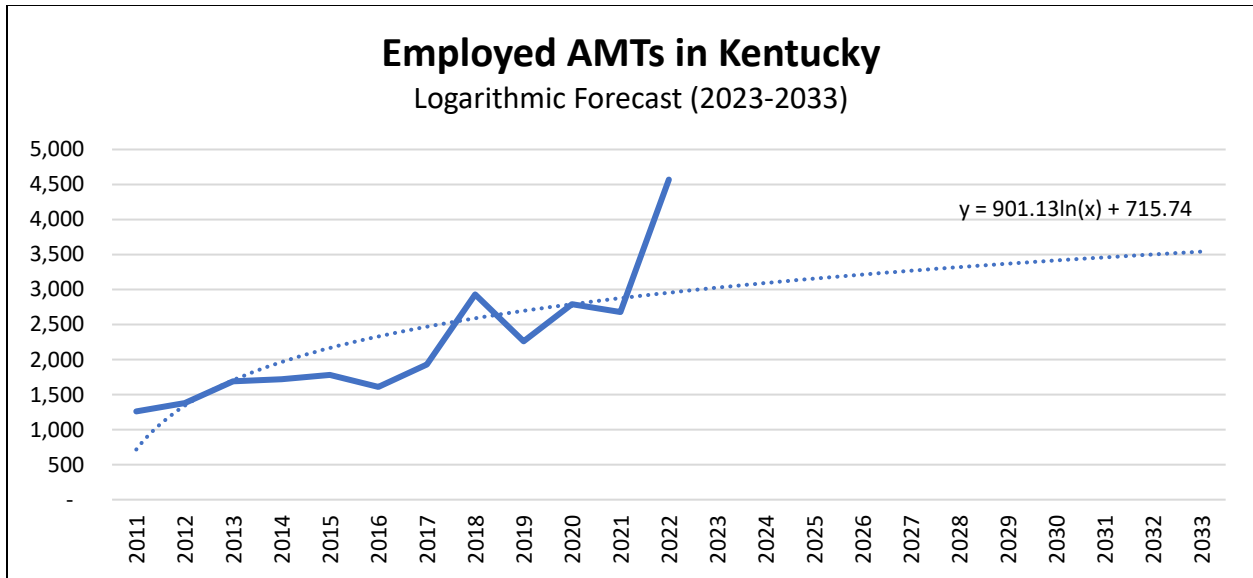


Figure 5.3 Logarithmic Forecast of Employed AMTs in Kentucky (2011-2033)

Sources: BLS OEWS (2022), Authors' Calculations

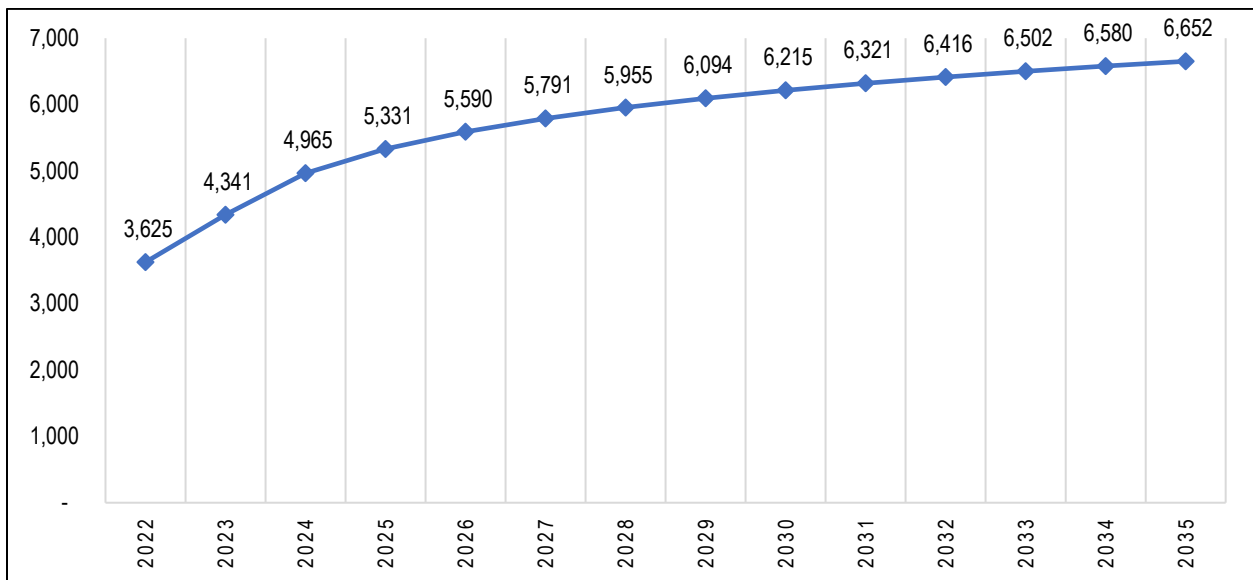


Figure 5.4 Logarithmic Forecast of Employed AMTs in Kentucky (2022-2033)

Sources: BLS OEWS (2022), Authors' Calculations

The logarithmic model predicts Kentucky will add 2,877 AMTs between 2023 and 2033. Extending the model to the midpoint of the next decade, we predict Kentucky will add 3,027 AMTs by 2035. Table 5.3 presents the outputs of the linear and logarithmic models side by side.

Table 5.3 Number of AMTs Added per Year by Linear and Logarithmic Functions (2023-2035)

Year	Linear Function		Logarithmic Function	
	Total	Number of AMTs Added by Year	Total	Number of AMTs Added by Year
2023	3,740	--	4,341	716
2024	3,957	217	4,965	625
2025	4,174	217	5,331	365
2026	4,391	217	5,590	259
2027	4,609	217	5,791	201
2028	4,826	217	5,955	164
2029	5,043	217	6,094	139
2030	5,260	217	6,215	120
2031	5,478	217	6,321	106
2032	5,695	217	6,416	95
2033	5,912	217	6,502	86
2034	6,129	217	6,580	78
2035	6,347	217	6,652	72

Sources: BLS OEWS (2022), Authors' Calculations

The models differ little in their ultimate outputs — in 2035 the linear model projects 6,347 AMTs; the logarithmic model forecasts 6,652. However, the growth trajectory is an important difference as we know that growth is not perfectly linear. The logarithmic function captures additions more organically, as they would occur during typical growth cycles. These models and their forecasts do not account for future shocks to the industry (*e.g.*, layoffs, closures, openings, etc.). Nevertheless, they provide a useful starting point to understand future employment dynamics based on historical trends.

5.3 Determining Where Supply Meets Demand

Based on national data, we could assume that the supply of certified AMTs is sufficient to cover market demand. Currently, the FAA records 291,325 total certified AMTs in the lower 48 states (omitting individuals who are enlisted in the military, live in Alaska, Hawaii, Washington, D.C., and US territories). The BLS reports 134,070 AMTs are working in the US. The difference between these two values, or net value, is 157,255. In theory, there are 157,255 potentially employable, certified AMTs in the US (Table 5.4).

Table 5.4 Net Certified AMTs vs. Employed AMTs

	Certified (FAA)	Employed (BLS, 49-3011 only)	Net
US (ALL)	298,916	134,070	164,846
US (Excluding Military, Alaska, Hawaii, DC, & US Territories)	291,325*	134,070	157,255

Source: FAA, BLS, Authors' Calculations

However, focusing on Kentucky, we see a different story emerge. The logarithmic forecast predicts that the job market will need and sustain 4,341 AMTs in 2023. This is an addition of 716 workers from the average of AMTs working in 2021 and 2022, as discussed above. Turning to worker supply, assuming that employers list AMT certification as a job requirement, Kentucky AMT programs could add 151 certified AMTs to the local job market each year. This will grow to 166 AMTs in 2025 once Maysville Community and Technical College’s program produces certified graduates. Ohio-based programs certify 75 students per year. By 2025 Kentucky and Ohio-based programs will graduate 226 certified AMTs each year.

Since job markets are fluid and individuals move between states for new occupations, it is also important to take into consideration how these individuals play into the system. The average number of AMTs moving into Kentucky from surrounding states is 215 per year (2014-2021); conversely, the average number of AMTs moving out of Kentucky is 278 creating a net loss of 63 AMTs between these two averages.

Two potential models of equilibrium emerge. First, we can assume there are no leakages out of the Kentucky workforce to other states (closed model). With this assumption, we predict that all certified Kentucky graduates of AMT programs and all certified graduates from southern Ohio programs will be employed in Kentucky (226 certified AMTs per year). In addition to this and keeping in line with the no loss of workers to surrounding states assumption, we will only count the average number of workers migrating into Kentucky (215 per year). This brings the potential supply of AMTs in Kentucky up to 441. This total will shift to 456 certified graduates in 2025 with the addition of the Maysville Community and Technical College graduates (also assuming here that all graduates are certified). In addition to this, an additional 50 seats of capacity will be added to the JCTC facility starting in the Spring 2024 semester. We will assume that all students graduate and are certified. This brings the total number of certified students to 506 by the end of the 2026 academic year.

The second model (open model) assumes that 10% of students will move out of Kentucky once they graduate and are certified, moving the total number of certified AMTs from Kentucky and southern Ohio programs to 171 potential workers, shifting to 184 in 2025 and 230 in 2026. In addition to this, we will use the average net migration (-63 AMTs), which subtracts the average number of AMTs moving out of Kentucky from those moving into Kentucky between 2014 and 2021. This brings the potential supply of AMTs to 108 per year, shifting to 121 in 2025 and 166 in 2026.

Table 5.5 (next page) displays the totals extrapolated from the closed and open models side by side. In 2023, the final column in each table subtracts the forecasted number of additional workers from total supply (certified graduates + migrating workers). From 2024 onward, demand also encompasses the number of open positions from the previous year. For example, in the 2025 closed model, the net amount represented in the final column is the supply of workers (226 certified graduates + 215 migrating AMTs into KY) minus the forecasted number of AMTs added that year (365) plus the remaining open positions from 2024 (458 positions); supply for this year equals 456 workers, while demand equals 824 workers, resulting in a total of -368 (*i.e.*, 368 open positions remain where supply does not meet demand). Red cells in the final column indicate that supply does not meet demand; green cells denote that supply does meet or surpass the demand for workers.

Table 5.5 Net Forecasted Demand for AMTs Based Upon Closed and Open Model (2023-2035)

5.5.1: Closed Model

Supply: [All Graduates from KY + OH Stay in KY] + [Migrating Workers into KY only]

Year	Forecasted Demand		Supply of Workers		[Supply – Demand] + Surplus (or deficit) of workers from the previous year
	Total Forecasted AMTs	Number of AMTs Added by Year	Certified Graduates (KY+OH)	Migrating AMTs into KY Only	
2023	4,341	716	226	215	(275)
2024	4,965	625	226	215	(458)
2025	5,331	365	241	215	(368)
2026	5,590	259	291	215	(121)
2027	5,791	201	291	215	184
2028	5,955	164	291	215	526
2029	6,094	139	291	215	893
2030	6,215	120	291	215	1,278
2031	6,321	106	291	215	1,678
2032	6,416	95	291	215	2,089
2033	6,502	86	291	215	2,509
2034	6,580	78	291	215	2,937
2035	6,652	72	291	215	3,371

5.5.2: Open Model

Supply: [Only 90% of Graduates (KY+OH) Remain in KY] + [Average Net Migration for AMTs in KY]

Year	Forecasted Demand		Supply of Workers		[Supply – Demand] + Surplus (or deficit) of workers from the previous year
	Total Forecasted AMTs	Number of AMTs Added by Year	Certified Graduates (KY+OH)	Average Net Migration for KY	
2023	4,341	716	203	-63	(575)
2024	4,965	625	203	-63	(1,060)
2025	5,331	365	217	-63	(1,271)
2026	5,590	259	262	-63	(1,331)
2027	5,791	201	262	-63	(1,334)
2028	5,955	164	262	-63	(1,299)
2029	6,094	139	262	-63	(1,239)
2030	6,215	120	262	-63	(1,160)
2031	6,321	106	262	-63	(1,068)
2032	6,416	95	262	-63	(964)
2033	6,502	86	262	-63	(851)
2034	6,580	78	262	-63	(730)
2035	6,652	72	262	-63	(603)

These two models present two very different scenarios of demand. In the closed model, we assumed all of Kentucky's certified graduates remain in Kentucky when seeking future employment. This is not likely. Second, we also applied this assumption to Ohio-based schools that listed the primary employers of graduates in Kentucky (specifically CVG). Third, we assume that AMTs are only migrating into Kentucky, not those emigrating. Despite these caveats, we can see a general threshold of when the AMT job market could net out based upon the logarithmic forecast. If we incorporate the rough estimate of AMTs who relocate to Kentucky (215 workers per year), the supply of workers meets the forecasted demand for workers between 2026 and 2027. The open model shows a dramatically different story. Assuming that only 90% of certified graduates from Kentucky and southern Ohio are employed in Kentucky each year and that approximately 63 AMTs leave KY each year between 2023 and 2035, on average, 1,037 AMT positions will remain open each year when netting out the forecasted number of workers (plus the surplus or deficit from the previous year) from the supply of workers. In this scenario, the demand for workers far outpaces the supply of workers.

Chapter 6 Conclusions

Determining a market's demand for a specific occupation is nuanced and complex. Several factors influence the supply of workers and regional demand for those workers, such as the number of new workers entering the market after graduation, workers migrating in and out of a region, and workers aging out of the prime working age cohort. In terms of AMTs in Kentucky, the supply of workers can be derived mainly from graduates of AMT programs in Kentucky and surrounding states; from the data available, this source of supply comes mainly from the two current programs (JCTC & SCC) in Kentucky and schools in southern Ohio. An additional component of supply is the number of workers moving to Kentucky to work as AMTs. Demand for workers in Kentucky comes mainly from industry located in Louisville and northern Kentucky, specifically at or affiliated with the SDF and CVG airports, respectively. We predict that over the next five years approximately 2,166 AMT positions will open in Kentucky. Looking back at the two models presented (closed and open), we see that if all certified graduates stay in Kentucky, that no currently employed AMTs leave KY, and 215 AMTs relocate to Kentucky each year, then the supply of AMTs will meet the demand for certified workers around 2027. However, if we allow for leakages from this forecast (*i.e.*, only 90% of local graduates work in Kentucky and 63 currently employed AMTs leave Kentucky each year), the supply of workers will not meet the demand for workers. In fact, on average, 1,037 positions will remain open each year.

This stark difference also highlights the importance of worker retention. If the net migration of AMTs were flipped from 63 individuals leaving Kentucky to 63 AMTs moving to Kentucky, supply would meet demand in 2033. Therefore, increasing worker retention while simultaneously increasing the supply of certified workers (*i.e.*, new graduates) could quicken the pace of meeting the forecasted demand for workers each year. Much of the forecasted growth is contingent upon the expansion of operations at the UPS Worldport (SDF) and a conglomerate of corporations working at CVG (Amazon, DHL, ABX Air, Airborne Maintenance and Engineering Services, Atlas Air, and FEAM Aero) (KY Chamber, 2023). Should operations expand at a greater rate than we saw in the historical data, the number of open positions could be much greater than either of the forecasting models used. In addition, FEAM Aero partnering with Epic Flight Academy has broken ground on a new AMT training facility located at the CVG airport that will begin training students in 2024. This will add to the supply of students in the area. As the Air Transportation sector continues to rebound and grow during the post-pandemic era, the demand for AMTs will no doubt also increase, as the need for reliable aircraft is paramount to this and so many industries.

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Appendix A.1 Estimate of Students Receiving AMT Certification by Current FAA Enrollment Numbers

State	Name	City	Enrollment	Estimated Number of Program Graduates (68% of Enrollment)	Estimated Number Obtaining Certification (58% of Graduates)
KY	JEFFERSON COMMUNITY TECHNICAL COLLEGE	Louisville	75	51	30
	SOMERSET COMMUNITY COLLEGE	Somerset	50	34	20
IL	AVIATION INSTITUTE OF MAINTENANCE	Chicago	43	29	17
	COMMUNITY COLLEGE DISTRICT NUMBER 522	Granite City	33	22	13
	SOUTHWESTERN ILLINOIS COLLEGE				
	LEWIS UNIVERSITY	Romeoville	163	111	64
	LINCOLN LAND COMMUNITY COLLEGE	Springfield	30	20	12
	ROCK VALLEY COLLEGE AVIATION TECH	Rockford	168	114	66
	SOUTHERN ILLINOIS UNIV AVN TECH	Carbondale	139	95	55
	IN	AMERICAN TRANS AIR TRAINING CORPORATION	Indianapolis	155	105
AVIATION INSTITUTE OF MAINTENANCE					
IVY TECH COMMUNITY COLLEGE NORTHEAST		Fort Wayne	45	31	18
PURDUE UNIV SCHOOL OF AVIATION AND TRANSP TECH		West Lafayette	268	182	106
VINCENNES UNIVERSITY		Indianapolis	115	78	45
MO	GATEWAY INSTITUTE OF TECHNOLOGY	St. Louis	12	8	5
	STATE TECHNICAL COLLEGE OF MISSOURI	Linn	28	19	11
	TECHNICAL EDUCATION SERVICES INC	Kansas City	85	58	34
	AVIATION INSTITUTE OF MAINTENANCE				
OH	AEROSPACE CENTER	Swanton	52	35	21
	CINCINNATI STATE TECHNICAL AND COMMUNITY COLLEGE	Harrison	91	62	36
	COLUMBUS STATE COMMUNITY COLLEGE	Columbus	65	44	26

State	Name	City	Enrollment	Estimated Number of Program Graduates (68% of Enrollment)	Estimated Number Obtaining Certification (58% of Graduates)
	GREAT OAKS JOINT VOCATIONAL SCHOOL	Wilmington	25	17	10
	GREEN COUNTY CAREER CENTER	Xenia	31	21	12
	MAHONING COUNTY CAREER AND TECHNICAL CENTER	Canfield	37	25	15
	MIAMI VALLEY CAREER TECHNOLOGY CENTER	Clayton	24	16	9
VA	BLUE RIDGE COMMUNITY COLLEGE	Weyers Cave	23	16	9
	LIBERTY UNIVERSITY	Lynchburg	40	27	16
	TECHNICAL EDUCATION SERVICES INC	Manassas	157	107	62
	AVIATION INSTITUTE OF MAINTENANCE				
	TRAINING SERVICES INC	Norfolk	223	152	88
WV	MARSHALL UNIVERSITY AVIATION MAINTENANCE TECHNOLOGY	Huntington	25	17	10
	PIERPONT COMMUNITY AND TECHNICAL COLLEGE	Bridgeport	80	54	32

Appendix A.2 Estimate of Students Receiving AMT Certification by Institutional Capacity Totals

State	Name	City	Capacity	Estimated Number of Program Graduates (68% of Capacity)	Estimated Number Obtaining Certification (58% of Graduates)
KY	JEFFERSON COMMUNITY TECHNICAL COLLEGE	Louisville	150	102	59
	SOMERSET COMMUNITY COLLEGE	Somerset	100	68	39
IL	AVIATION INSTITUTE OF MAINTENANCE	Chicago	475	323	187
	COMMUNITY COLLEGE DISTRICT NUMBER 522	Granite City	50	34	20
	SOUTHWESTERN ILLINOIS COLLEGE				
	LEWIS UNIVERSITY	Romeoville	400	272	158
	LINCOLN LAND COMMUNITY COLLEGE	Springfield	50	34	20
	ROCK VALLEY COLLEGE AVIATION TECH	Rockford	300	204	118
	SOUTHERN ILLINOIS UNIV AVN TECH	Carbondale	325	221	128
IN	AMERICAN TRANS AIR TRAINING CORPORATION	Indianapolis	350	238	138

	AVIATION INSTITUTE OF MAINTENANCE				
	IVY TECH COMMUNITY COLLEGE NORTHEAST	Fort Wayne	130	88.4	51
	PURDUE UNIV SCHOOL OF AVIATION AND TRANSP TECH	West Lafayette	400	272	158
	VINCENNES UNIVERSITY	Indianapolis	500	340	197
MO	GATEWAY INSTITUTE OF TECHNOLOGY	St. Louis	50	34	20
	STATE TECHNICAL COLLEGE OF MISSOURI	Linn	80	54.4	32
	TECHNICAL EDUCATION SERVICES INC	Kansas City	300	204	118
	AVIATION INSTITUTE OF MAINTENANCE				
OH	AEROSPACE CENTER	Swanton	100	68	39
	CINCINNATI STATE TECHNICAL AND COMMUNITY COLLEGE	Harrison	200	136	79
	COLUMBUS STATE COMMUNITY COLLEGE	Columbus	300	204	118
	GREAT OAKS JOINT VOCATIONAL SCHOOL	Wilmington	25	17	10
	GREEN COUNTY CAREER CENTER	Xenia	25	17	10
	MAHONING COUNTY CAREER AND TECHNICAL CENTER	Canfield	50	34	20
	MIAMI VALLEY CAREER TECHNOLOGY CENTER	Clayton	75	51	30
	PITTSBURGH INSTITUTE OF AERONAUTICS	Vienna	150	102	59
	SINCLAIR COMMUNITY COLLEGE	Dayton	225	153	89
TN	DEPT OF AEROSPACE MIDDLE TENNESSEE	Murfreesboro	100	68	39
	NORTH CENTRAL INSTITUTE	Clarksville	150	102	59
	NORTHEAST STATE COMMUNITY COLLEGE	Blountville	50	34	20
	TENNESSEE COLLEGE OF APPLIED TECHNOLOGY MORRISTOWN	Morristown	50	34	20

	TENNESSEE COLLEGE OF APPLIED TECHNOLOGY, NASHVILLE	Nashville	75	51	30
	TENNESSEE COLLEGES OF APPLIED TECHNOLOGY-MEMPHIS	Memphis	150	102	59
VA	BLUE RIDGE COMMUNITY COLLEGE	Weyers Cave	25	17	10
	LIBERTY UNIVERSITY	Lynchburg	100	68	39
	TECHNICAL EDUCATION SERVICES INC	Manassas	300	204	118
	AVIATION INSTITUTE OF MAINTENANCE				
	TRAINING SERVICES INC	Norfolk	440	299.2	174
WV	MARSHALL UNIVERSITY AVIATION MAINTENANCE TECHNOLOGY	Huntington	100	68	39
	PIERPONT COMMUNITY AND TECHNICAL COLLEGE	Bridgeport	130	88.4	51

Appendix B Cross-industry NAICS Sectors Employing AMTs in the US (2022)

NAICS Code	NAICS Description
115000	Support Activities for Agriculture and Forestry
115100	Support Activities for Crop Production
211000	Oil and Gas Extraction
236000	Construction of Buildings
237000	Heavy and Civil Engineering Construction
237100	Utility System Construction
237130	Power and Communication Line and Related Structures Construction
332000	Fabricated Metal Product Manufacturing
333000	Machinery Manufacturing
334000	Computer and Electronic Product Manufacturing
334400	Semiconductor and Other Electronic Component Manufacturing
334500	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
336000	Transportation Equipment Manufacturing
336400	Aerospace Product and Parts Manufacturing
423000	Merchant Wholesalers, Durable Goods
423800	Machinery, Equipment, and Supplies Merchant Wholesalers
425000	Wholesale Trade Agents and Brokers
441000	Motor Vehicle and Parts Dealers
441200	Other Motor Vehicle Dealers
481000	Air Transportation
481100	Scheduled Air Transportation
481200	Nonscheduled Air Transportation
484000	Truck Transportation
487000	Scenic and Sightseeing Transportation
487900	Scenic and Sightseeing Transportation, Other
488000	Support Activities for Transportation
488100	Support Activities for Air Transportation
488500	Freight Transportation Arrangement
492000	Couriers and Messengers
492100	Couriers and Express Delivery Services
531000	Real Estate
532000	Rental and Leasing Services
541000	Professional, Scientific, and Technical Services
541300	Architectural, Engineering, and Related Services
541330	Engineering Services
541380	Testing Laboratories and Services
541500	Computer Systems Design and Related Services
541600	Management, Scientific, and Technical Consulting Services
541700	Scientific Research and Development Services
541710	Research and Development in the Physical, Engineering, and Life Sciences

NAICS Code	NAICS Description
541900	Other Professional, Scientific, and Technical Services
551000	Management of Companies and Enterprises
551100	Management of Companies and Enterprises
561000	Administrative and Support Services
561200	Facilities Support Services
561300	Employment Services
561320	Temporary Help Services
611000	Educational Services
611300	Colleges, Universities, and Professional Schools
611500	Technical and Trade Schools
621000	Ambulatory Health Care Services
621900	Other Ambulatory Health Care Services
621910	Ambulance Services
811000	Repair and Maintenance
811100	Automotive Repair and Maintenance
811110	Automotive Mechanical and Electrical Repair and Maintenance
811300	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance

**Appendix C AMT Employment in NAICS Sectors 48 and 49 (Transportation and Warehousing):
US Only (2022)**

Sectors 48 and 49 - Transportation and Warehousing	
Total Employment	81,330
Sub-Sectors	Employment
Air Transportation (481000)	31,790
<i>Scheduled Air Transportation (481100)</i>	25,150
<i>Nonscheduled Air Transportation (481200)</i>	6,640
Truck Transportation (484000)	70
Scenic and Sightseeing Transportation (487000)	270
<i>Scenic and Sightseeing Transportation, Other (487900)</i>	270
Support Activities for Transportation (488000)	39,740
<i>Support Activities for Air Transportation (488100)</i>	39,660
<i>Freight Transportation Arrangement (488500)</i>	-
Couriers and Messengers (492000)	9,330
<i>Couriers and Express Delivery Services (492100)</i>	9,330

**Appendix D AMT Employment in NAICS Sectors 31, 32, and 33 (Manufacturing): US Only
(2022)**

Sectors 31, 32, and 33 – Manufacturing	
Total Employment	22,250
Sub-Sectors	Employment
Fabricated Metal Product Manufacturing (332000)	80
Computer and Electronic Product Manufacturing (334000)	600
Semiconductor and Other Electronic Component Manufacturing (334400)	210
Navigational, Measuring, Electromedical, and Control Instruments Manufacturing (334500)	390
Transportation Equipment Manufacturing (336000)	21,330
<i>Aerospace Product and Parts Manufacturing (336400)</i>	<i>21,330</i>