CEDBR
Center for Economic Development and Business Research

Wichita State University

AEROSPACE LABOR SPECIALIZATION

LABOR SPECIALIZATION

Understanding the strengths, weaknesses, and advantages of Wichita's labor force begins with looking at its current composition and historical trends, as well as a comparative look at how it competes against other MSAs heavily involved in the aerospace industry.

Labor Pool and Migration

WICHITA MSA EMPLOYMENT BY OCCUPATION TYPE, MAY 2021

Occupation Type	Employment	Location Quotient	Annual Mean Wage
Management	13,420	0.75	$101,120
Business and Financial Operations	14,780	0.81	$69,270
Computer and Mathematical	5,980	0.64	$78,890
Architecture and Engineering	7,150	1.46	$84,290
Life, Physical, and Social Science	1,470	0.57	$67,510
Community and Social Science	4,400	0.98	$45,600
Legal	1,520	0.64	$75,160
Educational Instruction and Library	18,140	1.10	$47,610
Arts, Design, Entertainment, Sports, and Media	2,890	0.79	$46,060
Healthcare Practitioners and Technical	17,830	1.01	$78,230
Healthcare Support	13,330	1.00	$28,340
Protective Service	5,490	0.80	$46,340
Food Preparation and Serving Related	25,090	1.11	$24,360
Building and Grounds Cleaning and Maintenance	7,570	0.91	$29,740
Personal Care and Service	6,630	1.28	$28,160
Sales and Related	25,110	0.94	$39,540
Office and Administrative Support	37,170	1.01	$38,330
Farming, Fishing, and Forestry	350	0.38	$31,330
Construction and Extraction	13,400	1.14	$48,330
Installation, Maintenance, and Repair	13,680	1.22	$51,590
Production	26,490	1.56	$46,670
Transportation and Material Moving	22,000	0.86	$37,980

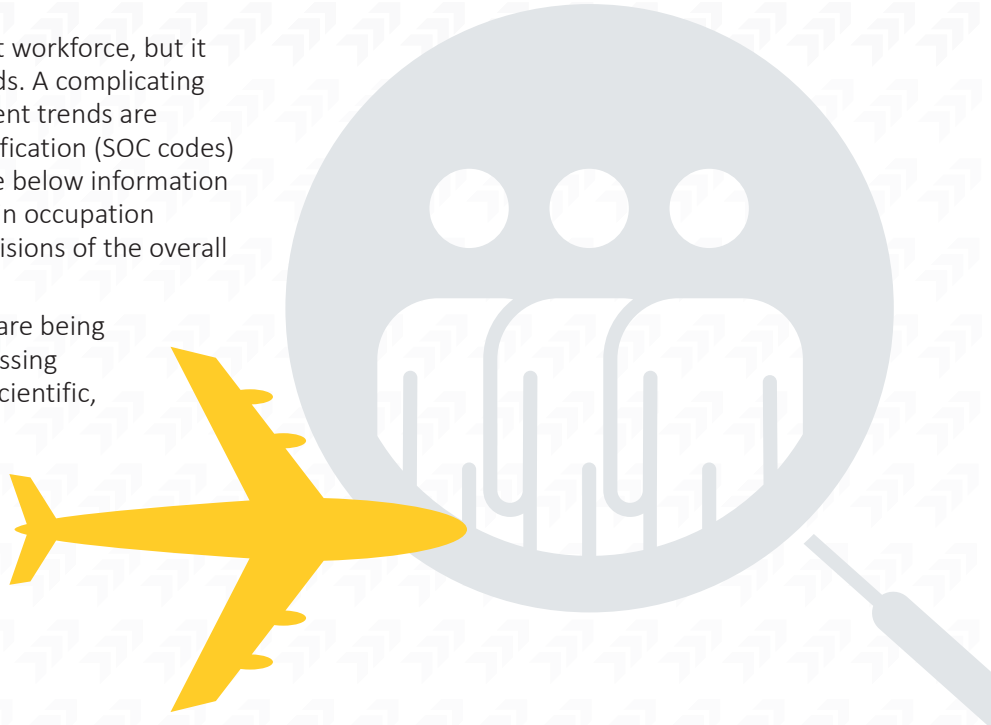
Source: CEDBR, BLS - OEWS

Broadly, the Wichita MSA has two relevant occupation types with strong concentrations of employment: architecture and engineering occupations and production occupations. As highlighted in the table above, the location quotients for both occupation types are approximately 1.5, meaning employment in these occupations is half-again as large a share of the overall workforce compared nationally. For the purposes of this analysis, these are what we are defining as Wichita's "specialization." Further analysis will be based upon the workforce that fills and supports these occupations, of which aerospace is the primary component in Wichita.

AEROSPACE PRODUCTS AND PARTS MANUFACTURING EMPLOYMENT SHARE BY HIGH-LEVEL OCCUPATION TYPE, 2021		
SOC Code	**Employment**	**% of Employment**
11-0000	Management Occupations	7.20%
13-0000	Business and Financial Operations Occupations	11.04%
15-0000	Computer and Mathematical Occupations	8.77%
17-0000	Architecture and Engineering Occupations	21.15%
19-0000	Life, Physical, and Social Science Occupations	0.47%
23-0000	Legal Occupations	0.09%
25-0000	Educational Instruction and Library Occupations	0.01%
27-0000	Arts, Design, Entertainment, Sports, and Media Occupations	0.44%
29-0000	Healthcare Practitioners and Technical Occupations	0.04%
33-0000	Protective Service Occupations	0.34%
35-0000	Food Preparation and Serving Related Occupations	0.01%
37-0000	Building and Grounds Cleaning and Maintenance Occupations	0.27%
41-0000	Sales and Related Occupations	0.78%
43-0000	Office and Administrative Support Occupations	5.46%
47-0000	Construction and Extraction Occupations	0.64%
49-0000	Installation, Maintenance, and Repair Occupations	7.18%
51-0000	Production Occupations	34.04%
53-0000	Transportation and Material Moving Occupations	2.08%
Source: BLS - OEWS		

The above charts are a snapshot of the current workforce, but it is also important to understand historical trends. A complicating factor in this analysis is that data on employment trends are measured not by Standard Occupational Classification (SOC codes) as above but with NAICS codes. As a result, the below information does not map precisely to current counts within occupation types. Still, a general sense of the same subdivisions of the overall workforce can be drawn.

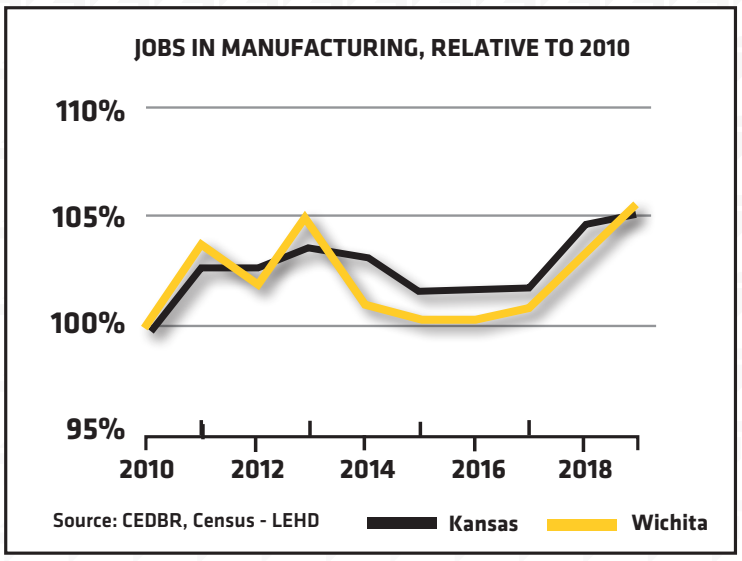
By NAICS codes, two types are of interest and are being considered analogous for the purpose of discussing trends: manufacturing jobs and professional, scientific, and technical services jobs. Moreover, manufacturing was chosen to represent production workers, and professional services were selected because it included engineering.

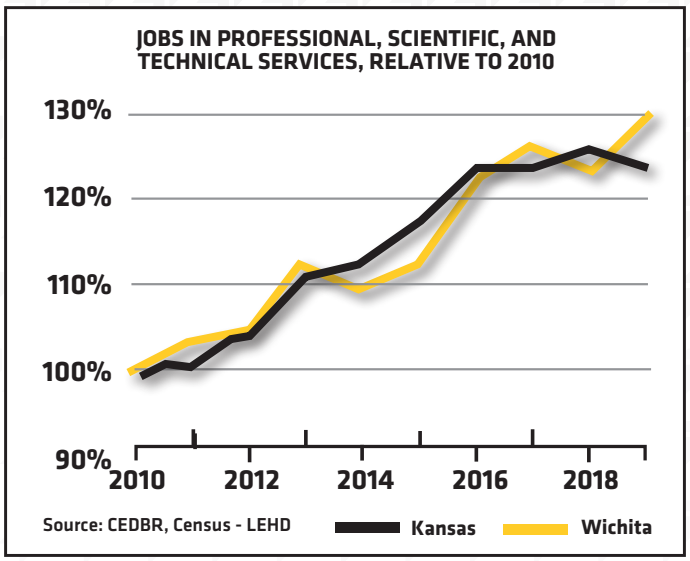


Labor Pool and Migration *(continued)*

Occupations classified in SOC codes as production are primarily analogous to those listed under the NAICS classification of manufacturing. Comparing in-state employment trends, we must recognize that because Wichita represents a large portion of the state's manufacturing labor force, trends are similar. However, Wichita is more volatile than the state due to the smaller geography level and higher reliance on aerospace.

Manufacturing employment declined from 2013 to 2016 in Wichita but returned to historical highs by 2019.





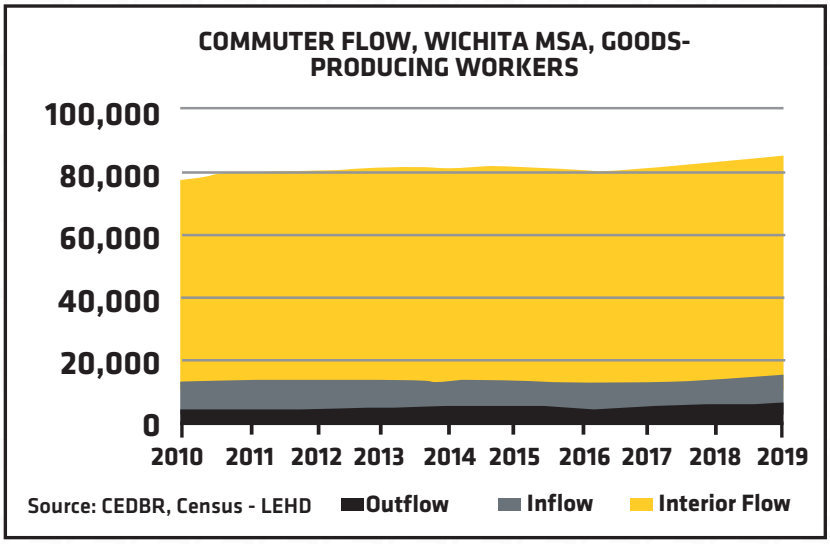
Employment in Professional, Scientific, and Technical Services occupations, of which Architecture and Engineering occupations are a subset, trended more consistently upward since 2010. As a result, the Wichita MSA has continued to grow even while overall state employment in this occupation declined from 2018 to 2019.

Commuter Flow

In addition to overall employment trends in the Wichita MSA, it is important to identify the labor flow. Labor market flow can be measured by commuters (workers commuting into and out of the MSA to work) or migration (workers moving to or away from the Wichita MSA). Generally, worker commutes tend to be from within the state, while the migration is at the national level.

There are three components to commuter flow, as shown below:

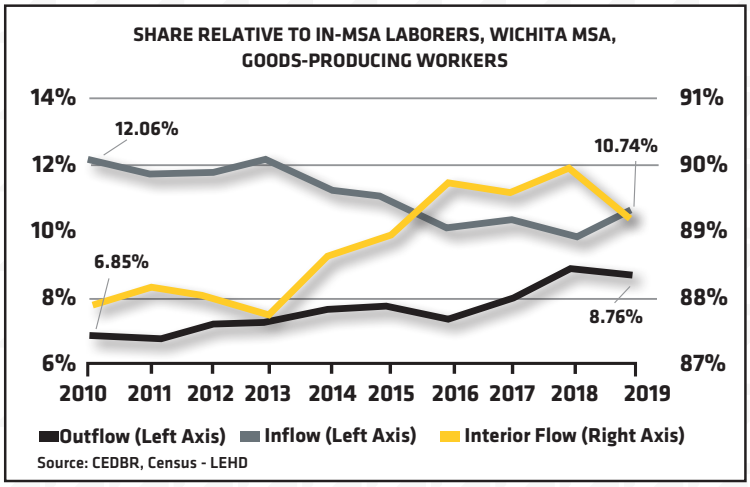
- Interior flow includes workers who both live and work in the Wichita MSA.
- Inflow includes workers who live outside the Wichita MSA and commute to work.
- Outflow includes workers who live in the MSA but commute outside of it to work.



Together, these three represent the total commuter labor flow (i.e. not permanent migration).

Commuter Flow *(continued)*

Each component's trend illustrates a particular element of the MSA's labor flow. We define the In-MSA goods-producing workforce as the sum of interior flows and inflows, interpreted as goods-producing workers who work in Wichita. These two series always sum to 100%. Outflows, on this chart, measures Wichita's goods-producing workforce unutilized by local employers.



There are two notable ways to interpret this data. First, the share of local goods-producing workers who commute out to work continues to grow relative to the In-MSA goods-producing workforce, indicating a progressively larger segment of the local labor market in these occupations who find more favorable employment opportunities outside of the MSA. This also means the metropolitan area has access to a larger labor market than it is currently utilizing.

Second, the share of the In-MSA workforce from inflows continues to decline. Inflows have declined from 8,752 in 2010 to 8,403 in 2019, meaning fewer manufacturing workers outside the MSA were working in Wichita. Conversely, counts of outflows have increased substantially over the same period, from 4,967 in 2010 to 6,853 in 2019.

Together, these observations paint a picture that competition between Wichita and surrounding communities in goods-producing occupations is increasing. However, this should not be interpreted negatively. Instead, it may indicate an increasing prevalence of goods-producing occupations across the area, increasing the demand for skilled goods-producing workers. As such, utilizing the labor in the surrounding markets keep the people engaged in the market and prevents the atrophy of skills.

Migration

As mentioned previously, commuter flow measures only the commutes made by workers into or out of the Wichita MSA and does not effectively capture workers who move into the market.

NET ANNUAL AVERAGE MIGRATION TO KS MANUFACTURING OCCUPATIONS - TOP TEN

Rank	MSA	2017	2018	2019	2020	Annual Average
1	Miami-Fort Lauderdale-Pompano Beach, FL	6	0	3	9	4.50
2	Columbia, MO	-1	0	1	6	1.50
3	Joplin, MO	-9	-9	11	13	1.50
4	Gadsden, AL	0	0	2	3	1.25
5	Fond du Lac, WI	1	1	1	1	1.00
6	McAllen-Edinburg-Mission, TX	2	-1	2	1	1.00
7	Buffalo-Cheektowaga, NY	1	1	0	2	1.00
8	Huntington-Ashland, WV-KY-OH	0	-2	3	3	1.00
9	Chicago-Naperville-Elgin, IL-IN-WI	-1	4	1	-1	0.75
10	Jefferson City, MO	1	2	0	0	0.75

*Net migration calculated by count of workers from all sectors migrating to Kansas manufacturing jobs minus count of workers from Kansas manufacturing jobs migrating to all sectors in other areas.

Source: CEDBR, Census-LEHD - J2J

Net in-migration figures for manufacturing jobs in Kansas have low annual averages from MSAs outside of Kansas. The highest yearly average since 2017 was in Miami, Florida. MSAs in Missouri occupy ranks 2, 3, and 10 due to the proximity, though these MSAs also have high variation year-to-year.

Migration*(continued)*

NET ANNUAL AVERAGE MIGRATION TO KS MANUFACTURING OCCUPATIONS - BOTTOM TEN						
Rank	MSA	2017	2018	2019	2020	Annual Average
1	Dallas-Fort Worth-Arlington, TX	-23	-32	-29	-35	-29.75
2	St. Louis, MO-IL	-1	-17	-3	-20	-10.25
3	Denver-Aurora-Lakewood, CO	-11	-8	-10	-6	-8.75
4	Phoenix-Mesa-Chandler, AZ	-1	-9	-6	-15	-7.75
5	Nashville-Davidson-Murfreesboro-Franklink, TN	-3	-9	-11	-2	-6.25
6	Oklahoma City, OK	-1	-8	-3	-12	-6.00
7	Tulsa, OK	4	-5	-8	-11	-5.00
8	Minneapolis-St.Paul-Bloomington, MN-WI	-4	-7	-4	-3	-4.50
9	Houston-The Woodlands-Sugar Land, TX	-4	-13	-2	4	-3.75
10	Cincinnati, OH-KY-IN	-4	-2	-3	-5	-3.50
*Net migration calculated by count of workers from all sectors migrating to Kansas manufacturing jobs minus count of workers from Kansas manufacturing jobs migrating to all sectors in other areas.						
Source: CEDBR, Census-LEHD - J2J						

The above table shows quarterly net out-migration data for Kansas manufacturing workers by MSA. Compared to those with the greatest net in-migration, MSAs with the greatest net out-migration have substantially larger magnitudes. Of these, many are significant competitors in aerospace products and parts manufacturing and related industries.

MSA	Notable Aerospace Firms
Cincinnati, OH-KY-IN	Boeing, GE Aviation, Cincinnati Control Dynamics Inc., Global Aerospace Design Corp., OHCA Aero
Dallas-Fort Worth-Arlington, TX	Lockheed Martin, Bell Helicopter Textron, Raytheon
Denver-Aurora-Lakewood, CO	Primus Aerospace, A&M Aerospace, RUAG Space USA, Bye Aerospace
Houston-The Woodlands-Sugar Land, TX	Honeywell, Curtis-Wright Surface Technologies, Lockheed Martin, American Aeromotive Components, UTC Aerospace Systems, The Aerospace Corporation, Raven Aerospace Technology Inc.
Minneapolis-St. Paul-Bloomington, MN-WI	Northrop Grumman, Lockheed Martin, Aerospace Welding Minneapolis, UTC Aerospace Systems, Honeywell Aerospace
Nashville-Davidson--Murfreesboro--Franklin, TN	Aviation M.D. Inc., GKN Aerospace Engineering, Tect Aerospace, Stevens Aerospace and Defense
Oklahoma City, OK	Boeing, Northrop Grumman, Lockheed Martin, Ametek Aerospace & Defense, Meta Special Aerospace, Field Aerospace
Phoenix-Mesa-Chandler, AZ	American Manufacturing (Aerospace)
St. Louis, MO-IL	Boeing, Global Aerospace Technical Support, Inc., LMI Aerospace, GKN Aerospace
Tulsa, OK	Honeywell Aerospace, Spirit Aerosystems, LMI Aerospace
Source: CEDBR	

Each of the above MSAs, from which Wichita has consistent negative manufacturing worker migration, has prominent and numerous aerospace manufacturing or support firms. It is important, then, to consider how Wichita's aerospace-related workforce ranks in comparison to these competitors.

Aerospace Employment Concentrations

Higher levels of employment concentration within an occupation are a sign of labor specialization, which tends to translate into economic efficiencies for firms. These economic efficiencies occur because of competition with other workers, more labor opportunities, knowledge spillover, and greater upward mobility. To further understand the labor market conditions within Wichita, this report has highlighted three aerospace-related occupations: aerospace engineers, aviation technicians, and aircraft assemblers structure, surfaces, rigging, and systems).

MSAS WITH HIGHEST CONCENTRATION, AEROSPACE ENGINEERS

Rank	Metropolitan Area	Employment	Location Quotient	Annual Average Wage
1	California-Lexington Park, MD	1,120	60.30	$120,160
2	Huntsville, AL	3,340	36.13	$122,880
3	Boulder, CO	1,170	16.03	$148,990
4	Palm Bay-Melbourne-Titusville, FL	1,240	13.98	$112,710
5	Wichita, KS	1,510	13.20	$108,960
6	Crestview-Fort Walton Beach-Destin, FL	390	8.45	$104,400
7	Dayton, OH	1,040	7.29	$113,120
8	Las Cruces, NM	170	6.22	$93,940
9	Bakersfield, CA	650	5.23	$116,150
10	Colorado Springs, CO	600	5.18	$130,440

Source: CEDBR, BLS-OEWS

Aerospace engineers perform a variety of duties, including designing, constructing, testing aircraft, missiles, spacecraft, and conducting research to evaluate equipment and systems. As a result, they often have specific job titles, including aeronautical engineer, aerospace engineer, aerospace stress engineer, avionics engineer, design engineer, flight controls engineer, flight test engineer, structural analysis engineer, systems engineer, or test engineer.

Aerospace engineers are employed across a range of industries, representing 3.97% of employment in Aerospace Product and Part Manufacturing. These engineers are also within several other industries, shown below as the representative share of each industry's employment.

INDUSTRIES WITH LARGEST SHARE OF AEROSPACE ENGINEERS

Aerospace Product and Part Manufacturing	3.97%
Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	1.41%
Support Activities for Air Transportation	0.67%
Scientific Research and Development Services	0.61%
Architectural, Engineering, and Related Services	0.61%

Among MSAs for which data is available from the Bureau of Labor Statistics, Wichita has the fifth-highest concentration of employment, thirteen times greater than national averages. Wichita has a lower mean wage rate among the top listed competitors, partially due to Wichita's status as one of the most affordable cities to live in, meaning the lower wages remain competitive. The California, Maryland MSA has the highest concentration of aerospace engineering occupations by a considerable margin, as it is home to a wide array of aerospace firms. Those firms include Boeing, Lockheed Martin, BAE Systems, Sikorsky Aircraft Corporation, L3 Aerospace Systems, MAG Aerospace, and KIHOMAC.

Aerospace Employment Concentrations *(continued)*

MSAS WITH THE HIGHEST CONCENTRATION, AVIONICS TECHNICIANS				
Rank	MSA	Employment	Location Quotient	Annual Mean Wage
1	California-Lexington Park, MD	140	22.76	$83,930
2	Wichita, KS	500	13.22	Not Available
3	New Bern, NC	70	11.52	$65,810
4	Palm Bay-Melbourne-Titusville, FL	230	7.84	$61,400
5	Jacksonville, NC	40	6.54	$64,000
6	Greensboro-High Point, NC	240	5.27	$53,600
7	Ogden-Clearfield, UT	180	5.03	$69,150
8	Oklahoma City, OK	360	4.46	$57,130
9	Jacksonville, FL	380	4.09	$60,570
10	Tucson, AZ	200	4.04	$65,450
Source: CEDBR, BLS-OEWS				

Avionics technicians install, inspect, test, adjust, or repair avionics equipment, such as radar, radio, navigation, and missile control systems in aircraft or space vehicles. Common job titles included under this occupation include aircraft electrical systems specialist, aircraft technician, aviation electrical technician, aviation electronics technician, avionics electronics technician, avionics installer, avionics systems integration specialist, avionics technician, and electronic technician. Avionics technicians make up 1.28% of Aerospace Products and Parts Manufacturing.

INDUSTRIES WITH LARGEST SHARE OF AVIONICS TECHNICIANS	
Support Activities for Air Transportation Aerospace Product and Part Manufacturing	3.37%
Aerospace Product and Part Manufacturing	1.28%
Nonscheduled Air Transportation	0.72%
Scheduled Air Transportation	0.28%
Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	0.23%

Wichita ranks second in its concentration of avionics technicians and has the greatest quantity among the top ten. Unfortunately, mean wage data for these occupations were not available from the Bureau of Labor Statistics. Once again, the highest-ranked MSA was California, Maryland.

MSAS WITH THE HIGHEST CONCENTRATION, AIRCRAFT STRUCTURE, SURFACES, RIGGING, AND SYSTEM ASSEMBLERS				
Rank	Metropolitan Area	Employment	Location Quotient	Annual Mean Wage
1	Wichita, KS	4,740	70.61	$53,360
2	Savannah, GA	1,050	25.02	$62,660
3	Tulsa, OK	1,060	10.75	$46,540
4	San Deigo-Carlsbad, CA	1,150	3.51	$46,760
5	Palm Bay-Melbourne-Titusville, FL	180	3.46	$40,780
6	Huntsville, AL	180	3.23	$53,890
7	Dallas-Fort Worth-Arlington, TX	2,610	3.08	$51,320
8	Waco, TX	80	2.83	$50,890
9	Port St. Lucie, FL	80	2.35	$40,980
10	Hartford-West Hartford-East Hartford, CT	230	1.75	$55,010
Source: CEDBR, BLS-OEWS				

Aerospace Employment Concentrations *(continued)*

Aircraft assemblers have duties that include assembling, fitting, fastening, and installing parts of airplanes, space vehicles, or missiles, such as tails, wings, fuselage, bulkheads, stabilizers, landing gear, rigging and control equipment, or heating and ventilating systems. Job titles under this occupation include airframe and powerplant technician, aircraft line assembler, assembler, assembly riveter, helicopter technician, sheet metal assembler and riveter, sheet metal mechanic, structures mechanic, and structures technician.

These positions represent 6.07% of employment in Aerospace Products and Parts Manufacturing.

INDUSTRIES WITH LARGEST SHARE OF AIRCRAFT ASSEMBLERS	
Aerospace Product and Part Manufacturing	**6.07%**
Support Activities for Air Transportation	**0.59%**

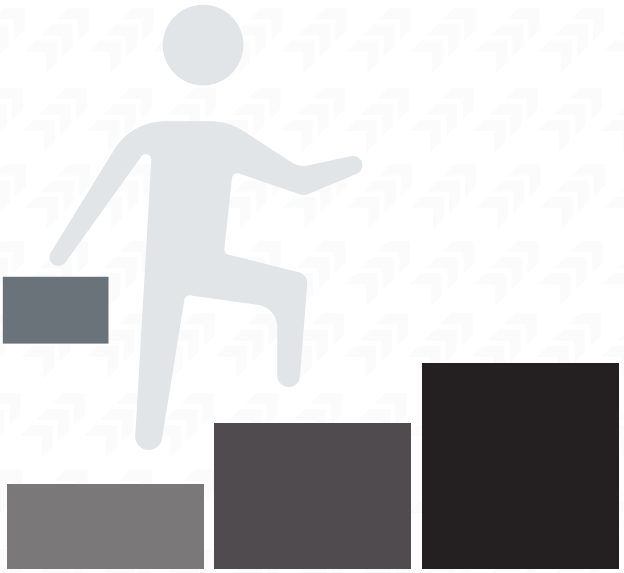
Among these occupations, Wichita ranks first with a substantially higher concentration of employment than other MSAs for which data is available and a concentration over 70 times greater than the nation. Savannah, Georgia, ranks second, having approximately 25 times the national average concentration for this occupation. Wichita also has nearly twice the quantity of these occupations among the highest-ranked MSAs. Its mean wage rate for these positions is among the highest of its competitors, which may explain its runaway dominance in concentration.

Workforce Skills Assessments

Having access to an available labor force is essential for any firm to grow; however, access to a talent pipeline is perhaps even more valuable. A qualified labor market with higher relative skills and knowledge capabilities equates to increased productivity and quality, both of which provide a competitive edge over others in the global marketplace.

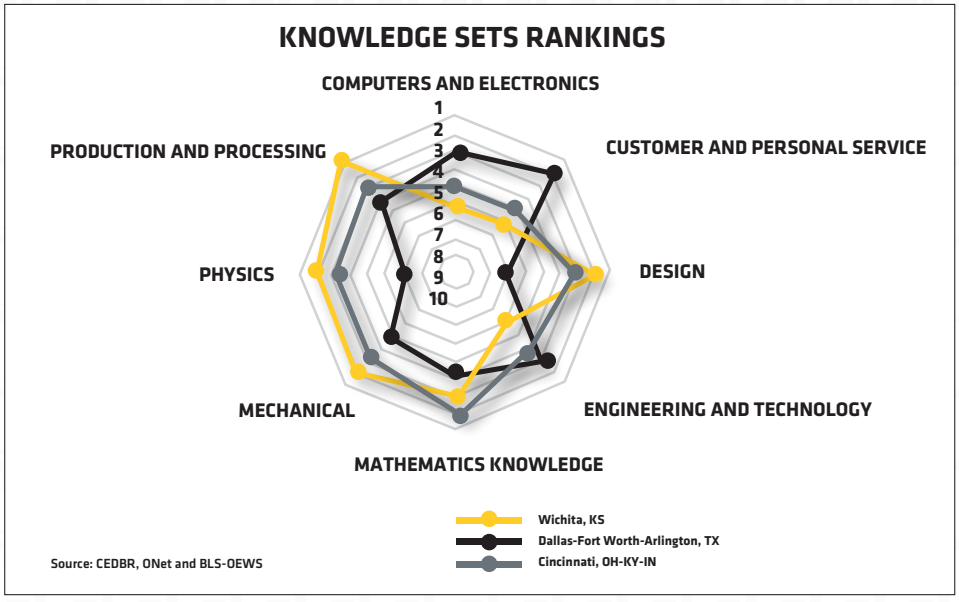
OVERALL AEROSPACE WORKFORCE SKILL RANKING	
Rank	**MSA**
1	**Palm Bay-Melbourne-Titusville, FL**
2	**Wichita, KS**
3	**Cincinnati, OH-KY-IN**
4	**Dallas-Fort Worth-Arlington, TX**
5	**Mobile, AL**
6	**Phoenix-Mesa-Scottsdale, AZ**
7	**Seattle-Tacoma-Bellevue, WA**
8	**Oklahoma City, OK**
9	**Los Angeles-Long Beach-Anaheim, CA**
10	**Hotsprings, AR**
11	**San Diego-Carlsbad, CA**
Source: CEDBR, ONet and BLS-OEWS	

Wichita ranks second overall among the labor force comprising aerospace products and parts manufacturing, behind Palm Bay, Florida. This high overall ranking is driven by Wichita's consistent ranking across multiple skills and knowledge categories.



Workforce Skills Assessments *(continued)*

DETAILED AEROSPACE KNOWLEDGE RANKINGS				
Rank	Computers and Electronics	Computer and Personal Service	Design	Engineering and Technology
1	Palm Bay-Melbourne-Titusville, FL	Phoenix-Mesa-Scottsdale, AZ	Palm Bay-Melbourne-Titusville, FL	Palm Bay-Melbourne-Titusville, FL
2	Phoenix-Mesa-Scottsdale, AZ	Dallas-Fort Worth-Arlington, TX	Wichita, KS	Phoenix-Mesa-Scottsdale, AZ
3	Dallas-Fort Worth-Arlington, TX	Mobile, AL	Cincinnati, OH-KY-IN	Dallas-Fort Worth-Arlington, TX
4	Mobile, AL	Palm Bay-Melbourne-Titusville, FL	Mobile, AL	Cincinnati, OH-KY-IN
5	Cincinnati, OH-KY-IN	Cincinnati, OH-KY-IN	Seattle-Tacoma-Bellevue, WA	Mobile, AL
6	Wichita, KS	Wichita, KS	San Diego-Carlsbad, CA	Wichita, KS
7	Seattle-Tacoma-Bellevue, WA	Oklahoma City, OK	Dallas-Fort Worth-Arlington, TX	Seattle-Tacoma-Bellevue, WA
8	Oklahoma City, OK	Hot Springs, AR	Phoenix-Mesa-Scottsdale, AZ	Los Angeles-Long Beach-Anaheim, CA
9	Los Angeles-Long Beach-Anaheim, CA	Los Angeles-Long Beach-Anaheim, CA	Hot Springs, AR	Oklahoma City, OK
10	San Diego-Carlsbad, CA	San Diego-Carlsbad, CA	Oklahoma City, OK	Hot Springs, AR
Rank	Mathematics Knowledge	Mechanical	Physics	Production and Processing
1	Palm Bay-Melbourne-Titusville, FL	Palm Bay-Melbourne-Titusville, FL	Palm Bay-Melbourne-Titusville, FL	Wichita, KS
2	Cincinnati, OH-KY-IN	Wichita, KS	Wichita, KS	Palm Bay-Melbourne-Titusville, FL
3	Wichita, KS	Cincinnati, OH-KY-IN	Cincinnati, OH-KY-IN	Cincinnati, OH-KY-IN
4	Dallas-Fort Worth-Arlington, TX	Mobile, AL	Mobile, AL	Dallas-Fort Worth-Arlington, TX
5	Mobile, AL	Dallas-Fort Worth-Arlington, TX	Seattle-Tacoma-Bellevue, WA	Mobile, AL
6	Phoenix-Mesa-Scottsdale, AZ	Hot Springs, AR	San Diego-Carlsbad, CA	Phoenix-Mesa-Scottsdale, AZ
7	Los Angeles-Long Beach-Anaheim, CA	Oklahoma City, OK	Dallas-Fort Worth-Arlington, TX	Hot Springs, AR
8	Seattle-Tacoma-Bellevue, WA	Phoenix-Mesa-Scottsdale, AZ	Oklahoma City, OK	San Diego-Carlsbad, CA
9	Oklahoma City, OK	San Diego-Carlsbad, CA	Phoenix-Mesa-Scottsdale, AZ	Los Angeles-Long Beach-Anaheim, CA
10	San Diego-Carlsbad, CA	Seattle-Tacoma-Bellevue, WA	Hot Springs, AR	Oklahoma City, OK
Source: CEDBR, ONet and BLS-OEWS				



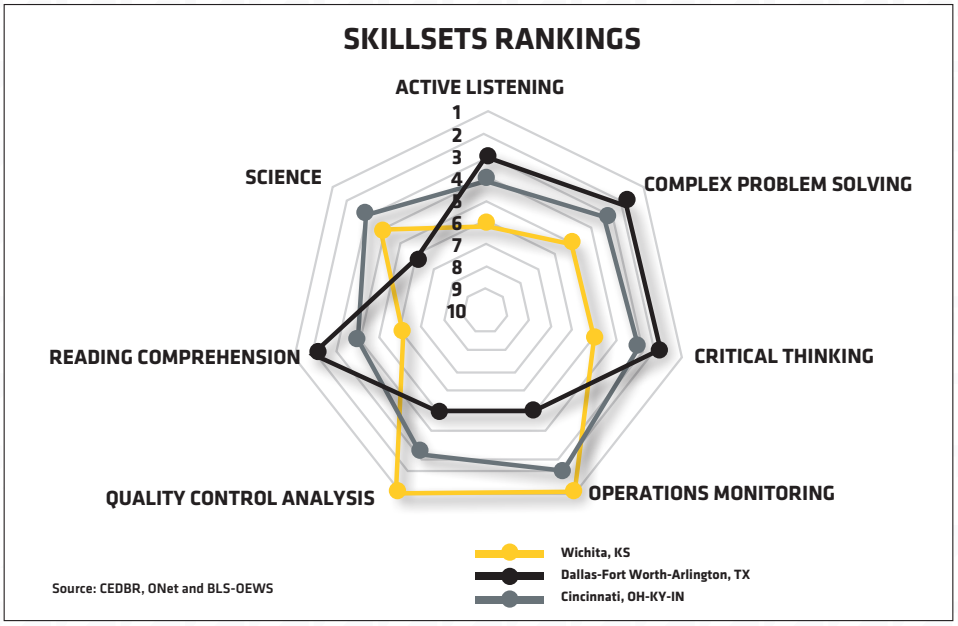
Wichita's greatest strengths among knowledge categories most relevant to aerospace were production and processing, physics, mechanical, and design knowledge. In addition, the large representation of production workers and aerospace engineers in the labor force gives a proportional advantage in supporting the aerospace sector compared to nearly all its competitors. Together, Wichita's near dominance in these knowledge categories means its workforce is superior across all phases of aerospace production.

Workforce Skills Assessments *(continued)*

DETAILED AEROSPACE SKILLS RANKINGS				
Rank	**Active Listening**	**Complex Problem Solving**	**Critical Thinking**	**Operations Monitoring**
1	Palm Bay-Melbourne-Titusville, FL	Palm Bay-Melbourne-Titusville, FL	Palm Bay-Melbourne-Titusville, FL	Wichita, KS
2	Phoenix-Mesa-Scottsdale, AZ	Dallas-Fort Worth-Arlington, TX	Dallas-Fort Worth-Arlington, TX	Cincinnati, OH-KY-IN
3	Dallas-Fort Worth-Arlington, TX	Cincinnati, OH-KY-IN	Cincinnati, OH-KY-IN	Palm Bay-Melbourne-Titusville, FL
4	Cincinnati, OH-KY-IN	Phoenix-Mesa-Scottsdale, AZ	Phoenix-Mesa-Scottsdale, AZ	Mobile, AL
5	Mobile, AL	Wichita, KS	Wichita, KS	Dallas-Fort Worth-Arlington, TX
6	Wichita, KS	Mobile, AL	Mobile, AL	Phoenix-Mesa-Scottsdale, AZ
7	Los Angeles-Long Beach-Anaheim, CA	Seattle-Tacoma-Bellevue, WA	Los Angeles-Long Beach-Anaheim, CA	Hot Springs, AR
8	Oklahoma City, OK	Oklahoma City, OK	Seattle-Tacoma-Bellevue, WA	Oklahoma City, OK
9	Hot Springs, AR	Los Angeles-Long Beach-Anaheim, CA	Oklahoma City, OK	Los Angeles-Long Beach-Anaheim, CA
10	Seattle-Tacoma-Bellevue, WA	San Diego-Carlsbad, CA	Hot Springs, AR	Seattle-Tacoma-Bellevue, WA
Rank	**Quality Control Analysis**	**Reading Comprehension**	**Science**	
1	Wichita, KS	Palm Bay-Melbourne-Titusville, FL	Palm Bay-Melbourne-Titusville, FL	
2	Palm Bay-Melbourne-Titusville, FL	Dallas-Fort Worth-Arlington, TX	Seattle-Tacoma-Bellevue, WA	
3	Cincinnati, OH-KY-IN	Phoenix-Mesa-Scottsdale, AZ	Cincinnati, OH-KY-IN	
4	Mobile, AL	Cincinnati, OH-KY-IN	Wichita, KS	
5	Dallas-Fort Worth-Arlington, TX	Mobile, AL	San Diego-Carlsbad, CA	
6	Hot Springs, AR	Wichita, KS	Dallas-Fort Worth-Arlington, TX	
7	Oklahoma City, OK	Los Angeles-Long Beach-Anaheim, CA	Mobile, AL	
8	Los Angeles-Long Beach-Anaheim, CA	Seattle-Tacoma-Bellevue, WA	Phoenix-Mesa-Scottsdale, AZ	
9	Phoenix-Mesa-Scottsdale, AZ	Oklahoma City, OK	Oklahoma City, OK	
10	San Diego-Carlsbad, CA	Hot Springs, AR	Los Angeles-Long Beach-Anaheim, CA	

Source: CEDBR, ONet and BLS-OEWS

Like in the knowledge categories, Wichita dominated the majority of MSAs across multiple skillsets; however, the two highest segments were quality control analysis and operations monitoring. Quality control analysis ensures that aerospace products and parts are of high quality. Operations monitoring focuses on the procedure of moving through the stages of production and distribution.



Methodology

CEDBR has developed a method of analysis based upon occupational skills data from O*NET OnLine (ONet)and the Bureau of Labor Statistics. ONet contains assessments of skills and knowledge sets used in all occupations. It also contains psychographic information such as interests and values, and conditional data such as work activities, context, and styles. For this analysis, the center included 35 basic and cross-functional skills and 33 knowledge sets. A complete list of included skills and knowledge is below. A subset of these, including only those core to aerospace engineering, production, and support occupations, will be discussed and included in this analysis. Definitions for relevant skills and knowledge sets are provided below.

KNOWLEDGE AND SKILL CLASSIFICATION AND GROUPINGS

KNOWLEDGE		SKILLS	
Group	Knowledge Set	Group	Skill
Arts and Humanities	English Language	Content	Active Listening
	Fine Arts		Mathematics Skill
	Foreign Language		Reading Comprehension
	History and Archeology		Science
	Philosophy and Theology		Speaking
Business and Management	Administration and Management		Writing
	Administration	Process	Active Learning
	Customer and Personal Service		Critical Thinking
	Economics and Accounting		Learning Strategies
	Personnel and Human Resources		Monitoring
	Sales and Marketing	Complex Problem Solving	Complex Problem Solving
Communications	Communications and Media	Resource Management Skills	Management of Financial Resources
	Telecommunications		Management of Material Resources
Education and Training	Education and Training		Management of Personnel Resources
Engineering and Technology	Building and Construction		Time Management
	Computers and Electronics	Social Skills	Coordination
	Design		Instructing
	Engineering and Technology		Negotiation
	Mechanical		Persuasion
Health Services	Medicine and Dentistry		Service Orientation
	Therapy and Counseling		Social Perceptiveness
Law and Public Safety	Law and Government	Systems Skills	Judgment and Decision Making
	Public Safety and Security		System Analysis
Manufacturing and Production	Food Production		System Evaluation
	Production and Processing	Technical Skills	Equipment Maintenance
Mathematics and Science	Biology		Equipment Selection
	Chemistry		Installation
	Geography		Operation and Control
	Mathematics Knowledge		Operations Analysis
	Physics		Operations Monitoring
	Psychology		Programming
	Sociology and Anthropology		Quality Control Analysis
Transportation	Transportation		Repairing
			Technology Design
			Troubleshooting

Source: CEDBR, ONet

DETAILED AEROSPACE KNOWLEDGE RANKINGS			
Computers and Electronics	**Computer and Personal Service**	**Design**	**Engineering and Technology**
Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.	Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.	Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.	Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
Mathematics Knowledge	**Mechanical**	**Physics**	**Production and Processing**
Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.	Knowledge of machines and tools, including their designs, uses, repair, and maintenance.	Knowledge and prediction of physical principles, laws, their interrelationships, and applications to understanding fluid, material, and atmospheric dynamics, and mechanical, electrical, atomic and sub-atomic structures and processes.	Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.
DETAILED AEROSPACE SKILL RANKINGS			
Active Listening	**Complex Problem Solving**	**Critical Thinking**	**Operations Monitoring**
Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.	Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.	Watching gauges, dials, or other indicators to make sure a machine is working properly.
Quality Control Analysis	**Reading Comprehension**	**Science**	
Conducting tests and inspections of products, services, or processes to evaluate quality or performance.	Understanding written sentences and paragraphs in work-related documents.	Using scientific rules and methods to solve problems.	
Source: CEDBR, ONet and BLS-OEWS			

ONet has quantified the nebulous concept of knowledge and skill-based on the frequency of use and level of complexity. Both measures were ranked on a scale from 0 to 100. For tangible examples of this index: a physics complexity of 14 corresponds to using a crowbar to pry open a box, a complexity of 57 would be calculating the speed of a falling object, and a level of 85 would be designing a cleaner-burning gasoline engine. For mechanical knowledge, a complexity of 28 would be replacing the filters in a furnace, a complexity of 57 would be replacing the valve on a steam pipe, and a score of 100 would be performing an overhaul of an aircraft engine. It is important to note that levels of complexity for each task are internally consistent, not cross-comparable across knowledge sets. A task with a score of 57 in physics is not necessarily equally as complex as a task with a 57 in mechanical, as the scaling of complexity is indexed to each skill independently. These measures were multiplied together to create an aggregate intensity variable from 0 to 10,000.

A note on data quality: two conditions represent values of 0 in the base data: the first being that data is unavailable for an occupation-skill/knowledge measurement and the second being that a skill is irrelevant to an occupation. There are few examples of the former, and they are not typically core skills of those occupations, so it does not create an error in the ranking.

Two weightings have been used in this ranking. The first weighting is each occupation's fraction of the total labor force in each geography, accomplished by dividing employment by the total employment in that same area. The second weighting is each occupation's relevance to aerospace products and parts manufacturing.

The table below shows each occupation code's share of the aerospace products and parts manufacturing workforce. To create properly-weighted data for the rankings, a coefficient equal to this share was multiplied by each occupation's skill intensity variables for each geography. Omitted from this table, and therefore omitted from the ranking calculation, are all occupations representing <0.01% of employment in aerospace products and parts manufacturing, as they are irrelevant to analyzing this segment of the labor force. Altogether, 228 occupation codes were included in the calculations.

Methodology *(continued)*

AEROSPACE PRODUCTS AND PARTS MANUFACTURING EMPLOYMENT SHARE BY OCCUPATION, 2021

Occupation Code	% of Employment	Occupation Code	% of Employment	Occupation Code	% of Employment	Occupation Code	% of Employment
11-0000	7.20%	17-2051	0.17%	41-1012	0.02%	51-4023	0.07%
11-1011	0.08%	17-2061	0.29%	41-3091	0.05%	51-4031	0.61%
11-1021	1.08%	17-2071	1.88%	41-4011	0.17%	51-4032	0.07%
11-2021	0.15%	17-2072	1.18%	41-4012	0.35%	51-4033	0.85%
11-2022	0.23%	17-2081	0.06%	41-9031	0.17%	51-4034	0.31%
11-2032	0.02%	17-2111	0.17%	41-9099	0.01%	51-4035	0.23%
11-3012	0.09%	17-2112	4.96%	43-0000	5.46%	51-4041	4.05%
11-3013	0.17%	17-2131	0.52%	43-1011	0.32%	51-4051	0.07%
11-3021	0.58%	17-2141	2.90%	43-3021	0.03%	51-4061	0.04%
11-3031	0.34%	17-2199	1.85%	43-3031	0.26%	51-4062	0.02%
11-3051	1.30%	17-3012	0.03%	43-3051	0.04%	51-4071	0.19%
11-3061	0.45%	17-3013	0.20%	43-3061	0.16%	51-4072	0.27%
11-3071	0.17%	17-3019	0.01%	43-4051	0.31%	51-4081	0.58%
11-3111	0.01%	17-3021	0.91%	43-4071	0.03%	51-4111	0.55%
11-3121	0.18%	17-3023	0.41%	43-4151	0.04%	51-4121	0.75%
11-3131	0.03%	17-3024	0.04%	43-4161	0.06%	51-4122	0.07%
11-9041	1.69%	17-3025	0.04%	43-4171	0.04%	51-4191	0.14%
11-9121	0.01%	17-3026	0.57%	43-4199	0.01%	51-4192	0.13%
11-9199	0.60%	17-3027	0.28%	43-5032	0.04%	51-4193	0.17%
13-0000	11.04%	17-3028	0.08%	43-5061	1.48%	51-4194	0.07%
13-1041	0.17%	17-3029	0.59%	43-5071	1.47%	51-4199	0.08%
13-1051	0.36%	19-0000	0.47%	43-5111	0.03%	51-5112	0.01%
13-1071	0.58%	19-2031	0.02%	43-6011	0.29%	51-6031	0.01%
13-1075	0.03%	19-2032	0.05%	43-6014	0.39%	51-6091	0.05%
13-1081	1.60%	19-2041	0.01%	43-9021	0.03%	51-6093	0.06%
13-1082	0.92%	19-2099	0.13%	43-9061	0.37%	51-7011	0.05%
13-1111	1.13%	19-4031	0.04%	43-9199	0.03%	51-8021	0.04%
13-1121	0.01%	19-4099	0.01%	47-0000	0.64%	51-8031	0.02%
13-1141	0.05%	19-5011	0.17%	47-2031	0.02%	51-8099	0.01%
13-1151	0.35%	19-5012	0.03%	47-2111	0.27%	51-9021	0.07%
13-1161	0.29%	23-0000	0.09%	47-2141	0.06%	51-9022	0.10%
13-1199	1.43%	23-1011	0.07%	47-2152	0.08%	51-9023	0.04%
13-2011	0.62%	23-2011	0.02%	47-2211	0.18%	51-9031	0.02%
13-2031	0.10%	25-0000	0.01%	47-4041	0.01%	51-9041	0.05%
13-2051	0.77%	27-0000	0.44%	49-0000	7.18%	51-9051	0.06%
13-2054	0.01%	27-1013	0.01%	49-1011	0.25%	51-9061	4.69%
13-2099	0.04%	27-1014	0.03%	49-2091	1.28%	51-9111	0.06%
15-0000	8.77%	27-1021	0.05%	49-2093	0.02%	51-9123	0.01%
15-1211	1.98%	27-1024	0.05%	49-2094	0.14%	51-9124	1.04%
15-1212	0.46%	27-3031	0.06%	49-3011	3.53%	51-9161	2.51%
15-1231	0.07%	27-3041	0.05%	49-3023	0.02%	51-9162	0.42%
15-1232	0.21%	27-3042	0.17%	49-9021	0.13%	51-9191	0.13%
15-1241	0.24%	27-3099	0.01%	49-9041	0.85%	51-9192	0.02%
15-1242	0.07%	27-4021	0.01%	49-9043	0.09%	51-9198	0.25%
15-1243	0.01%	29-0000	0.04%	49-9044	0.03%	51-9199	0.40%
15-1244	0.29%	29-1141	0.02%	49-9071	0.69%	53-0000	2.08%
15-1251	0.19%	29-1229	0.01%	49-9096	0.01%	53-1047	0.09%
15-1252	4.32%	33-0000	0.34%	49-9098	0.02%	53-2011	0.01%
15-1253	0.26%	33-1099	0.04%	49-9099	0.07%	53-2012	0.21%
15-1254	0.02%	33-2011	0.06%	51-0000	34.04%	53-2022	0.03%
15-1255	0.04%	33-2021	0.02%	51-1011	2.09%	53-3032	0.14%
15-1299	0.18%	33-9021	0.03%	51-2011	6.07%	53-3033	0.08%
15-2031	0.30%	33-9032	0.13%	51-2028	1.56%	53-6051	0.20%
15-2041	0.01%	33-9099	0.05%	51-2031	0.59%	53-7051	0.11%
15-2051	0.10%	35-0000	0.01%	51-2041	0.16%	53-7062	0.53%
17-0000	21.15%	37-0000	0.27%	51-2051	0.30%	53-7064	0.05%
17-2011	3.97%	37-2011	0.26%	51-4021	0.02%	53-7065	0.45%
17-2041	0.02%	41.0000	0.78%	51-4022	0.03%	53-7199	0.02%

Source: BLS-OEWS

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About the Center

This report was produced by The Center for Economic Development and Business Research (CEDBR), part of the W. Frank Barton School of Business at Wichita State University. We are a reliable resource for local, state and national demographic and economic data. We strive to enhance economic growth and development through our applied and objective research, which makes us an active and well-respected partner with economic development leaders.