

GREATER OKLAHOMA CITY REGION AEROSPACE INDUSTRY

Industry Survey and Economic Impact Assessment

June 2016

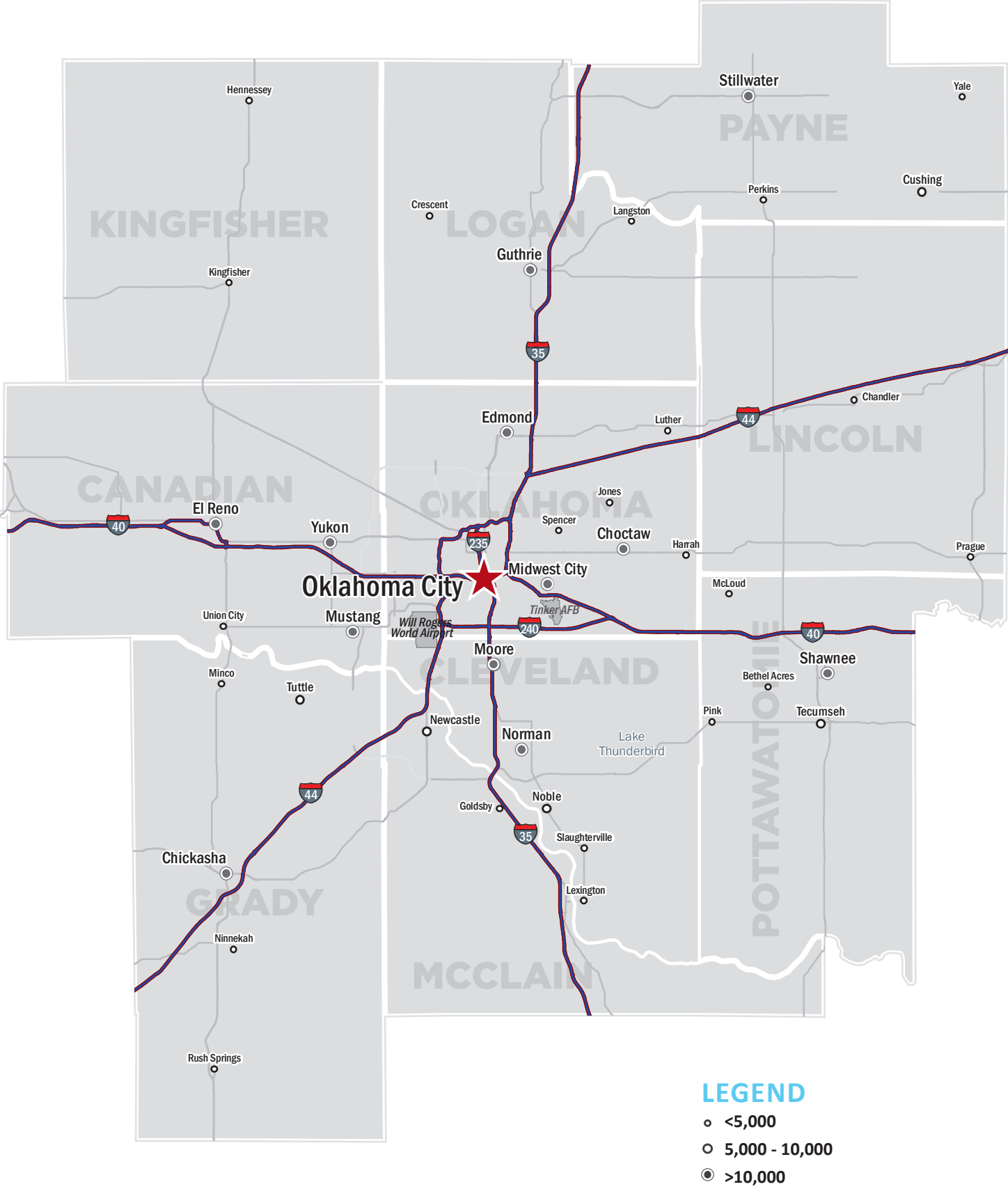
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The Greater Oklahoma City Region



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Introduction

The State of Oklahoma and the Greater Oklahoma City region continue to build upon a rich tradition in aerospace. From early aircraft testing and manufacturing to its more recent distinction as a major hub for maintenance, repair, and overhaul (MRO) of aircraft, Oklahoma remains a key component of the U.S. aerospace infrastructure. The Greater Oklahoma City region serves as the center of aerospace activity in the state and continues to attract significant aerospace industry development.

State and local policymakers recognize the substantial and long-lasting economic role played by the aerospace industry and actively work to enhance the development and expansion of the industry. A priority in the state's current economic development strategy is the expansion of the state's existing aerospace cluster.¹ Local economic development officials in the Greater Oklahoma City region likewise target development of the region's existing aerospace assets.

To facilitate a better understanding of the economic role played by the industry, this report serves as a benchmark evaluation of the current size, composition, and economic contribution of the aerospace sector in the 10-county Greater Oklahoma City region in 2015.

The first section of the report provides an in-depth economic profile of establishments in the Greater Oklahoma City region that are directly and substantially engaged in the provision of aerospace-related goods and services. Approximately 236 public and private sector establishments comprise the aerospace industry in the region. These employers produce an estimated \$4.9 billion in goods and services and employ more than 36,600 workers earning \$2.7 billion in labor income. Aerospace activity is highly concentrated in Oklahoma County but is spread across all 10 counties in the region.

The second section examines the composition of the aerospace labor force in the region. Oklahoma continues to rank among the top 20 states for the number of workers in most key aerospace occupations. Wages for many aerospace occupations in Oklahoma are competitive relative to other states and reflect the comparatively low overall cost-of-living in the state. The findings also illustrate the challenges faced when comparing Oklahoma's aerospace sector to other states. Existing state-level studies of aerospace activity rarely capture the full breadth of the industry in Oklahoma. Often overlooked are the large government installations and the diverse maintenance, repair, and overhaul (MRO) infrastructure that characterize the industry in the state and the Greater Oklahoma City region.

The next section of the report examines the role of aerospace-related federal contracting activity at the state level and in the Greater Oklahoma City region. In fiscal year 2015, a total of \$2.76 billion in federal contracts were issued for performance within Oklahoma, with slightly more than half (\$1.41 billion) deemed directly for aerospace-related goods and services. For the 10-county Greater Oklahoma City region, \$1.19 billion in contracts are directly aerospace-related.

The final section examines the broader spillover, or ripple, economic effects that the aerospace industry generates across the Greater Oklahoma City region. Estimates indicate that the industry indirectly supports the jobs of an additional 31,000 workers in the region earning \$1.4 billion in income, and the production of \$3.3 billion in total goods and services. Through both the direct activity of the industry and spillover effects to the broader economy, establishments engaged in aerospace in the Greater Oklahoma City region support approximately 67,600 jobs, \$4.1 billion in labor income, and the production of \$8.2 billion in goods and services in 2015.

Scope of Research

To better understand the size and structure of the Greater Oklahoma City aerospace industry, this report provides a comprehensive economic profile of establishments in the region that are directly and substantially engaged in the provision of aerospace-related goods and services.

The scope of the process for compiling the industry profile is as follows:

Definition of Aerospace. In broadest terms, the *aerospace* industry comprises various forms of manmade air and space flight, along with the associated areas of manufacturing, maintenance, research and development, and engineering activities underlying air and space travel.² The *aviation* sector is considered a subset of aerospace, referring only to the production, maintenance, development, and application of vehicles capable of atmospheric flight. For convenience, aviation is often divided into civil and military aviation, with civil aviation further subdivided into commercial and general. Throughout the report, *aerospace* is used to denote all aspects of the industry, including the aviation sector.

Study Region. The profile of the industry is developed for the 10-county Greater Oklahoma City region (see *10-county Map on inside front cover*). The region is defined by a contiguous area in central Oklahoma that includes Canadian, Cleveland, Grady, Kingfisher, Lincoln, Logan, McClain, Oklahoma, Payne, and Pottawatomie counties.³ Oklahoma County is roughly the geographic center of the region and represents the core of the industry. The 10-county region includes the seven component counties of the Oklahoma City Metropolitan Statistical Area (MSA) plus Kingfisher County to the south, Pottawatomie County to the east, and Payne County to the north. In compiling economic impact estimates for the industry, direct and spillover economic effects are estimated for the same 10-county region and exclude activities located outside the region such as the aerospace industry in the Tulsa area.

Data Sources. Aerospace establishments are identified using a proprietary database⁴ of employment and revenue for businesses and public sector entities operating in the 10-county region. Firms are selected primarily using NAICS and SIC industry codes affiliated with aerospace, but are also identified using aviation-related keywords within firm names, as well as known addresses for aviation hubs in the area. The database is supplemented by adding a small number of establishments identified through discussions with aerospace industry officials and recent news reports. Airports and heliports are identified using online FAA databases and are included in the industry profile only if actively operated.

The initial set of aerospace establishments is cleaned manually for duplicate entries, name changes, mergers and relocations, and other recognized reporting errors. Each entity is evaluated through a combination of direct phone contact, online search, and discussion with industry experts to determine if it is 1) directly and substantially engaged in the provision of aerospace-related goods and services and 2) still actively operating within the region. Firms that are only indirectly related to the industry or serve in a minor support capacity are excluded. The role played by firms that indirectly support the industry is nonetheless important and is captured in part through estimated economic spillover effects in the final section of the report.

Data Coverage. Both private and public sector employers are included, as well as both military personnel and civilian contract workers at federal installations. The data are collected at the establishment level and represent unique operating locations. A small number of individual firms operate multiple establishments (e.g. the FAA maintains locations at multiple airports in the region).

Economic Measures. The industry profile and other estimates compiled in the report are based on estimates of the level of employment, labor income, and output for each aerospace firm. Employment covers primarily wage and salary workers but includes some self-employed proprietors reported in the data. Labor income is a comprehensive measure of earnings and includes both employee compensation (wages and salaries plus other supplements to wages and salaries) and proprietor's self-employment income.

Output generally represents the market value of all goods and services produced and is closely related to total revenue for most establishments. For most service-providing firms, output is assumed equal to revenue. Efforts are made to adjust output to reflect the producer's cost for manufacturing firms. When output is not available for a firm, an estimate is formed using either the output per employee from similar firms in the database where available or the output per employee for the corresponding industry group from the IMPLAN input-output model.

Estimates of employment and output are obtained primarily from the proprietary firm-level database used in the initial identification of aerospace firms. The reported employment and output estimates for each firm are evaluated to determine whether 1) total activity accurately reflects the current level of operation at each firm and 2) activity per worker is consistent with similar firms operating in the region. Adjustments are made to the database to reflect information provided by individual firms in phone contacts, feedback from industry officials, information in public reports, and news reports of layoffs, mergers, and relocations.

Labor income is estimated using either information provided by the individual firms in phone contacts, information in public reports, feedback from industry officials, or average labor income per employee for the corresponding industry sector from the IMPLAN input-output model. Labor income for both Tinker AFB and the FAA Center are derived from internal reports provided by representatives at each facility.

Industry Groupings. Aerospace establishments in the region are divided into five major subgroups:

- 1) **Government** – Tinker Air Force Base (AFB), Federal Aviation Administration's (FAA) Mike Monroney Aeronautical Center, and other federal and state government entities including air traffic control.
- 2) **Maintenance, Repair, and Overhaul (MRO)** – firms engaged in aircraft maintenance, repair, and refurbishment of aircraft.
- 3) **Air Transportation** – civilian airports, airlines providing scheduled passenger transportation, air cargo and courier services, aircraft ground support services, aircraft dealers, plane storage, car rental at airports, and other related services.
- 4) **Manufacturing, Engineering, and Consulting** – aircraft and aircraft part manufacturing, engineering and design services, and aviation-related consulting.
- 5) **All other sectors** – primarily aerospace education (including flight training schools), aerial spraying, and aerial photography.

These five subgroups are believed to capture the essential features of the current structure of the Greater Oklahoma City region aerospace industry.

Greater OKC Region Aerospace Industry

Industry Profile

Figure 1 provides an economic profile of the Greater Oklahoma City region aerospace sector in 2015. An estimated 236 public and private sector establishments in the region are directly engaged in aerospace activity. These employers produce an estimated \$4.9 billion in goods and services and employ more than 36,400 workers earning \$2.67 billion in labor income in 2015.

Average labor income in aerospace is approximately \$72,818 per worker in 2015. For comparison, income per worker in the industry is 36 percent higher than the overall average of \$53,542 for all industries statewide and 30 percent higher than the \$55,944 average for all industries in the 10-county Oklahoma City region.⁵

Figure 1. Greater Oklahoma City Region Aerospace Industry (2015)

Industry Subgroup	Establish-ments	Employ-ment	Output (\$Mil)	Labor Income (\$Mil)
Government	16	29,392	\$3,218.7	\$2,108.0
Tinker AFB (military and Federal civilian)	1	23,726	2,204.2	1,476.4
FAA Mike Monroney Aeronautical Center	2	5,415	989.1	613.4
Other State/Federal Government	13	251	25.3	18.2
Maintenance, Repair, and Overhaul (MRO)	78	4,763	1,299.2	370.3
Air Transportation (Airports, aircraft sales, and air travel)	102	1,652	242.9	111.7
Manufacturing, Engineering, and Consulting	22	642	113.1	66.7
Other (education, spraying, and aerial photography)	18	162	19.2	9.2
Total	236	36,611	\$4,893.1	\$2,665.9

Source: infoUSA, Tinker AFB internal reports, FAA Monroney Center internal reports, and direct verification of data

The results for each of the five major subgroups of the aerospace sector are described in the following sections.

Government. While only 16 governmental entities are part of the Greater Oklahoma City region aerospace sector, these entities serve as the core of activity in the area. Tinker AFB and the FAA Center are the two largest employers with a combined 29,141 military, federal civilian, and civilian contract workers who earn labor income of approximately \$2.1 billion annually.⁶ The two facilities produce a combined \$3.2 billion in output of goods and services, roughly two-thirds of total aerospace industry output in the region. Average labor income per worker at the two facilities is \$72,137 in 2015.

Tinker AFB is the largest aerospace facility in the region and one of three strategic military MRO sites (along with Warner Robins AFB, Ga. and Hill AFB, Utah) operated by the Air Force. Constructed in 1941, Tinker is the largest single-site employer in Oklahoma with a reported 23,726 military, federal civilian, and contract personnel working at the base. The workforce at Tinker AFB consists of a reported 5,842 military personnel and 17,884 federal civilian employees and contractors.⁷ Workers at Tinker earned a total of \$1.48 billion in labor income in 2015, or \$62,226 per worker.

The FAA's Monroney Center was established in 1946 as a centralized training and logistics facility and has since expanded to serve as a multi-tenant campus employing an estimated 5,412 federal civilian workers and contractors in 2015 earning \$613 million in labor income. The highly-skilled workers at the Center

provide training and logistics services and other aviation safety-related and business support products and services and earn average labor income of \$113,269 annually.

Thirteen other government entities operating in the region include FAA air traffic control, U.S. Customs, Air National Guard, and the Civil Air Patrol. These entities employ 251 workers earning \$18.2 million in labor income in 2015, an average of \$72,670 per worker.

Maintenance, Repair, and Overhaul (MRO). Oklahoma City continues to develop as a key domestic hub for aircraft MRO activity. Estimates indicate that 78 firms employing 4,763 workers provide MRO services in the Greater Oklahoma City region. These firms produce \$1.3 billion in output of goods and services annually and provide more than \$370 million in labor income to employees. Workers in the sector earn an average of \$77,741 in labor income annually.

MRO firms employing more than 100 workers in the Oklahoma City region include Boeing, AAR Aircraft Service, Field Aerospace, General Dynamics, Pratt and Whitney, and Tetra Tech EMC.⁸ Boeing's ongoing expansion into the Oklahoma City area makes it the third largest aerospace employer in the region with 2,412 employees earning a total of \$202 million in labor income annually.

The greatest concentration of MRO activity in the region is located at or adjacent to Tinker AFB base. The significant scale of the military MRO operations at Tinker AFB has attracted a large number of aerospace-related firms to the installation and surrounding areas. In 2015, an estimated 30 firms employing 3,289 workers provided MRO services to the Air Force.

The second largest concentration of MRO activity is centered around the major commercial air carriers at Will Rogers World Airport. The airport is home to 7 MRO firms with 982 workers who specialize in commercial airliners.

A smaller MRO hub is located at Wiley Post Airport, a reliever airport for Will Rogers and an active corporate and business aviation hub. Wiley Post Airport has 17 MRO providers that employ 266 workers specializing in smaller commercial and general aviation aircraft.

Local MRO activities are similarly present at many of the regional general aviation airports across the 10-county region. An additional 24 MRO firms with 226 workers are spread across the Oklahoma City region, typically located near small general aviation airports.

Air Transportation. A total of 102 establishments employing 1,652 workers provide air transportation services in the Greater Oklahoma City region. These establishments produce an estimated \$243 million in output of goods and services annually and include civilian airports, airlines providing scheduled passenger transportation, air cargo and courier services, airport operation and security, aircraft ground support services, airport car rental, aircraft dealers, and plane storage. Air transportation establishments paid an estimated \$112 million in labor income with average annual earnings of \$67,630 per worker.

Civil aviation airports are a key component of the air transportation sector. A total of 59 public and private civil aviation airports in the region are registered with the FAA at year-end 2015. Only 34 of the 59 registered airports are actively operated, with 19 open for public use and 15 for private use.⁹ Regional airports are operating in all 10 counties comprising the Greater Oklahoma City region. The number of active airports by county includes five in Lincoln and McClain counties; four in Canadian, Cleveland, and Grady counties; three in Logan, Oklahoma, and Payne counties; two in Pottawatomie county; and one in Kingfisher county.

Will Rogers World Airport in Oklahoma City is the largest public airport in the state and serves as the hub for commercial aviation services in the region. Six carriers currently offer scheduled air passenger service at Will Rogers – Alaska Air, Allegiant, American, Delta, Southwest, and United – and report approximately

1.9 million revenue passenger enplanements in 2015. The grounds of Will Rogers are home to 70 tenant establishments that employ over 12,000 workers, many of which are aviation-related.¹⁰ Major tenants include the FAA's Monroney Center, AAR Aircraft Services-Oklahoma, Federal Bureau of Prisons Transfer Center, U.S. Customs & Border Protection-National Air Training Center, Southwest Airlines Reservation Center, and the Metro Tech Aviation Career Center.

Following Will Rogers, regional airports with a small number of commercial enplanements each year include Stillwater Regional, Max Westheimer, Wiley Post, and Shawnee Regional. Will Rogers is also the busiest airport based on total flight activity in 2015, followed by Wiley Post in Oklahoma City, Stillwater Regional, Max Westheimer in Norman, Clarence Page Airport near Yukon, and El Reno Regional.

The region is also home to 25 private-use heliports located in six of the Greater Oklahoma City region's 10 counties. Six heliports are publicly-owned, 18 are privately-owned, and one is operated by the Oklahoma Army National Guard.

Manufacturing, Engineering, and Consulting. Approximately 22 establishments are engaged in aircraft manufacturing, engineering, and consulting in the Oklahoma City region and produce \$113 million in total output. These firms employ 642 workers and provide total annual labor income of \$67 million to workers. Annual labor income in the sector averages \$103,960 per worker.

Nine firms employing 356 workers are engaged in the manufacture of aircraft parts and components. These firms produce an estimated \$70 million in output, or more than two-thirds of the total output produced by the overall group. The largest manufacturing firms include ASCO Aerospace and Pro-Fab. Thirteen firms are engaged in engineering and consulting services and employ 286 workers receiving total labor income of \$21 million annually. The largest engineering and consulting firms include Frontier Electronic Systems, Southwest Research Institute, and HEBCO.

Other Aerospace. A final group of 18 firms provides a range of other aerospace-related goods and services. This activity primarily includes aerospace education (including flight training schools), aerial spraying, and aerial photography. These firms employ 162 workers earning \$9.2 million in labor income and produce \$19 million in annual output of goods and services.

Aerospace Employment by County

Figure 2 partitions the aerospace industry profile among the 10 counties comprising the Oklahoma City region. While all counties have some aerospace presence, the industry's core remains highly concentrated in Oklahoma County. Oklahoma County is home to nearly two-thirds of the region's aerospace employers, over 97 percent of the jobs, and more than 93 percent of the total output produced by the sector.

Tinker AFB, the FAA Center, and Will Rogers World Airport are all located within Oklahoma County. Most of the remaining large employers in the region such as Boeing and the Southwest Airlines Reservation Center are similarly located in Oklahoma County. Most of the jobs located outside Oklahoma County are in aircraft maintenance and air transportation and primarily support local general aviation. Among the other counties, Canadian, Cleveland, and Payne have the largest aerospace employment bases.

Figure 2. Greater OKC Region Aerospace Industry by County (2015)								
County	Establishments		Employment		Output (\$Mil)		Total Employment	Aerospace as % of Total Employment
Canadian	13	5.5%	234	0.6%	38.5	0.8%	53,240	0.4%
Cleveland	17	7.2%	138	0.4%	23.9	0.5%	129,516	0.1%
Grady	6	2.5%	13	0.0%	3.4	0.1%	23,819	0.1%
Kingfisher	5	2.1%	27	0.1%	3.0	0.1%	10,667	0.3%
Lincoln	8	3.4%	60	0.2%	110.6	2.3%	15,127	0.4%
Logan	7	3.0%	55	0.2%	20.4	0.4%	24,730	0.2%
McClain	7	3.0%	20	0.1%	20.0	0.4%	14,373	0.1%
Oklahoma	150	63.6%	35,611	97.3%	4,591.6	93.8%	586,575	6.1%
Payne	14	5.9%	369	1.0%	63.8	1.3%	51,912	0.7%
Pottawatomie	9	3.8%	84	0.2%	17.9	0.4%	34,638	0.2%
Greater OKC Region	236	100.0%	36,611	100.0%	\$4,893.1	100.0%	944,597	3.9%

Notes: Total employment in each county is based on BEA's measure of total employment (wage & salary + proprietors) and includes military personnel.
Source: Bureau of Economic Analysis (BEA), RegionTrack Inc., InfoUSA Database, Tinker AFB internal reports, FAA internal reports, and direct verification of data.

Figure 2 further illustrates the contribution of aerospace employment as a share of the total workforce in each county in the region. The 36,611 jobs in the sector account for 3.9 percent of the nearly 1 million total jobs in the 10-county region. Oklahoma County, with 35,611 aerospace jobs, has the highest concentration with 6.1 percent of total county employment directly attributed to the aerospace sector. In the remaining counties, the industry generally accounts for less than one percent of total employment.

State-Level Aerospace Industry Rankings

The unique structure of Oklahoma's aerospace industry makes comparisons of relative size and composition with other states difficult. Existing surveys of the industry are typically based on narrowly-defined industry definitions that fail to capture the full breadth of firms engaged in aerospace activities both in the state and in the Greater Oklahoma City region.

Existing studies also tend to capture mostly the private side of the industry and the manufacturing component of the industry, neither of which are among the strengths of the sector in the Greater Oklahoma City region. Commonly overlooked are the large federal aviation-related installations and the diverse MRO infrastructure located in the state and region.

Hence most comparative state-level studies of aerospace tend to understate the size and overall economic role played by the sector in the state. This is of particular concern when evaluating the size of the industry in the Greater Oklahoma City region, which serves as home to two major aviation-related federal installations – Tinker AFB and the FAA's Monroney Aeronautical Center.

State-Level Aerospace and Defense Industry Rankings – Deloitte. A recent tabulation of state-level aerospace and defense activity by Deloitte attempts to apply a broader definition of the industry to better reflect the various industry structures present across the states, including the level of federal activity. Included in the definition of aerospace and defense used in the report are the traditional aerospace manufacturing sectors, a number of aerospace services sectors, arms and ammunition, communications equipment, research and development, and some civilian Department of Defense employees.¹¹ However, excluded from the report are workers in the air transportation sector and in aircraft MRO. Military personnel are excluded as well. While including much of the federal sector, the report does not account for the substantial amount of MRO activity taking place across the Greater Oklahoma City region.

The state-level results from Deloitte shown in Figure 3 give Oklahoma only a mid-tier ranking for aerospace and defense industry size. The state is home to a reported 10,930 aerospace and defense workers (29th). These workers collectively earn a reported \$750 million in income annually (31st) with an average wage of \$68,863 per worker (40th).

A comparison of the Deloitte results for the state with the profile for the Greater Oklahoma City region in Figure 1 illustrates the difficulty in capturing the breadth of the industry as it is structured. The reported workforce for the state is less than one-third of the aerospace employment and labor income captured in the profile for the Greater Oklahoma City region alone. Despite the broader industry definition used in the report, it provides an incomplete measure of the size of Oklahoma's overall aerospace industry. For Oklahoma, the survey captures much of the private sector aerospace industry in Tulsa and private contractors servicing Tinker AFB in Oklahoma City, but overlooks the substantial federal civilian MRO workforce at Tinker AFB as well as activity at the FAA Center.

The Deloitte report nevertheless provides a highly useful gauge for comparing the concentration of *non-MRO and commercial aviation-related* aerospace activities across the states and accurately illustrates Oklahoma's middle-tier presence on that measure relative to competing states.

Across the states, aerospace and defense employment remains highly concentrated in a top tier of three states that includes California, Washington, and Texas, all with more than 100,000 workers. These states tend to have large aerospace manufacturing sectors, space-related installations, and large Air Force facilities.

A second tier of five states includes Florida, Arizona, Connecticut, Kansas, and Virginia, all with approximately 43,000-57,000 aerospace and defense workers. These states also tend to have a diverse set of private and public sector aerospace establishments.

The report further examines industry trends and indicates that overall aerospace and defense hiring remains hampered by pullbacks in U.S. defense spending. Total aerospace and defense employment is down 9.4 percent between 2010 and 2014, a loss of nearly 140,000 jobs.

However, the two arms of the industry - aerospace and defense - as defined in the report have followed very different paths. The defense side of the industry suffered significant losses traced to federal budget cuts, with employment down 18 percent (loss of 185,000 jobs) between 2010 and 2014. Conversely, on the aerospace side, hiring has remained strong and increased by 17.2 percent (gain of 57,000 jobs) in the period. Aerospace job gains offset only roughly one-third of the large job losses on the defense side in the period.

The report projects a turnaround in hiring in aerospace and defense in the next few years, led primarily by a rebound in the U.S. defense budget due to continued national security threats. This suggests that a high concentration of federal activity could benefit both the state and the Greater Oklahoma City economies in the projected scenario.

Figure 3. Aerospace & Defense Industry Rankings (2014)

State	Employment	Payroll (\$mil)	Average Wages
Alabama	27,510 15	\$2,186.6 18	\$79,483 30
Alaska	1,582 48	107.9 47	68,213 41
Arizona	50,641 5	5,117.6 5	101,057 10
Arkansas	7,611 35	466.7 37	61,315 47
California	183,356 1	20,015.5 1	109,162 3
Colorado	20,356 18	2,318.9 17	113,916 2
Connecticut	50,327 6	5,159.4 4	102,518 9
Delaware	1,727 46	143.2 45	82,894 24
District of Col.	3,236 42	283.6 41	87,637 17
Florida	57,183 4	4,595.7 6	80,369 29
Georgia	36,947 10	3,179.7 11	86,062 19
Hawaii	2,699 43	210.2 43	77,886 32
Idaho	2,225 45	160.4 44	72,061 37
Illinois	18,181 21	1,642.8 19	90,359 14
Indiana	19,826 19	1,367.7 22	68,985 39
Iowa	14,969 24	1,394.4 21	93,151 12
Kansas	45,134 7	3,650.8 9	80,888 28
Kentucky	9,105 33	579.2 35	63,606 45
Louisiana	18,638 20	1,349.8 23	72,418 36
Maine	10,849 30	818.4 30	75,438 33
Maryland	28,736 14	3,065.3 12	106,672 6
Massachusetts	32,499 13	3,841.9 7	118,215 1
Michigan	17,707 22	1,450.0 20	81,888 27
Minnesota	12,979 26	1,103.3 25	85,010 21
Mississippi	15,791 23	1,064.0 26	67,382 42
Missouri	25,052 16	2,599.7 15	103,772 8
Montana	1,235 49	73.1 49	59,213 48
Nebraska	2,273 44	124.3 46	54,679 51
Nevada	3,364 41	241.7 42	71,836 38
New Hampshire	9,463 31	1,029.3 27	108,769 4
New Jersey	22,217 17	2,376.8 16	106,983 5
New Mexico	7,544 37	624.4 34	82,773 25
New York	37,727 9	3,449.1 10	91,423 13
North Carolina	13,640 25	1,134.8 24	83,197 23
North Dakota	1,633 47	102.4 48	62,736 46
Ohio	32,779 12	2,905.6 14	88,645 15
Oklahoma	10,930 29	752.7 31	68,863 40
Oregon	8,187 34	673.8 33	82,303 26
Pennsylvania	34,611 11	3,020.1 13	87,261 18
Rhode Island	4,027 39	301.4 40	74,836 35
South Carolina	11,409 27	891.6 29	78,145 31
South Dakota	862 50	47.9 50	55,564 50
Tennessee	9,424 32	706.3 32	74,946 34
Texas	104,240 3	9,997.0 3	95,904 11
Utah	11,174 28	937.0 28	83,857 22
Vermont	3,648 40	312.4 39	85,632 20
Virginia	42,977 8	3,785.2 8	88,077 16
Washington	126,194 2	13,384.6 2	106,064 7
West Virginia	5,046 38	337.1 38	66,801 43
Wisconsin	7,545 36	485.7 36	64,373 44
Wyoming	423 51	24.1 51	56,968 49
Total	1,232,587	\$117,653	\$93,818

Source: U.S. Aerospace and Defense Labor Market Study, Deloitte LLP, Feb. 2016.

Aerospace Manufacturing Attractiveness

A recent analysis of the aerospace sector by PricewaterhouseCoopers (PwC) provides an alternative view of the industry designed to measure the attractiveness of each state as a location for highly coveted aerospace manufacturing expansion projects.

Attractiveness is based on four measures: 1) operating costs (including wages), 2) existing aerospace industry size, 3) effective tax rates, and 4) educational attainment. While the study attempts to translate these measures into indicators of aerospace manufacturing location, they are equally as useful as a basic set of measures of overall aerospace market attractiveness.

Oklahoma receives fairly strong marks on all four components in the PwC study and is given an overall ranking of 16th relative to the other states (see Figure 4). Across the four components, Oklahoma ranks in the top 10 on both effective tax rate (7th) and operating costs (9th). These rankings are consistent with ongoing efforts within the state to reduce the overall business tax burden as well as offer attractive incentives to the aerospace industry. Only a few other states including Missouri, South Carolina, and South Dakota offer a similarly attractive environment of operating costs and tax rates.

However, Oklahoma receives only mid-tier rankings on both existing industry size (37th) and educational attainment (37th). The industry size ranking is typical of studies that overlook the breadth of the industry in the state. The low ranking in educational attainment is more descriptive of the broader state workforce than the workforce available to support the aerospace sector. The state's current economic development strategy, which targets both educational attainment and growth in the aerospace sector, reflects both of these concerns.

The top ten states for aerospace manufacturing attractiveness represent a diverse mix of traditional aerospace locales, manufacturing powers, and low cost/tax states including Florida, Michigan, Ohio, Utah, Virginia, Georgia, New York, Texas, Missouri, and North Carolina.

Figure 4. PwC State Aerospace Manufacturing Attractiveness Rankings

State	Taxes	Operating Expenses	Industry Size	Education	Overall
Alabama	27	15	18	34	22
Alaska	30	49	42	44	50
Arizona	24	35	23	20	28
Arkansas	40	9	24	47	39
California	34	46	6	4	20
Colorado	12	47	12	8	13
Connecticut	32	50	19	14	33
Delaware	50	43	26	41	49
Florida	14	21	5	12	1
Georgia	8	31	11	16	6
Hawaii	9	44	39	27	37
Idaho	21	6	29	43	27
Illinois	47	12	7	6	11
Indiana	22	18	15	32	18
Iowa	49	4	46	33	41
Kansas	38	37	15	23	32
Kentucky	29	3	14	39	16
Louisiana	23	18	42	35	36
Maine	45	25	30	35	42
Maryland	16	44	28	7	23
Massachusetts	37	42	10	2	21
Michigan	10	25	3	18	2
Minnesota	44	36	13	11	29
Mississippi	11	13	33	48	30
Missouri	4	7	34	24	9
Montana	18	1	39	38	25
Nebraska	31	29	49	28	43
Nevada	1	31	48	42	40
New Hampshire	48	41	38	25	48
New Jersey	41	48	27	3	37
New Mexico	35	21	50	40	46
New York	20	28	17	1	6
North Carolina	25	9	22	15	10
North Dakota	19	38	41	44	44
Ohio	26	18	1	17	3
Oklahoma	7	9	32	37	16
Oregon	36	21	21	19	26
Pennsylvania	46	27	2	12	18
Rhode Island	43	40	31	29	45
South Carolina	13	2	36	29	14
South Dakota	1	13	47	46	31
Tennessee	15	7	34	26	15
Texas	39	16	4	9	8
Utah	5	29	7	22	4
Vermont	42	38	37	29	46
Virginia	6	34	19	5	5
Washington	28	31	7	10	12
West Virginia	17	4	44	50	33
Wisconsin	33	17	25	20	23
Wyoming	1	21	45	49	35

Notes: Ranking of 1 is most attractive, 50 is least attractive.

Source: PricewaterhouseCoopers (PwC) 2015 Aerospace Manufacturing Attractiveness Rankings

Few states with a high effective tax rate are ranked among the overall leaders in the PwC report. Five of the top ten states overall are ranked among the top ten based on lowest effective tax rate, while nine of the top ten states overall are ranked in the top half of states based on low tax rates.

Also of note is that the states with the largest existing aerospace sectors are generally not the highest ranked destinations for aerospace manufacturing activity overall according to the PwC evaluation. Only five of the ten highest-ranked states overall are listed among the top ten based on the industry size component. The traditional aerospace states of Washington (12th), California (20th), Arizona (28th), and Kansas (32nd) are not among the top ten and receive relatively low rankings on at least two of the four component measures. This is consistent with the significant relocation of aerospace jobs by Boeing from both Washington and Kansas to the Greater Oklahoma City region in recent years.

Aerospace Labor Force in the Greater OKC Region

The ability of the Greater Oklahoma City region to meet the aerospace industry's future expansion needs will depend largely upon the availability of a highly skilled workforce. This section of the report provides a detailed view of the existing aerospace workforce in the region. Employment and wages for several key aerospace-related occupations in Oklahoma are examined relative to other states. The report also provides a detailed view of the workforce at both Tinker AFB and the FAA's Monroney Center. These two federal facilities employ a large, highly skilled labor force with occupations reaching across most areas of aerospace.

Occupation-Based Workforce Measures

The availability and wage cost of aerospace workers plays a key role in the relative competitiveness of the states for future industry growth. The Bureau of Labor Statistics (BLS) provides data on employment levels and average annual wage rates by detailed occupation covering both private sector and federal civilian government workers in aerospace-related jobs.

Aerospace Employment Comparison. Figures 7 and 8 provide a state-level comparison of employment levels and wage rates across several key aerospace occupations. The large, top-tier aerospace states of California, Texas, Arizona, Florida, Washington, and Georgia continue to lead in number of employees in most aerospace occupational categories. These states tend to have both significant aerospace manufacturing infrastructure and large-scale federal and military installations.

Oklahoma currently ranks 18th among the states with 820 aerospace engineers (see Figure 7). The number of aerospace engineers in a state is closely related to the level of research and development, manufacturing, and space-related activity taking place. The Oklahoma City metropolitan area is home to a reported 480 of the state's 820 aerospace engineers, with recent gains led by Boeing's ongoing expansion in the region.¹² Current state incentives to attract aerospace engineers to Oklahoma include a direct tax rebate of up to

Figure 7. Key Aerospace Industry Occupations and Wage Rates by State (2015)

Aerospace Engineers (SOC 17-2011)			Aerospace Engineering & Operations Technicians (SOC 17-3021)			Aircraft Mechanics and Service Technicians (SOC 49-3011)			Avionics Technicians (SOC 49-2091)		
State	Jobs	Annual Wages	State	Jobs	Annual Wages	State	Jobs	Annual Wages	State	Jobs	Annual Wages
1 California	12,950	\$116,500	1 California	2,110	\$73,210	1 Texas	16,540	\$58,300	1 California	1,970	\$68,970
2 Washington*	8,620	132,610	2 Texas	900	60,150	2 California	13,330	64,170	2 Florida	1,790	57,290
3 Texas	6,500	108,990	3 Arizona	780	50,470	3 Florida	12,010	55,770	3 Texas	1,630	55,070
4 Ohio	4,850	107,240	4 Georgia	730	68,370	4 Georgia	8,470	64,780	4 Georgia	1,540	60,830
5 Alabama	4,200	109,980	5 Ohio	430	72,540	5 Arizona	4,590	58,740	5 Washington	1,390	75,020
6 Maryland	2,920	122,450	6 Maryland	420	69,530	6 Washington	4,550	70,200	6 Alabama	770	61,700
7 Kansas	2,500	100,500	7 Kansas	410	60,480	7 N. Carolina	4,060	55,160	7 Kansas	700	58,330
8 Florida	2,400	105,080	8 Colorado	390	74,990	8 Oklahoma	3,570	50,170	8 Arizona	640	52,720
9 Virginia	2,350	131,470	9 New Jersey	250	60,130	9 Illinois	3,550	60,340	9 Pennsylvania	500	63,360
10 Georgia	2,320	105,060	10 Alabama	220	62,290	10 Ohio	3,510	60,940	10 Oklahoma	470	52,540
11 Colorado	2,160	132,670	11 Virginia	220	60,760	11 New York	3,120	61,840	11 Tennessee	460	48,770
12 Connecticut	2,000	107,050	12 Louisiana	150	66,550	12 Alabama	2,900	63,980	12 Ohio	430	57,540
13 Michigan	1,400	94,370	13 N. Mexico	150	62,780	13 Pennsylvania	2,830	55,950	13 N. Carolina	320	53,880
14 Massachusetts	1,290	110,800	14 Minnesota	130	65,250	14 Michigan	2,760	52,100	14 Illinois	300	55,120
15 Pennsylvania	1,220	99,190	15 Oklahoma	120	68,660	15 Maryland	2,350	68,310	15 New York	290	63,540
16 Arizona	1,180	92,410	16 Connecticut	110	76,620	16 Virginia	2,260	63,870	16 Louisiana	250	63,800
17 Utah	840	80,070	17 Utah	100	65,570	17 Louisiana	1,960	59,560	17 Maryland*	250	61,760
18 Oklahoma	820	88,950	18 Pennsylvania	90	50,530	18 Missouri	1,830	63,080	18 Michigan	240	60,560
19 N. Carolina	630	94,570	19 Michigan	70	57,760	19 Kentucky	1,780	82,050	19 Utah	230	54,530
20 New York	590	113,080	20 Tennessee	30	55,370	20 Colorado	1,760	65,280	20 Indiana	220	48,580

* Values are estimates of data suppressed by BLS.

Source: Bureau of Labor Statistics (BLS) Occupational Employment Statistics

\$5,000 per year for each engineering job created or retained in the aerospace industry by qualifying employers in the state.¹³

Oklahoma's 120 aerospace engineering and operations technicians ranks 15th among the states, but places Oklahoma ahead of a group of traditional aerospace states that includes Connecticut (120), Utah (100), and Michigan (70). Aerospace engineering and operations technicians are most prevalent among states with large civilian aerospace manufacturing sites.

Oklahoma is ranked 8th in employment of aircraft mechanics and service technicians with 3,570 workers, and 10th in avionics technicians with 470 workers. The higher relative rankings for Oklahoma on both of these occupations reflects the relatively larger role they play in aircraft MRO activity, one of the state's and region's strengths in aerospace. The Oklahoma City metro area is home to 2,180 aircraft mechanics and service technicians, 61 percent of the state total, and 370 avionics technicians, nearly 80 percent of the state total. These two occupations better reflect the overall presence of military and civilian aviation across the states and in the Greater Oklahoma City region.

Aerospace Wage Comparison. Figure 8 provides a comparison of the overall wage structure for a range of aerospace-related occupations in Oklahoma with eight traditional aerospace states. In general, wages in Oklahoma for most of the occupations are among the lowest in the industry and reflect the relatively low overall cost-of-living in the state.

Oklahoma's aerospace wages are well below the western states of California and Washington for all reported occupations, and are below the neighboring states of Texas and Kansas across most occupations. Oklahoma's aerospace wages are basically on par with Arizona and Florida, both lower-cost-of-living Sun Belt states with a more highly developed aerospace sector.

Figure 8. Average Annual Earnings by Aerospace Occupation by State (2015)									
Occupation	AL	AZ	CA	CO	FL	KS	OK	TX	WA
Aerospace Engineer. & Operations Tech.	\$62,290	\$50,470	\$73,210	\$74,990	\$60,530	\$60,480	\$68,660	\$60,150	*\$73,940
Aerospace Engineers	109,980	92,410	116,500	132,670	105,080	100,500	88,950	108,990	*132,610
Avionics Technicians	61,700	52,720	68,970	65,220	57,290	58,330	52,540	55,070	75,020
Aircraft Mechanics & Service Tech.	63,980	58,740	64,170	65,280	55,770	63,930	50,170	58,300	70,200
Electricians	45,350	48,970	66,950	48,560	42,600	52,870	46,160	45,680	64,860
Machinists	39,910	40,740	43,240	43,840	38,120	40,990	39,910	41,500	48,950
Engine & Other Machine Assemblers	37,690	34,430	45,350	37,600	*37,310	36,850	37,600	37,900	43,570
Welders, Cutters, Solderers, & Brazers	37,110	41,000	42,970	43,450	36,900	38,480	39,960	43,580	47,280

* Values are estimates of data suppressed by BLS.
Source: Bureau of Labor Statistics (BLS) Occupational Employment Statistics

The average wage of \$85,710 for aerospace engineers in Oklahoma remains low relative to the largest aerospace states. In the Oklahoma City metro area, aerospace engineers earn a reported average of \$90,050 per year.¹⁴

The labor market for aircraft mechanics and service technicians is highly developed in Oklahoma but still has the lowest average wage (\$50,170) among the comparison group. The average in the Oklahoma City metro area is slightly higher than the state at \$52,190 annually.

Oklahoma's wages for support occupations such as electricians, machinists, engine assemblers, and welders are more reflective of a national market. Wages for these occupations in Oklahoma are comparable to those found in the eight comparison states. Wages in the Oklahoma City metro area for most of the occupations in Figure 8 are generally 5-15 percent above the respective statewide average.

Air Force Personnel in Oklahoma

Air Force personnel remain the backbone of the aerospace sector in Oklahoma. For fiscal year 2015, Oklahoma is home to a total of 22,159 Air Force civilian and active duty military personnel, the fifth highest number among the states (see Figure 5). Only Texas, Florida, California, and Georgia are home to more.

Measured by civilian Air Force workers, Oklahoma is ranked 1st among the states with a reported 15,358 civilian personnel in fiscal year 2015. The state has consistently ranked at or near the top the past two decades, rivaled only by Texas.¹⁵ Only three other states have more than 10,000 Air Force civilian workers - Georgia (13,519), Ohio (13,217), Florida (11,861), and Utah (11,104).

An estimated 13,888 civilian Air Force employees are based at Tinker AFB, with most of the remaining 1,470 civilians based at either Altus AFB or Vance AFB in Enid. A large share of these highly skilled workers work directly in aviation roles and are discussed in detail in the following sections of the report.

The presence of these civilian workers greatly expands the competitive labor market for aerospace workers with the technical skills and industry knowledge that are needed to support the ongoing expansion of the industry in the state.

Active duty and reserve Air Force personnel are no less important a component of the aviation market in the state (see Figure 5). A total of 6,801 active duty and reserve Air Force personnel are located within Oklahoma, the 14th highest level among the states. These personnel include flight crew, flight operations and management, and aircraft maintenance specialists. A reported 5,842 active duty and reserve personnel are based at Tinker AFB, with the remaining approximately 950 personnel based at Altus AFB, Vance AFB, and other locations across the state.

Figure 5. Active Duty & Civilian Personnel (by FY15 Rank)

State	Active Duty Air Force	Air Force Civilian Personnel	Total Air Force Personnel
Texas	32,327 ¹	15,003 ²	47,330 ¹
Florida	21,952 ²	11,861 ⁵	33,813 ²
California	18,026 ³	8,924 ⁷	26,950 ³
Georgia	8,989 ⁸	13,519 ³	22,508 ⁴
Oklahoma	6,801 ¹⁴	15,358 ¹	22,159 ⁵
Ohio	5,392 ¹⁹	13,217 ⁴	18,609 ⁶
Virginia	12,198 ⁴	6,024 ⁸	18,222 ⁷
Utah	3,593 ²⁶	11,104 ⁶	14,697 ⁸
New Mexico	11,340 ⁵	3,321 ¹⁰	14,661 ⁹
Colorado	8,698 ⁹	5,408 ⁹	14,106 ¹⁰
Arizona	9,022 ⁷	2,198 ¹⁵	11,220 ¹¹
Nevada	9,154 ⁶	1,320 ²¹	10,474 ¹²
Maryland	7,999 ¹⁰	2,367 ¹⁴	10,366 ¹³
Alaska	7,386 ¹²	2,002 ¹⁶	9,388 ¹⁴
South Carolina	7,491 ¹¹	1,752 ¹⁹	9,243 ¹⁵
North Dakota	7,071 ¹³	862 ²⁷	7,933 ¹⁶
Nebraska	5,489 ¹⁸	2,410 ¹³	7,899 ¹⁷
Mississippi	5,601 ¹⁷	1,770 ¹⁸	7,371 ¹⁸
Washington	6,152 ¹⁵	1,114 ²⁴	7,266 ¹⁹
North Carolina	6,152 ¹⁵	1,071 ²⁵	7,223 ²⁰
All States	254,340	139,454	393,794

Source: Interactive Demographic Analysis System (IDEAS)

Federal Civilian Employment in Oklahoma City

The location of both Tinker AFB and the FAA Center in Oklahoma City results in a highly concentrated workforce of federal civilian workers in the area. Figure 6 details the top 20 Core Based Statistical Areas (CBSA) for Executive Branch civilian employment in fiscal year 2015.¹⁶ This measure excludes active duty and reserve military but captures a large share of the civilian employment at both Tinker AFB and the FAA Center.

The Oklahoma City area is home to a reported 23,943 Executive Branch civilian employees in fiscal year 2015, the 12th largest concentration among CBSAs in the nation. The majority of these civilian workers are engaged in aviation-related work, with almost two-thirds reportedly based at Tinker AFB (15,110). An additional 8,833 personnel are located across the Oklahoma City area, including more than 5,400 federal civilian employees at the FAA's Monroney Center. The remaining 3,421 federal civilian personnel perform a variety of job functions in other areas of the Oklahoma City region.

Figure 6. Federal Executive Branch Civilian Employment by CBSA

Rank	Core Based Statistical Area (CBSA)	States	Federal Civilian Employment (FY2015)	Total Wage & Salary Employment (2015)	Federal Civilian Share of Total Wage & Salary Employment
1	Washington-Arlington-Alexandria	DC-VA-MD-	273,195	3,171,400	8.6%
2	New York-Newark-Jersey City	NY-NJ-PA	56,261	9,337,200	0.6%
3	Virginia Beach-Norfolk-Newport	VA-NC	46,430	765,400	6.1%
4	Baltimore-Columbia-Towson	MD	42,150	1,364,900	3.1%
5	San Diego-Carlsbad	CA	34,560	1,386,400	2.5%
6	Philadelphia-Camden-Wilmington	PA-NJ-DE-MD	32,871	2,821,000	1.2%
7	Atlanta-Sandy Springs-Roswell	GA	31,329	2,584,900	1.2%
8	Los Angeles-Long Beach-Anaheim	CA	30,697	5,816,900	0.5%
9	Chicago-Naperville-Elgin	IL-IN-WI	28,545	4,585,900	0.6%
10	San Antonio-New Braunfels	TX	26,705	980,700	2.7%
11	Dallas-Fort Worth-Arlington	TX	26,303	3,399,300	0.8%
12	Oklahoma City	OK	23,943	629,900	3.8%
13	Seattle-Tacoma-Bellevue	WA	22,505	1,891,600	1.2%
14	Boston-Cambridge-Newton	MA-NH	21,376	2,648,000	0.8%
15	Urban Honolulu	HI	21,550	468,400	4.6%
16	Miami-Fort Lauderdale-West Palm	FL	20,596	2,506,600	0.8%
17	Denver-Aurora-Lakewood	CO	19,662	1,395,000	1.4%
18	Kansas City	MO-KS	18,621	1,041,900	1.8%
19	San Francisco-Oakland-Hayward	CA	18,620	2,259,200	0.8%
20	Houston-The Woodlands-Sugar	TX	17,318	2,988,900	0.6%

Notes: Includes only non-seasonal full-time permanent employees for Fiscal Year 2014. CBSA's are equivalent to MSA's for most regions.
Source: U.S. Office of Personnel Management

The Oklahoma City metro area is relatively small compared to other CBSAs with similar levels of federal civilian employment (see Figure 6). The approximately 24,000 federal civilian jobs in the Oklahoma City region is comparable to levels reported for Dallas, San Antonio, Seattle, Boston, and Miami, all much larger cities. Only three other cities ranked among the top 20 – Virginia Beach, San Antonio, and Honolulu – have fewer than 1 million wage and salary jobs, and only Honolulu is smaller than Oklahoma City.

Oklahoma City also has the 4th high concentration of federal civilian employment among the top 20 cities. A reported 3.8% of all wage and salary workers in the Oklahoma City metropolitan area are federal civilian

personnel. Only Washington D.C. (8.6 percent), Virginia Beach, VA (6.1 percent), and Honolulu, HI (4.6 percent) have a higher share of federal civilian personnel in the regional workforce.

Tinker AFB Workforce

Tinker AFB has a unique mix of active duty and reserve military personnel, federal civilian employees, and civilian contract workers. This group represents the largest single source of aerospace-related employment in the region, as well as a large share of employment in the industry statewide. Civilians comprise more than 75 percent of the total workforce at Tinker AFB and primarily support the aircraft MRO mission of the Oklahoma City Air Logistics Center.

Civilian Air Force Workers. Among the 17,884 civilian workers at Tinker AFB, a reported 13,888 (78 percent) are federal civilian employees employed by the Air Force who pursue the aviation and logistics mission of the base. Figure 9 provides a detailed breakdown of occupations for these highly skilled civilian Air Force personnel at five-year intervals over the past decade.

Currently, there are a reported 7,492 (54 percent) white collar occupations among the civilian Air Force personnel. Numerous high-skill, white collar civilian occupations are represented at the base, including specialties in engineering and architecture (1,963 jobs), information technology (267 jobs), mathematics and statistics (132 jobs), medical, hospital, dental, and public health (119 jobs), and physical sciences (35 jobs).

Major white collar administrative and business occupations supporting the mission of the base include general administrative, clerical, and office services (1,945 jobs), business and industry (1,202 jobs), and accounting and budget (278 jobs). Related logistics occupations include supply (334 jobs) and transportation (89).

Civilians also fill a reported 6,396 trade and craft jobs at Tinker AFB. Approximately 5,000 of these jobs reflect traditional occupations in aircraft maintenance, repair, and overhaul and include metal work (1,539 jobs), aircraft overhaul (1,182 jobs), engine overhaul (529 jobs), electrical installation and maintenance (393 jobs), metal processing (380 jobs), painting (369), electronic equipment installation and maintenance (352 jobs), machine tool work (324 jobs), and fluid systems maintenance (301 jobs).

Related trade and craft occupations include warehousing and stock handling (268 jobs), packing and processing (166 jobs), and industrial equipment maintenance (135).

The total number of white collar civilian employees has remained fairly stable around 7,500 personnel since fiscal year 2005. Total trade and craft employment increased about 5 percent in the period, roughly matching the change in total civilian employment.

The white collar share of total civilian employment is relatively stable in the ten-year period at about 55 percent.

Despite stability in both the size of the civilian workforce and the mix between white collar and trade occupations in recent years, some of the individual occupation specialties at Tinker AFB show marked changes in staffing levels over the past decade (see Figure 9).

Among white collar occupations, the greatest gains in employment are found in engineering and architecture, business and industry, mathematics and statistics, and quality assurance and inspection.

Only the number of supply jobs decreased significantly in the period among white collar personnel.

Among trade and craft occupations, the greatest hiring gains in the period are concentrated in metal work, warehousing and stock handling, and aircraft overhaul.

Declining employment trends are present in five trade and craft occupations: 1) electrical installation and maintenance, 2) machine tool work, 3) metal processing, 4) fluid systems maintenance, and 5) engine overhaul.

Figure 9. AF Civilian Jobs by Occupation - Tinker AFB

OPM Federal Occupational Classification	Fiscal Year		
	2005	2010	2015
White Collar Occupations	7,533	7,454	7,492
00 Miscellaneous Occupations	170	218	213
01 Social Science, Psychology, and Welfare	59	65	46
02 Human Resources Management	156	150	128
03 General Admin, Clerical, & Office Services	1,952	2,073	1,945
04 Biological Sciences	2	2	2
05 Accounting and Budget	250	278	278
06 Medical, Hospital, Dental, & Public Health	86	118	119
08 Engineering and Architecture	1,740	1,776	1,963
09 Legal and Kindred	26	22	22
10 Information and Arts	51	45	36
11 Business and Industry	953	964	1,202
13 Physical Sciences	42	36	35
14 Library and Archives	1	1	0
15 Mathematics and Statistics	70	99	132
16 Equipment, Facilities, and Services	392	417	403
17 Education	86	78	88
18 Investigation	7	3	7
19 Quality Assurance, Inspection, & Grading	163	171	183
20 Supply	910	562	334
21 Transportation	117	112	89
22 Information Technology	300	264	267
Trade, Craft, or Labor Jobs	6,029	6,746	6,396
26 Electronic Equip Installation & Maint.	369	364	352
28 Electrical Installation and Maintenance	314	445	393
31 Fabric and Leather Work	26	29	38
33 Instrument Work	46	43	32
34 Machine Tool Work	380	365	324
35 General Services and Support Work	106	205	132
37 Metal Processing	599	463	380
38 Metal Work	1,102	1,546	1,539
41 Painting and Paperhanging	292	371	369
42 Plumbing and Pipefitting	19	22	21
43 Pliable Materials Work	98	96	84
46 Wood Work	12	11	12
47 General Maint. & Operations Work	1	1	2
48 General Equipment Maintenance	27	32	26
52 Miscellaneous Occupations	5	7	9
53 Industrial Equipment Maintenance	138	140	135
54 Industrial Equipment Operation	27	22	12
57 Transportation/Mobile Equip Oper.	66	61	62
58 Transportation/Mobile Equip Maint.	3	0	0
66 Armament Work	25	39	28
69 Warehousing and Stock Handling	178	237	268
70 Packing and Processing	143	184	166
82 Fluid Systems Maintenance	441	377	301
86 Engine Overhaul	631	659	529
88 Aircraft Overhaul	981	1,027	1,182
Total AF Civilian Employment	13,562	14,200	13,888

Source: Interactive Demographic Analysis System (IDEAS) – Air Force

Active Duty Air Force Personnel

Active duty Air Force personnel, both officers and enlisted, play a key role at Tinker AFB and comprise a large component of the Oklahoma City region aerospace workforce.

Air Force Officers

As shown in Figure 10, approximately 1,100 active duty Air Force officers are currently assigned to Tinker AFB. This represents slightly more than 5 percent of total military and civilian personnel at the base.

Officers tend to have occupational specialties that more broadly support the combat operations mission of the Air Force rather than the maintenance and logistics mission of the Air Logistics Center.

Over the past ten years, the overall number of active duty officers at the base is down by nearly 20 percent, a loss of almost 300 officers.

More than two-thirds of the officers (802) work in flight operations roles (10X-16X). The most common specialties within flight operations include air battle manager and airfield operation (504), pilot (183), and navigator (75).

Among the remaining areas, important specialties include 46 officers in logistics (20C-21X), 77 in medical (40C-48X), and 91 in acquisition (60C-65X)

Consistent with the overall decline in the number of officers at the base over the 10-year period, declines are present in a number of specialties. The largest change is a cut in the number of officers with a specialty in communications (33XX) from 107 to zero in the period. Meaningful declines also occurred among officers in acquisition roles (63XX), logistics (21XX), several medical specialties (40C-48X), development engineers (62XX), and trainees (92XX). A recent drop is also reported in air battle manager/field operations (13XX) positions.

Specialties with rising staffing levels include the cyber operations (17XX) and manpower (38XX) groups.

Figure 10. Active Duty Air Force Officers - Tinker AFB

Air Force Specialty Code (AFSC)	Fiscal Year		
	2005	2010	2015
10XX Operations Commander	1	3	2
11XX Pilot	178	179	183
12XX Navigator	71	70	75
13XX Air Battle Mgr./Field Operation	556	587	504
14XX Intelligence	10	3	10
15XX Weather	7	3	3
16XX Operations Support	0	2	2
17XX Cyber Operations	0	73	23
20XX Logistics Commander	2	5	8
21XX Logistics	82	56	38
30XX Support Commander	4	1	2
31XX Security Forces	5	4	2
33XX Communications	107	0	0
34XX Services	4	0	0
35XX Public Affairs	4	2	0
36XX Personnel	24	0	0
38XX Manpower	1	20	12
40XX Medical Commander	1	1	1
41XX Health Services Administrator	8	10	9
42XX Biomedical Clinicians	15	12	14
43XX Biomedical Specialists	14	16	13
44XX Medicine	11	10	8
45XX Surgery	4	1	3
46XX Nurse	23	13	10
47XX Dental	10	12	10
48XX Aerospace Medicine	10	9	9
51XX Judge Advocate	11	11	13
52XX Chaplain	6	5	4
60XX Program Director	1	3	0
61XX Scientist	2	2	2
62XX Development Engineer	53	50	34
63XX Acquisition Manager	78	29	40
64XX Contracting	18	12	14
65XX Finance	4	2	1
81XX Instructor	7	7	5
83XX Recruiting Service	2	3	4
86XX Operations/Comm. & Control	2	1	0
87XX Inspector General	1	1	3
88XX Aide de Camp	0	0	1
90XX General Officer	1	0	0
91XX Wing Commander/Commander	5	9	11
92XX Trainee/Student	48	53	18
96XX Other Officer	0	0	0
97XX Exec. Officer above Wing Level	1	5	3
UNC Unclassified	6	13	15
Total Active Duty Officers	1,398	1,298	1,109

Source: Interactive Demographic Analysis System (IDEAS) – Air Force

Air Force Enlisted Personnel

Air Force enlisted personnel play a relatively larger role than officers in supporting the aviation and logistics mission at Tinker AFB. As shown in Figure 11, active duty Air Force enlisted personnel numbered 3,238 at Tinker AFB in fiscal year 2015, roughly three times the number of active duty officers.

The total number of enlisted Air Force personnel is down by about 30 percent (loss of 1,525 personnel) between fiscal years 2010 and 2015 following the realignment of several Air Force maintenance programs.

As with officers stationed at Tinker, a significant portion of the enlisted personnel support combat aviation operations. However, many enlisted personnel are directly engaged along with federal and contract civilian workers in aircraft maintenance and logistics.

The majority of enlisted personnel are assigned to three major specialty categories: 905 in operations (1A-1W in Figure #), 1,358 in maintenance and logistics (2A-2W), and 618 in support (3A-3S).

Other smaller specialties include 171 medical personnel (4A-4Y), 12 professional personnel (5J and 5R), 36 acquisitions personnel (6C and 6F), and 118 special duty personnel (8X).

The 1,358 maintenance and logistics personnel (2A-2W) are the largest single component and comprise more than 40 percent of the enlisted ranks. The largest specialty area within this group is aircraft maintenance with 1,239 personnel. Other maintenance and logistics specialties include material management (56 jobs), maintenance management (29 jobs), and transportation (23 jobs).

Much of the overall decline in enlisted personnel at the base the past decade is traced to the elimination of 535 jobs in communications-electrical and wiring systems maintenance (2E); a reduction of 300 jobs representing one-third of enlisted personnel in air crew operations (1A); and 240 positions cut in knowledge and client systems (3D).

Further cuts on the aviation side include a reduction of 160 positions (more than 10 percent of group personnel) in aerospace maintenance (2A).

Figure 11. Air Force Enlisted Personnel - Tinker AFB

Air Force Specialty Code (AFSC)	Fiscal Year		
	2005	2010	2015
1A Air Crew Operations	942	943	648
1B Cyber Operations	0	0	1
1C Command Control Systems	98	142	162
1N Intelligence	42	50	41
1P Flight Equipment	0	46	39
1S Safety	3	2	1
1T Aircrew Protection	41	3	4
1W Weather	15	8	9
2A Aerospace Maintenance	1,400	1,345	1,239
2E Comm.-Elec./Wire Systems	535	0	0
2F Fuels	0	2	0
2G Logistics Plans	1	13	7
2M Missile Maintenance	9	3	3
2P Precision Measurement	3	1	0
2R Maintenance Management	3	31	29
2S Material Management	30	89	56
2T Transportation	137	47	23
2W Munitions & Weapons	0	3	1
3A Information Management	86	0	27
3C Communication-Computer Systems	124	0	0
3D Knowledge and Client Systems	400	923	160
3E Civil Engineering	75	56	2
3M Services	24	1	0
3N Public Affairs	6	1	0
3P Security Forces	370	433	335
3S Mission Support	118	107	94
4A Health Services Management	40	38	35
4B Bioenvironmental Engineering	21	21	19
4C Mental Health Service	9	14	10
4D Diet Therapy	2	1	0
4E Cardiopulmonary Laboratory	12	18	17
4J Physical Medicine	3	3	4
4M Aerospace Physiology	1	2	0
4N Aerospace Medical Service	54	49	42
4P Pharmacy	15	10	10
4R Diagnostic Imaging	5	4	3
4T Medical Laboratory	6	7	6
4V Ophthalmic	7	3	2
4Y Dental	35	36	23
5J Paralegal	8	11	9
5R Chaplain Assistant	5	3	3
6C Contracting	11	13	16
6F Fin Management & Contracting	31	20	20
8X Special Duty	116	92	118
9X Reporting	20	20	18
UNC Unclassified	2	1	2
Total Enlisted Personnel	4,865	4,615	3,238

Source: Interactive Demographic Analysis System (IDEAS) – Air Force

FAA – Mike Monroney Aeronautical Center Workforce

The FAA's Monroney Center is based in Oklahoma City and serves as the centralized service and support facility for the FAA and Department of Transportation (DOT). The FAA Center is located on the grounds of Will Rogers World airport and supported by a \$972 million operational budget in fiscal year 2015.

The Center is a combination of diverse business units with operations ranging across most areas of the federal aviation transportation system. Major functions of the Center include the FAA Academy, which trains more than 100,000 students annually, and the FAA Logistics Center, which provides consulting, engineering, repair, distribution, and technical support for U.S. air traffic control systems.

The FAA Center is home to a reported 5,412 civilian workers in fiscal year 2015 (see Figure 12). The workforce consists of 3,438 federal civilian employees (55 percent) and 1,974 civilian contract workers (45 percent).

The workforce at the Center is conveniently divided by major budgetary source. A reported 2,951 employees are assigned to the core Aeronautical Center. These core Center workers include 1,860 federal FAA personnel and 1,091 contractors. An additional 2,278 federal civilian and contractor positions are assigned to other FAA activities at the Center. These non-core activities support 1,408 federal civilian workers and 870 civilian contractors.

A small number of non-FAA tenants are also located at the Center, including the Air Force, Coast Guard, Transportation Safety Institute, and Office of Inspector General. These entities jointly employ 183 workers of which 170 are federal civilian employees and 13 are contract workers.

The FAA continues to maintain a very highly skilled workforce in Oklahoma City. The mix of occupations is detailed in Figure 12.¹⁷ Approximately 98 percent of the jobs are white collar and most require professional or other specialized training.

Employment is highly concentrated in three key occupational groups. The largest includes 1,884 jobs in general administrative, clerical, and office services occupations. These jobs reflect the administrative nature of much of the activity at the Center. The second largest specialty area includes 1,294 engineering and architecture positions. The large pool of FAA engineers based in Oklahoma City provides scheduled and emergency technical support services to FAA customers nationwide. The 616 workers in the accounting and budget group comprise the third largest specialty area.

Other specialty occupation groups with 100 or more employees include transportation (322), legal (228), investigation (188), physical sciences (185), and business and industry (114).

Figure 12. Personnel by Occupation - FAA Center (FY15)

OPM Federal Occupational Classification	Positions
White Collar Occupations	5,289
00 Miscellaneous Occupations Group	21
01 Social Science, Psychology, and Welfare Group	53
02 Human Resources Management Group	96
03 General Admin, Clerical, & Office Serv Group	1,884
04 Biological Sciences Group	11
05 Accounting and Budget Group	616
06 Medical, Hospital, Dental, & Public Hlth Group	55
07 Engineering and Architecture Group	1,294
08 Legal and Kindred Group	228
10 Information and Arts Group	27
11 Business and Industry Group	114
13 Physical Sciences Group	185
14 Library and Archives Group	2
15 Mathematics and Statistics Group	35
16 Equipment, Facilities, and Services Group	21
17 Education Group	64
18 Investigation Group	188
19 Quality Assur., Inspection, & Grading Group	47
20 Supply Group	26
21 Transportation Group	322
Trade, Craft, or Labor Jobs	122
31 Fabric and Leather Work	2
35 General Services & Support Work Family	3
41 Painting and Paperhanging Family	5
43 Pliable Materials Work Family	2
46 Wood Work Family	8
69 Warehousing & Stock Handling Family	88
70 Packing and Processing Family	14
All Occupations	5,412

Source: FAA Mike Monroney Center internal documents and RegionTrack classifications

Federal Procurement in Oklahoma Aerospace

Federal contracting serves as a significant source of economic activity across the state of Oklahoma and in the Greater Oklahoma City region in particular. The presence of large federal and military installations including Tinker Air Force Base, Fort Sill, Vance Air Force Base, and the FAA's Monroney Center contributes to the success of Oklahoma-based firms in receiving federal procurement awards.

Total Procurement Activity

Figure 13 illustrates the significant economic role played by federal contract funding both at the state level and in the 10-county Greater Oklahoma City region. In fiscal year 2015, 7,900 federal procurement contracts valued at \$2.76 billion were issued for performance within Oklahoma. Approximately 70 percent (\$1.91 billion) of total state contracting activity is traced to the 10-county Greater Oklahoma City region. More than 90 percent (\$1.73 billion) of the activity in the 10-county region occurred in Oklahoma County alone.

The Department of Defense engages in the largest share of contracting within the state. Nearly 78 percent (\$2.15 billion) of the value of contracts issued statewide are by Department of Defense agencies, with the remaining 22 percent conducted by all other major federal departments combined.

The Defense share of total contract value equals 77 percent (\$1.47 billion) in the 10-county region and 80 percent (\$1.39 billion) in Oklahoma County.

The Air Force has traditionally served as the largest single source of Defense contracting activity in Oklahoma. Air Force-related contracting in Oklahoma totals \$1.274 billion in fiscal year 2015. Air Force activity in the 10-county region is \$1.1 billion, with nearly all of the activity concentrated in Oklahoma County.

Figure 13. Federal Procurement by Department (FY2015)

	Oklahoma	10-County OKC Region	Oklahoma County
Department of Defense:			
Air Force	1,274,183,319	1,104,150,803	1,097,242,422
Army	487,021,985	149,932,280	133,435,895
Navy	166,816,842	129,280,789	96,535,890
Defense Logistics Agcy.	135,656,223	85,625,925	67,872,542
Other Dept. of Defense	83,498,834	-3,945,264	-4,930,256
Total Dept. of Def.	\$2,147,177,203	\$1,465,044,534	\$1,390,156,493
Other Departments:			
Transportation	226,084,009	211,475,942	205,113,013
Veterans Affairs	83,214,865	62,086,476	60,225,829
Health and Human Serv.	77,268,642	35,861,841	22,694,840
General Services Admin.	53,814,055	42,126,688	11,091,272
Justice	42,927,370	32,865,526	16,251,150
Homeland Security	26,020,339	17,936,585	13,508,413
Interior	24,990,469	2,595,060	1,446,932
Agriculture	22,039,397	12,808,827	554,455
Labor	22,038,616	7,222,371	1,799
Housing & Urban Devel.	11,907,003	10,048,423	10,048,423
Commerce	10,064,726	3,459,019	45,235
All Other Departments	12,549,126	3,176,885	3,761,290
Total Other Depts.	\$612,918,616	\$441,663,643	\$344,742,652
All Departments	\$2,760,095,819	\$1,906,708,177	\$1,734,899,144

Notes: Includes contracts first signed in fiscal year 2015 based on place of performance.

Source: Federal Procurement Data System – Next Generation (FPDS-NG)

The majority of total Air Force expenditures statewide are connected to Tinker Air Force base, with most of the remainder attributed to Vance and Altus Air Force bases.

Aerospace Share of Total Oklahoma Procurement

Aerospace-related federal procurement in the state extends well beyond Air Force contract expenditures. Determining the exact amount of contracting related to aerospace becomes a detailed accounting exercise due to the presence of multiple branches of the Armed Forces at Tinker Air Force base and the spreading of procurement services across the various agencies within the Department of Defense.

Estimates of the share of total federal contracting related specifically to aerospace are formed by examining data derived from the Federal Procurement Data System (FPDS) for each of the 7,900 contracts signed in fiscal year 2015 for performance within Oklahoma.¹⁸ Contracts for goods and services specifically related to aerospace are identified using both NAICS codes and Product or Service Descriptions for each contract.¹⁹

The contracts capture a range of goods and services used in aerospace including aircraft maintenance and repair, tools, parts, equipment, machinery, fuel, research and development, and construction projects related directly to aviation. Yet other contracts provide federal funding for municipal airports, aviation training, aviation-related human research, and other non-military applications. All procurement contracts believed to be only loosely related to aerospace are excluded.

Figure 14 summarizes aerospace-related federal procurement activity in Oklahoma in fiscal year 2015. An estimated 1,630 contracts (20.6 percent of 7,900 total contracts) statewide valued at \$1.41 billion are deemed directly for aerospace-related goods and services. The average contract is valued at nearly \$865,000. Aerospace contracts account for slightly more than half (51.0 percent) of the total value of procurement activity in the state in the period. Of the \$1.41 billion in total aerospace-related contracts, 80.4 percent (\$1.13 billion) are performed by firms with a listed operating address within Oklahoma.

For the 10-county Greater Oklahoma City region, 859 contracts (25.5 percent of 3,372 total contracts) valued at \$1.19 billion are directly aerospace-related. The average contract in the region is valued at \$1.38 million. More than 60 percent of the value of all contracts issued in the region is traced to aerospace; 83.4 percent of the value of total aerospace contracts is traced to vendors with an operating address in Oklahoma.

Figure 14. Oklahoma Aerospace-Related Federal Procurement (FY2015)			
Federal Agency	State of Oklahoma	10-County Region	Oklahoma County
Air Force	\$1,005,619,094	\$905,186,345	\$903,280,883
Army	117,418,940	56,787,085	47,700,466
Navy	114,614,234	97,589,597	93,545,538
Defense Logistics Agency	87,146,735	49,085,376	33,849,909
Other Federal Agencies	83,426,183	78,614,291	57,421,974
Total Aerospace & Aviation-Related	\$1,408,225,186	\$1,187,262,693	\$1,135,798,771
Total Procurement	\$2,760,095,819	\$1,906,708,177	\$1,734,899,144
Aerospace Share of Total Procurement	51.0%	62.3%	65.5%
Total Aerospace Procurement Performed by Oklahoma-based vendors	\$1,132,206,291	\$990,602,781	\$952,109,159
Share of Aerospace Procurement Performed by Oklahoma-based vendors	80.4%	83.4%	83.8%
Notes: Aerospace-related procurement is determined by examining NAICS industry codes and product or service descriptions for each of the 7,900 contracts first signed in fiscal year 2015. Contracts deemed issued to Oklahoma-based vendors specify an operating entity with an address located within Oklahoma.			
Source: Federal Procurement Data System – Next Generation (FPDS-NG) and RegionTrack classifications			

For Oklahoma County, 669 contracts (25.5 percent of 2,623 total contracts) valued at \$1.14 billion are deemed aerospace-related, 65.5 percent of the value of total procurement in the county in fiscal year 2015. The average contract issued for performance in Oklahoma County is valued at approximately \$1.7 million. Nearly 84 percent of the aerospace-related contracts in Oklahoma County are performed by vendors located in Oklahoma.

Aerospace Procurement by Local Area

Although Oklahoma County dominates aerospace contracting activity within the 10-county region, several smaller yet significant pockets of activity are highly visible within the federal procurement data.

Figure 15 details the distribution of federal aerospace-related contracting activity by city for each of the 10 counties in the Greater Oklahoma City region.

In Oklahoma County, Oklahoma City accounts for more than 95 percent (\$1.08 billion) of county-wide aerospace-related federal contracting. An additional \$48.4 million in combined activity is performed in Midwest City and at Tinker Air Force Base. Very little contracting is performed in other areas of the county.

Cleveland County is home to the largest concentration of aerospace-related activities in the region outside of Oklahoma County. Contracts awarded to firms in Norman and the Oklahoma City portion of Cleveland County total more than \$24 million in fiscal year 2015. This activity represents nearly half (44.4 percent) of all federal contracts performed by firms in the county in the period.

Firms located in Stillwater in Payne County received a total of \$12.7 million in federal aerospace-related contracts. This activity represents roughly 30 percent of all federal contracts received by firms in Payne County in the period.

Other cities outside of Oklahoma County with aerospace-related firms securing significant federal contracts in fiscal year 2015 include El Reno in Canadian County (\$8.0 million), Guthrie in Logan County (\$2.2 million), and Shawnee in Pottawatomie County (\$2.0 million).

Figure 15. Aerospace Procurement by Area (FY2015)

Region	Total Procurement	Aerospace & Aviation-Related	Share of Aerospace & Aviation
State of Oklahoma	\$2,760,095,819	\$1,408,225,186	51.0%
10-County Region	\$1,906,708,177	\$1,187,262,693	62.3%
Canadian County	28,572,877	8,843,593	31.0%
El Reno	17,466,968	8,039,623	46.0%
Oklahoma City	2,472,253	485,831	19.7%
Yukon	297,916	174,346	58.5%
Mustang	1,049,035	143,793	13.7%
Other	7,286,704	0	0.0%
Cleveland County	55,427,319	24,611,787	44.4%
Oklahoma City	15,305,692	12,385,227	80.9%
Norman	38,742,994	11,677,127	30.1%
Other	1,378,633	549,433	39.9%
Grady County	5,037,132	74,949	1.5%
Rush Springs	50,000	50,000	100.0%
Tuttle	844,260	22,731	2.7%
Chickasha	4,059,211	2,218	0.1%
Minco	77,102	0	0.0%
Verden	6,559	0	0.0%
Kingfisher County	22,614,980	0	0.0%
Lincoln County	1,923,248	742,214	38.6%
Stroud	748,274	742,214	99.2%
Other	1,174,974	0	0.0%
Logan County	9,604,097	2,155,667	22.4%
Guthrie	9,354,108	2,155,667	23.0%
Edmond	249,989	0	0.0%
McClain County	540,575	0	0.0%
Oklahoma County	1,734,899,144	1,135,798,771	65.5%
Oklahoma City	1,525,868,650	1,084,079,472	71.0%
Midwest City	33,163,219	32,143,917	96.9%
Tinker AFB	158,031,152	16,247,907	10.3%
Edmond	5,489,247	2,393,121	43.6%
Bethany	1,290,081	930,380	72.1%
Other	11,056,796	3,975	0.0%
Payne County	43,408,460	13,070,564	30.1%
Stillwater	41,448,450	12,650,857	30.5%
Perkins	1,962,777	419,707	21.4%
Other	-2,768	0	0.0%
Pottawatomie County	4,680,345	1,965,148	42.0%
Shawnee	4,672,375	1,965,148	42.1%
Other	7,970	0	0.0%

Source: Federal Procurement Data System – Next Generation (FPDS-NG)

Largest Aerospace Vendors

Figure 16 lists the top 25 vendors receiving federal aerospace-related procurement contracts within the 10-county Greater Oklahoma City region in fiscal year 2015. Among a total of 401 unique vendors receiving aerospace-related contracts in the period, these 25 vendors were awarded approximately 93 percent (\$1.102 billion) of the \$1.187 billion in total aerospace-related contracts issued in the period. The average contract value for the top 25 vendors is more than \$44.1 million.

The remaining 376 aerospace-related vendors received a total of \$84.3 million in contracts, with an average value of nearly \$225,000.

Most aerospace-related federal contracts in the region remain quite small on average, with only 48 of the 401 vendors receiving contracts with a total value exceeding \$1 million in fiscal year 2015.

Boeing is the largest single aerospace-related contracting entity in the 10-county Greater Oklahoma City region. Boeing's total contract value of \$542.3 million is more than double the \$252.1 million awarded to the second-largest vendor, Lear Siegler.

Other aerospace contractors such as DRS C3 (\$51.1 million), CNI Aviation (\$36 million), Atlantic Aviation (\$28.5 million), Honeywell (\$12.1 million), L-3 Communications (\$9.5 million), and Pratt and Whitney (\$9.2 million) largely specialize in the area of aircraft MRO services and comprise a substantial portion of the list of top vendors.

Large vendors providing primarily information technology services in fiscal year 2015 include I.S. Technologies (\$12.2 million) and Keybridge Technologies (\$4.5 million).

Other firms among the top 25 aerospace-related vendors in the 10-county Greater Oklahoma City region include construction companies, engineering firms, communications providers, energy providers, and contracting consultants.

Figure 16. Largest Aerospace-Related Vendors in the 10-County OKC Region (FY2015)

Rank	Vendor	Contract Value
1	The Boeing Company	\$542,269,558
2	Lear Siegler Serv., Inc. (URS Corp.)	252,118,051
3	DRS C3 & Aviation Company	51,075,292
4	CNI Aviation LLC	36,022,841
5	Nova Group, Inc.	32,060,100
6	Atlantic Aviation OKC, Inc.	28,486,022
7	HEBCO, Inc.	18,727,952
8	Moog, Inc.	12,824,776
9	I.S. Technologies LLC	12,204,794
10	Honeywell International Inc.	12,113,763
11	Leader Communications, Inc.	10,779,006
12	Delaware Resource Grp of Okla.	9,535,720
13	L-3 Communications Corporation	9,522,269
14	Pratt & Whitney	9,212,599
15	Bell Contracting, Inc.	8,847,630
16	Federal Prison Industries Inc.	7,906,046
17	Centuria Corporation	7,444,679
18	ASES, LLC (ARINC)	7,336,135
19	Terra Construction Inc.	6,597,333
20	Long Wave Inc.	5,394,482
21	Cool Roofing Systems, Inc.	4,747,919
22	Rockford Corporation	4,556,371
23	Nomadics, Inc.	4,485,264
24	Keybridge Technologies, Inc.	4,454,384
25	Centerpoint Energy Services, Inc.	4,199,821
Top 25 Vendors		\$1,102,922,806
All Other Vendors		84,339,888
All Vendors		\$1,187,262,693

Source: Federal Procurement Data System – Next Generation (FPDS-NG)

Economic Impact of Aerospace

The activity of the 236 aerospace establishments operating in the Greater Oklahoma City region generates substantial economic ripple, or spillover, effects in other industry sectors across the region. High average wages, the capital-intensive nature of the industry, a substantial use of high-skilled labor, extensive training and education requirements, and the natural clustering of aerospace companies in the region all work to create strong economic linkages between the industry and the broader regional economy.

The impact these establishments have on the region can be estimated in terms of additional jobs, labor income, and output of goods and services supported in other industries in the state. Economic impact multipliers are commonly used to estimate the effect of a change in economic activity in a given industry on the broader regional or national economy.²⁰ Most economic impact multipliers are derived from a detailed input-output model of a regional economy that maps the various spending flows between firms, households, and governments.²¹ It is important to note that economic multipliers in this report represent estimates of gross economic effects and do not account for any public or private costs associated with the aerospace sector.

Employment multipliers provide an estimate of the number of jobs generated in the broader Oklahoma City economy as new jobs are added in the aerospace sector. Similarly, *labor income* multipliers provide an estimate of the amount of additional earnings generated in the broader economy per new dollar of labor income received by aerospace business owners and employees. *Output* multipliers provide an estimate of the change in output in the broader Oklahoma City area economy per dollar of new output (or revenue) generated within the aerospace industry.

In interpreting multipliers, a given change in economic activity taking place within the aerospace industry is deemed the *direct* effect. Direct effects include the employment, labor income, and goods and services generated directly by the 236 firms and their employees that comprise the aerospace industry in the Greater Oklahoma City region.

The direct effect, in turn, produces both *indirect* and *induced* spillover effects which are estimated using multipliers. The indirect effects are the employment, income, and goods and services generated as a result of the aerospace establishments making purchases from firms in other industries within the state. The induced effects describe the economic activity generated by new household spending resulting from compensation generated from both the direct and indirect effects.

The key mechanisms behind the indirect and induced, or spillover, effects are the purchases made by aerospace establishments from other Oklahoma businesses and the spending of earned income within Oklahoma by aerospace workers.

The direct, indirect, and induced effects provide a convenient way of describing the overall multiplier effects that occur as establishments in the aerospace industry produce goods and services (direct effects), then impact those firms that support and supply the sector (indirect effects), and then finally impact the broader regional economy as worker's incomes and spending patterns are affected (induced effects).

Economic Spillover Effects

Figure 17 provides estimates of economic multiplier effects generated in the Greater Oklahoma City economy from the activity of the aerospace industry in 2015. Again, these are gross measures of economic spillover and do not account for any public or private costs to the region associated with the aerospace sector.

Figure 17. OKC Region Aerospace Industry Economic Impacts (2015)

Direct Effects			
Industry Group	Employment	Output (\$Mil)	Labor Income (\$Mil)
Government:			
Tinker AFB (military and Federal civilian)	23,726	\$2,204.2	\$1,476.4
FAA (Mike Monroney) Center	5,415	989.1	613.4
Other State/Federal Govt	251	25.3	18.2
Maintenance, Repair, and Overhaul (MRO)	4,763	1,299.2	370.3
Air Transportation (Airports, aircraft sales, and air travel)	1,652	242.9	111.7
Manufacturing, Engineering, and Consulting	642	113.1	66.7
Other (education, spraying, and aerial photography)	162	19.2	9.2
Total Direct Effects	36,611	\$4,893.1	\$2,665.9
Multiplier Effects (Indirect + Induced)			
Industry Group	Employment	Output (\$Mil)	Labor Income (\$Mil)
Government:			
Tinker AFB (military and Federal civilian)	17,083	\$991.9	\$634.8
FAA (Mike Monroney) Center	7,960	662.7	239.2
Other State/Federal Govt	151	15.7	4.4
Maintenance, Repair, and Overhaul (MRO)	2,524	1,390.2	340.7
Air Transportation (Airports, aircraft sales, and air travel)	2,115	153.0	62.6
Manufacturing, Engineering, and Consulting	1,091	53.2	105.5
Other (education, spraying, and aerial photography)	49	4.2	3.3
Total Indirect and Induced Effects	30,972	\$3,270.9	\$1,390.4
Total Effects (Direct + Indirect + Induced)			
Industry Group	Employment	Output (\$Mil)	Labor Income (\$Mil)
Government:			
Tinker AFB (military and Federal civilian)	40,809	\$3,196.1	\$2,111.2
FAA (Mike Monroney) Center	13,375	1,651.8	852.6
Other State/Federal Govt	402	41.0	22.6
Maintenance, Repair, and Overhaul (MRO)	7,287	2,689.4	710.9
Air Transportation (Airports, aircraft sales, and air travel)	3,767	395.9	174.3
Manufacturing, Engineering, and Consulting	1,733	166.3	172.2
Other (education, spraying, and aerial photography)	211	23.4	12.5
Total Effects	67,583	\$8,164.0	\$4,056.3

Source: IMPLAN Input-Output Model and RegionTrack Inc.

In terms of direct employment, 36,611 workers in the region are employed directly in aerospace, with the majority working at Tinker AFB and the FAA Center. These workers indirectly support an additional 30,972 jobs across the Greater Oklahoma City region (the sum of indirect and induced employment). In total, an estimated 67,583 jobs statewide are provided either directly by the aerospace sector or supported indirectly through multiplier effects generated by the industry. In other words, each direct job in the aerospace sector supports approximately 0.85 additional jobs in the broader regional economy.

The \$2.67 billion in direct labor income earned by workers in the industry likewise generates substantial ripple effects as the income is earned and recirculated within the regional economy. The estimates in Figure 17 indicate that an additional \$1.39 billion in labor income earned by workers in other industries statewide is supported by direct activity in the aerospace sector, or a total earnings impact of nearly \$4.1 billion.

The output of goods and services in the region is similarly stimulated by the presence of the industry. The multiplier effects in Figure 17 indicate that aerospace establishments in the region generate an estimated \$4.89 billion in direct output of goods and services, resulting in estimated multiplier effects (both indirect and induced) of \$3.27 billion in additional output of goods and services in other industries in the region. Overall, either directly or indirectly through multiplier effects, aerospace activity in the Greater Oklahoma City region supports the production of \$8.16 billion in total output of goods and services in 2015.

Estimated Tax Effects

The activities of the aerospace industry in turn produce significant additional tax revenue for state and local governments in the region. Revenue estimates are detailed in Figure 18 and reflect estimates of tax payments made directly by firms in the aerospace industry and their workers, as well as tax revenue generated from spillover effects in other industries.

The tax estimates are generated using an IMPLAN input-output model for the 10-county Greater Oklahoma City region. The tax scenario is based on the labor income specified at the IMPLAN industry level for each of the five major subgroups of the aerospace industry.²²

In total, the \$2.67 billion in labor income generated directly by the industry produces an estimated \$189.4 million in tax payments to state and local government in 2015. Again, it is important to note that the estimated tax effects are gross measures and do not account for public or private costs associated with the aerospace sector such as tax exemptions or incentives.²³

Figure 18. Estimated State and Local Tax Revenue - Aerospace Activity (2015)

Type of Tax	Tax Revenue (\$Mil)	% of Total Revenue
Personal Income Tax	\$87.7	46.3%
Corporate Income Tax	2.9	1.5%
Motor Vehicle Tax	14.2	7.5%
Personal Property Tax	1.1	0.6%
Sales and Use Tax:		
State	\$48.8	25.8%
Local	34.6	18.3%
Total Sales and Use Tax	\$83.4	44.0%
Total State and Local Tax Revenue	\$189.4	100.0%

Source: IMPLAN Input-Output Model, Oklahoma Tax Commission, and RegionTrack Inc.

The largest single source of revenue is personal income tax payments to state government of approximately \$88 million which account for roughly one-third of total taxes generated. Personal income taxes also represent approximately 2.2 percent of the estimated \$4.06 billion in total annual labor income earned either directly by workers in the aerospace industry or through spillover effects generated in other industries across the region.

The second largest source of tax revenue is an estimated \$83.4 million in sales and use tax revenue, which comprises 44 percent of total tax revenue. Sales and use tax revenue received by the state is 25.8 percent (\$48.8 million) of total revenue while sales and use tax received by local taxing jurisdictions (\$34.6 million) is 18.3 percent of total taxes generated.

Motor vehicle taxes received by the state total an estimated \$14.9 million, or 7.5 percent of total taxes.

Corporate income and personal property taxes are the two smallest sources of added tax revenue and generate an estimated \$2.9 million and \$1.1 million in revenue, respectively.

Summary of Aerospace Industry Assessment

The aerospace industry remains a substantial and strategic component of the Greater Oklahoma City region economy. In 2015, 236 public and private sector establishments were directly engaged in aerospace activity in the 10-county Greater Oklahoma City region. These establishments produced approximately \$4.9 billion in goods and services and employed more than 36,600 workers earning \$2.7 billion in income.

Average labor income in the aerospace sector reached \$72,817 in 2015, 35 percent higher than the statewide average.

Aerospace jobs account for approximately 4 percent of the nearly one million total jobs in the 10-county region.

While all 10 counties in the Greater Oklahoma City region have some aerospace industry presence, the industry's core remains highly concentrated in Oklahoma County. Oklahoma County is home to nearly two-thirds of the region's aerospace employers, over 97 percent of the jobs, and more than 93 percent of the total output produced by the sector.

Tinker Air Force Base (AFB) and the FAA's Mike Monroney Aeronautical Center remain the two largest aerospace-related employers in the region with a combined 29,141 military, federal civilian, and contract personnel who earn labor income of \$2.1 billion annually.

Oklahoma City continues to develop as a key hub for aircraft maintenance, repair, and overhaul (MRO) activity. Estimates indicate that 78 firms employing 4,763 workers provide MRO services in the Greater Oklahoma City region. These firms produce \$1.3 billion in total output of goods and services annually and provide more than \$370 million in labor income to employees.

Air transportation services are spread throughout the Oklahoma City region and are provided by 102 establishments employing 1,652 workers. These establishments produce an estimated \$243 million in output of goods and services annually, with a total payroll of \$112 million.

Approximately 22 establishments are engaged in aircraft manufacturing, engineering, and consulting in the Oklahoma City region and produce \$113 million in total output. These firms employ 642 workers and provide total annual labor income of \$67 million to workers.

An additional group of 18 firms provides a range of other aerospace goods and services such as aerospace education (including flight training schools), aerial spraying, and aerial photography. These firms produce \$19.2 million in annual output of goods and services and employ 162 workers earning \$9.2 million in labor income.

A high concentration of federal workers makes it difficult to compare Oklahoma's aerospace sector to the other states. Oklahoma ranks among the top 20 states for workers in most key aerospace occupations. The state currently ranks 18th for aerospace engineers, 15th for aerospace engineering and operations technicians, 8th in employment of aircraft mechanics and service technicians, and 10th in avionics technicians.

Wages for most aerospace occupations in Oklahoma are lower than in many competing states and reflect the relatively low overall cost-of-living in the state. Oklahoma's aerospace wages are well below the western states of California and Washington for nearly all occupations, and are below the neighboring states of Texas and Kansas across most occupations. Oklahoma's wages are basically on par with Arizona and Florida, both lower-cost-of-living Sun Belt states with a more highly developed aerospace sector.

Federal civilian and military personnel play a key role in the aerospace workforce in Oklahoma. The state is home to 22,159 Air Force civilian and active duty military personnel, the 5th highest number among the states. The majority of these workers are located at Tinker Air Force Base. Only Texas, Florida, California, and Georgia are home to more.

Measured by civilian Air Force workers, Oklahoma is ranked 1st among the states with a reported 15,358 civilian personnel in fiscal year 2015. The state has consistently ranked at or near the top the past two decades, rivaled only by Texas.

The presence of both Tinker AFB and the FAA Monroney Center give Oklahoma City a high concentration of federal civilian employment relative to other regions of the country. Measured by Executive Branch civilian employees, the Oklahoma City CBSA is home to a reported 23,943 personnel, the 12th largest concentration in the nation. The majority of these workers are located at Tinker Air Force Base and The FAA Center. A reported 3.9% of all wage and salary workers in the Oklahoma City metropolitan area are federal civilian personnel, the 4th high concentration of federal civilian employment among federal hiring hubs.

The 17,884 civilian Air Force workers at Tinker AFB represent the largest single source of aerospace-related employment in the region and represent a large share of employment in the industry statewide. Civilians comprise roughly three-fourths of the overall workforce at Tinker AFB and primarily support the aircraft MRO mission of the Oklahoma City Air Logistics Center. Currently, there are a reported 7,492 (54 percent) white collar civilian personnel. Civilians also fill a reported 6,396 trade and craft jobs at Tinker AFB. Approximately 5,000 of these trade and craft jobs reflect traditional occupations in aircraft maintenance, repair, and overhaul.

Active duty Air Force personnel, both officers and enlisted, play a key role at Tinker AFB and similarly comprise a large component of the Greater Oklahoma City region aerospace workforce. Approximately 1,100 active duty Air Force officers are currently assigned to Tinker AFB. A reported 3,238 Air Force enlisted personnel play a relatively larger role than officers in supporting the aviation and logistics mission at Tinker AFB. Many enlisted personnel are directly engaged along with federal and contract civilian workers in aircraft maintenance and logistics.

The FAA's Monroney Center received a \$972 million operational budget in fiscal year 2015 and is home to a reported 5,412 civilian workers earning \$613 million in labor income. The FAA continues to maintain a very highly skilled workforce in Oklahoma City. Approximately 98 percent of the jobs are white collar and most require professional or other specialized training.

Existing studies of state-level aerospace activity rarely capture the full breadth of the aerospace industry in the state and in the Greater Oklahoma City region. Often overlooked are the large government installations and the diverse maintenance, repair, and overhaul (MRO) infrastructure located in the state and region.

A recent Deloitte study on the size of the aerospace and defense industry gives Oklahoma only a mid-tier ranking but overlooks key aspects of the aerospace sector in the state. The state is home to a reported 10,930 aerospace and defense workers (29th). These workers collectively earn \$750 million in income annually (31st) with an average wage of \$68,863 per worker (40th).

In terms of competitiveness, a recent PwC study of aerospace manufacturing attractiveness gives Oklahoma fairly strong marks and an overall ranking of 16th relative to the other states. Oklahoma ranks among the top 10 on both effective tax rate (7th) and operating costs (9th). These rankings are consistent with ongoing efforts within the state to reduce the overall business tax burden as well as offer attractive incentives to the aerospace industry. However, Oklahoma receives only mid-tier rankings on both existing industry size (37th) and educational attainment (37th).

Aviation-related contracting remains a key source of economic activity in Oklahoma and in the Oklahoma City region in particular. In fiscal year 2015, a total of 7,900 federal contracts value at \$2.76 billion were issued for performance within Oklahoma. Of these, an estimated 1,630 contracts (20.6 percent of total contracts) valued at \$1.41 billion (51.0 percent of the total) are deemed directly for aerospace-related goods and services in fiscal year 2015. Of total aerospace-related contracts, 80.4 percent (\$1.13 billion) are performed by firms with a listed operating address within Oklahoma.

For the 10-county Greater Oklahoma City region, 859 contracts (25.5 percent of 3,372 total contracts) valued at \$1.19 billion are directly aerospace-related in fiscal year 2015. For Oklahoma County, 669 contracts (25.5 percent of 2,623 total contracts) valued at \$1.14 billion are deemed aerospace-related, 65.5 percent of the value of total procurement in the county in the period.

Among a total of 401 unique vendors receiving aerospace-related contracts in fiscal year 2015, the top 25 vendors were awarded approximately 93 percent (\$1.102 billion) of the \$1.187 billion in total aerospace-related contracts. The average contract value for the top 25 vendors was more than \$44.1 million. Most aerospace-related federal contracts in the region remain quite small on average, with only 48 of the 401 vendors receiving contracts with a total value exceeding \$1 million in fiscal year 2015.

Boeing is the largest single aerospace-related contracting entity in the 10-county region in fiscal year 2015. Boeing's total contract value of \$542.3 million is more than double the \$252.1 million awarded to the second-largest vendor, Lear Siegler.

Aerospace activity also generates substantial economic ripple, or spillover, effects in other industry sectors across the Greater Oklahoma City region. Through estimated economic spillover effects, aerospace employers in the region indirectly support an additional 30,972 jobs, \$1.4 billion in labor income, and the production of \$3.3 billion in goods and services.

In total, establishments engaged in aerospace activities in the Greater Oklahoma City region support either directly or indirectly through spillover effects approximately 67,600 jobs, \$4.1 billion in labor income, and the production of \$8.2 billion in goods and services.

The activities of the aerospace industry in turn produce significant additional tax revenue for state and local governments in the region. In 2015, the industry accounts for an estimated \$189.4 million in direct and indirect tax payments to state and local government before exemptions or incentives. The majority of the tax payments are received in the form of state personal income tax payments (\$87.7 million) and state and local sales tax (\$83.4 million).

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Endnotes

¹ A description of the role of aerospace as a targeted industry ecosystem in Oklahoma is available online at: <http://okcommerce.gov/aerospace-defense/>

² More specifically, the U.S. Dept. of Defense (DOD) defines aerospace as of, or pertaining to, Earth's envelope of atmosphere and the space above it; two separate entities considered as a single realm for activity in launching, guidance, and control of vehicles that will travel in both entities. See the DOD Dictionary of Military Terms, U.S. Department of Defense: http://www.dtic.mil/doctrine/dod_dictionary/.

³ Kingfisher, Payne, and Pottawatomie Counties are not component counties of the Oklahoma City Metropolitan Statistical Area (MSA) as defined by the Census Bureau.

⁴ Aerospace establishments are identified initially using the September 2015 version of the infoUSA U.S. Business database for the 10-county Greater Oklahoma City region. <http://www.infousa.com>

⁵ Overall average labor income for the state of Oklahoma and the Oklahoma City MSA is reported by the U.S. Bureau of Economic Analysis and calculated as the sum of employee compensation plus proprietor's income divided by total employment.

⁶ All employment, labor income, and output estimates for Tinker AFB and the FAA Center are measured on a federal fiscal year 2015 basis but are reported as 2015 estimates throughout the report for consistency with other data.

⁷ A reported 1,900 civilian contract workers are employed at Tinker AFB in support roles. These workers are included in the aerospace sector because of their essential role in maintaining the overall operational presence of the base. Tinker AFB does not disclose the earnings of these workers. Their earnings are estimated using the overall state average labor income per worker of \$53,542, for total estimated labor income of \$101.73 million in FY2015. An additional 107 reported employees of private businesses located on the base earning \$3.26 million are included in the Tinker AFB employment total for FY2015.

⁸ Boeing is listed within the MRO group despite some of its activities falling under the manufacturing, engineering, and consulting group. Boeing also performs MRO work at locations other than Tinker AFB.

⁹ Among the 34 active civil aviation airports, 16 are publicly owned and open for public use, 3 are privately owned but open for public use, and 15 are privately owned and available for private use only.

¹⁰ A more detailed description of Will Rogers World Airport and its tenants is available online at: <http://www.flyokc.com/departments.aspx>

¹¹ The scope of the study includes establishments engaged in aerospace products and parts manufacturing (NAICS code 33641), search and navigation equipment (NAICS code 334511) as well as establishments engaged in manufacturing and providing services related to military land vehicles (NAICS code 336992), military ships and water based vehicles (NAICS code 336611), arms used by the military (NAICS code 332994 and 332995), ammunitions used by the military (NAICS codes 332992 and 332993), defense broadcast and wireless communications equipment (NAICS code 334220) and other services purchased by the armed forces (several NAICS codes pertaining to industries providing services to the A&D sector). NAICS codes considered for services are 511140, 511199, 517110, 518210, 541310, 541330, 541511, 541512, 541513, 541519, 541618, 541620, 541710, 561110, 561210, 561612, 561720, 561730, 561990, and 562910. Civilian employees working for the DoD, other defense agencies, the FAA, and NASA comprise the group of aviation and defense-skilled workers described in the report.

¹² Recent news reports of ongoing Boeing activity in Oklahoma City are available online at: <http://boeing.mediaroom.com/2015-07-29-Boeing-Oklahoma-City-Expansion-Grows-Facilities-Business-Presence>; and at <http://www.industryweek.com/expansion-management/boeing-s-expansion-boosts-oklahoma-s-aerospace-sector>.

¹³ An overview of Oklahoma state tax incentives is available online at: <http://www.oklahoma-is-aerospace.com/incentives.php>

¹⁴ Metropolitan area wage rates are reported from the 2015 release of the Occupational Employment Statistics by the Bureau of Labor Statistics (BLS).

¹⁵ Source: Interactive Demographic Analysis System (IDEAS) - Air Force Personnel Center

¹⁶ Most core based statistical areas (CBSA) are equivalent to Census definitions for metropolitan statistical areas (MSA).

¹⁷ Detailed employment by occupation data is available only for approximately 3,400 federal civilian employees at the FAA Center. Because civilian contractors perform a similar mix of jobs, the same occupational profile is assumed for all employees at the Center.

¹⁸ All procurement contracts that are first signed in fiscal year 2015 and with place of performance in Oklahoma are included.

¹⁹ Contracts for aerospace goods and services are found across 219 unique 6-digit NAICS codes: 131 in manufactured products; 2 in petroleum and other energy products; 10 in construction; 15 in wholesale trade; 10 in retail trade; 3 in transportation and storage; 7 in information; 3 in real estate; 16 in professional and business services; 8 in administrative and support; 4 in educational services; 1 in accommodations and food services; and 8 in other services.

²⁰ Caution must be exercised when using input-output multipliers to estimate the total economic activity “supported” by an existing industry or firm. Input-output multipliers are intended to predict the *change* in region-wide economic activity that results from an incremental *change* in a given industry within a regional economy.

²¹ State- and region-level multipliers are typically estimated by adjusting, or regionalizing, national purchasing patterns for a given industry sector such that they better reflect the actual economic flows within the states.

²² Labor income is specified individually for Tinker AFB and the FAA Center in the model using military-federal government and non-military federal government, respectively. Other government providers are assumed to reflect non-military federal government activity. The remaining sectors are specified using the most representative IMPLAN industry sector.

²³ For example, the tax estimates are not adjusted for the state Aerospace Industry Engineer Workforce Tax Credit for either employers or employees.

Contact

As one of Oklahoma City’s most important industry sectors, the Greater Oklahoma City Chamber commissions a study on our area’s aerospace industry every five years. For more information, about the study and the industry, go to www.greateroklahomacity.com/aerospace or contact:

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