Kentucky Commission on Military Affairs &
the Commonwealth of Kentucky

The Kentucky Defense Industry Study

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Prepared by:

THOMAS P. MILLER & ASSOCIATES

Kentucky Governor Matt Bevin

"As Governor, my vision is that Kentucky would become the center for engineering and manufacturing excellence in the United States. That's why I am excited about the economic opportunities posed by our state's growing Aerospace and Defense industries. Aerospace manufactured products have quickly become our state's #1 export at $10.85 billion in 2016, a figure that ranks Kentucky second nationally in this category. Kentucky's tremendous logistical capability, our central geographic location, a low cost of living, and our business friendly environment, are contributing factors to this success and give our state great potential for the future. As aerospace companies seek growth opportunities in the Midwest and South, Kentucky is well positioned to see this industry continue to expand throughout the commonwealth."

Kentucky Governor Matt Bevin

Kentucky Lt. Governor Jenean Hampton

"Growing up in the 1960's, I'd often wake up early to watch the rocket launches from Cape Canaveral. NASA and the space program inspired me to dream BIG dreams. Even though I didn't become an astronaut, I've never forgotten the curiosity, optimism and excitement of that period. As Lt. Governor, I'm absolutely thrilled to help Kentucky's aviation and aerospace industry grow. I helped start the Kentucky Aerospace Industry Consortium, support STEM education programs, and promote advanced manufacturing as a rewarding career path. This study is paramount to help us understand Kentucky's aerospace/aviation potential as we become a hub of manufacturing excellence."

Lt. Governor Jenean Hampton

Project Foreword

Over the past five years, aerospace exports in Kentucky have begun to take off. In the early 2000s, aerospace exports hovered slightly over a few billion dollars. By 2013, however, export activity started to change and in 2015, we had generated over $8.7 billion in exports. This surge was enough to push the Commonwealth to #3 nationally in export activity. This sweeping growth was quickly recognized, and in the 2015 legislative session, the General Assembly passed House Joint Resolution 100 to mandate this study of the aviation, aerospace, and defense supply chains. Through intense and thorough research, it has uncovered and highlighted many of the incredible statistics, companies, universities, and research underway throughout our state. By the end of 2016, Kentucky's aerospace exports had grown to $10.85 billion, which makes the Commonwealth #2 in the United States, behind only the state of Washington. This industry is poised to have an enormous and positive impact for all Kentuckians.

Aerospace growth goes way beyond just exports for Kentucky. It has also expanded in the number of companies involved and the individuals looking to make an impact in this arena. For many years, we have had an impact in the automobile industry with large and well-known companies like Toyota, Ford, and Chevrolet. Naturally, this has brought many automobile parts suppliers and manufacturers into the area. As aerospace product manufacturing began to rise regionally many of these companies that made pieces and parts for automobiles, began to use their skills and capabilities to do the same thing within the aerospace industry. At the beginning of this study, the Kentucky Cabinet for Economic Development listed 60 companies involved in aerospace in the state. Through the study, we discovered that Kentucky is home to more than 600 businesses involved in the aerospace and aviation cluster. These companies range from large to small and account for over 17,500 jobs.

While many of these 600+ companies are medium to small in terms of size, some are the larger aerospace and defense companies to include; Raytheon, Lockheed Martin, GE Aviation, Belcan, BAE, and Safran Landing Systems. These companies have relocated and expanded in Kentucky in large part due to a pro-business environment, low-energy costs, and low taxes. Safran has continuously expanded its operations and is currently working on it fifth expansion since 1999. In fact, if you fly commercially there is a high percentage chance that the brakes your aircraft landed on were manufactured at the Safran facility located in Walton, Kentucky.

In addition to the many manufacturers, Kentucky is also home to large logistical operations at the UPS Worldport in Louisville (SDF), and a DHL Hub in the Northern Kentucky Airport (CVG). This has given us a large and unique capability in moving and exporting aerospace products throughout the nation and the world. As the aerospace industry continues to grow and expand throughout the Midwest and South, our incredible logistical strength has the potential to make Kentucky the focal point for the export of aerospace products and parts for the entire region. To add to our already overwhelming logistical capabilities, Amazon Prime announced early in 2017, that it would be investing $1.5 billion in a prime air hub at the Northern Kentucky Airport. This will serve to further increase CVG's already incredible shipping and receiving capabilities. CVG has a daily flight to France that flies whether or not there is even one passenger on board. The reason for this is the value of the aerospace products shipped in the cargo hold. Kentucky proves time and time again that in a world where the ability to reach customers globally is key to success, it can truly deliver.

Global logistics infrastructure is a big reason why many companies are looking to do more business with our Commonwealth. This advantage is not just a positive for the larger companies, but also for the small to medium size businesses in aviation and aerospace cluster. These Kentucky based companies make an incredible array of parts for both military and civilian aircraft. Phoenix Products makes parts for the Blackhawk Helicopter, C-130 and the F-16. Foam Design supplies for the MV-22 Osprey. Meggitt has parts on the E-3A as well as braking systems on many other various aircraft. A.C.E. Compressor builds remanufactured air compressors. Highlands Diversified Services makes armrests and seat parts for commercial airliners. In addition, over 30 Kentucky companies supply Boeing in Charleston, South Carolina. The list of companies in our state contributing to America's aircraft and airpower goes on and on.

Many of these companies are making an impact on the space side of the equation as well. Space Tango, in Lexington, Kentucky, is one of only a handful of companies in the world that has their very own lab on the International Space Station (ISS). They have the capability to deliver to their clients the ability to conduct tests and experiments in micro-gravity. Their lab completes all experiments autonomously, without continuous interaction from ISS astronauts. They can, however, communicate directly with astronauts through a live feed from their Lexington office as they install experiments into the lab on the ISS. Space Tango is pushing into a new frontier in micro-gravity by taking a new approach when looking at space research. Most money spent in space is on looking outward to what is beyond Earth. Space Tango looks at space and micro-gravity and seeks to find how they can use these exotic environments to positively impact our lives on earth. They are completing this mission by finding new ways to use micro-gravity to manufacture products that cannot be built within Earth's gravity, and conducting bio-medical testing through their affiliate, Exomedicine. Until a few years ago the term exomedicine, which seeks to understand better ways to treat illnesses or diseases, did not exist. Now individuals worldwide are making calls to one of Exomedicine's founders, Kris Kimel, to see where they can pursue a Ph.D. on the subject.

Discussing aerospace in Kentucky would not be complete without talking about how our education opportunities are also breaking new ground, and influencing the aviation and aerospace industries worldwide. For many years, we have held the standard for aviation based stem high school education. With 38 schools involved in this program in the past that provided four different pathways for students, Kentucky changed the way our young minds viewed aviation and aerospace. Kentucky officials are continuing to re-work this program so that all schools have the ability to expose their students to possibilities available in aviation and aerospace.

Kentucky universities are also making a huge difference, and each in their own unique way. The University of Louisville (UofL) supports research in micro and nanotechnology, advanced materials, biotechnology, and advanced manufacturing at their Micro/Nano Technology Center. UofL, along with Western Kentucky University are also conducting International Space Station (ISS) experiments to understand colloid material behavior to enhance solar cell performance. In partnership with NASA Kentucky, the University of Kentucky (UK), and Kentucky State University led the development of Next-Generation Entry Thermal Protection. This will be beneficial to both small and large satellites. UK also conducts Unmanned Aerial Systems research in their Mechanical Engineering Department. Eastern Kentucky University is making waves in their aviation department as one of the top pilot training programs in the nation.

Some of the most incredible work in aerospace, however, happens at Morehead State University (MSU) in eastern Kentucky led by Dr. Benjamin Malphrus. MSU not only is one of the leaders in cubesat and other

small satellite technologies, but is also now part of the NASA Deep Space Network (DSN). This makes MSU the only non-NASA asset to have that honor. To date, MSU has launched five satellites into space, and will have their sixth released from the ISS in June 2017. One of their most incredible endeavors comes in 2018, where they will release a satellite mission called "Lunar Ice Cube" from the first launch of the new NASA Space Launch System. The NASA Space Launch System will be the largest rocket ever created. MSU's Lunar Ice Cube mission will be to travel to the moon to look for potential ice formations, a critical building block for future NASA moon missions.

So what is next? As you can see, Kentucky is participating at the forefront of new frontiers, and is pushing the boundaries of technology. The innovation and participation of companies, universities, and individuals will continue to propel our state to the top of the aerospace industry in exports and other categories. The Commonwealth's biggest battle moving forward is perception. Most people in state and out of state are completely unaware of the impact we are having on aerospace. We need to act now to unite, promote, and grow this industry in order to solidify itself as a focal point in a growing aerospace region throughout the Midwest and South. Companies in aerospace continue to relocate in these areas for their business friendly policies, lower taxes, lower energy costs, and lower costs of living. Promotion of the industry will help grow businesses currently in Kentucky, but will also help attract new businesses to relocate. It will also increase awareness of the career opportunities in these thriving industries for our citizens.

As you can see, Kentucky is having a vast impact on the aerospace industry. This, however, is only a small portion of what is happening throughout the Commonwealth. To continue this momentum, state officials need to ensure they make the right steps to continue to strengthen this industry. Great strides have been made in the promotion and unification of the aerospace industry through the creation of the Kentucky Aerospace Industry Consortium by Governor Matt Bevin, and Lt. Governor Jenean Hampton. This organization will be key moving forward to grow the aerospace industry and create a brand for Kentucky Aerospace. The Commonwealth has also shown its commitment to the industry through the recruitment of Braidy Industries to relocate to Kentucky and invest $1.3 billion to build an aluminum mill in Greenup County. Some of the aluminum produced at this facility will be aerospace grade material suitable for many manufacturers and suppliers in the aerospace industries. This proves that our state is serious about aerospace and is poised to continue to make a huge impact.

Fifty years ago, most technological innovations were accomplished by governments, large companies, or major universities. However, we currently live in a world of rapidly growing technological capability. As that capability grows, it also shrinks in physical size. This has allowed smaller companies and individuals to create disruptive technologies or to have an impact on any industry globally. Want proof? Look no further than Kentucky with its robust and growing aerospace industry.

D. Stewart Ditto II
1st Lt, USMC (Ret)
Project Manager
Kentucky Commission on Military Affairs

Project Overview

Aerospace and Aviation are two industries rising to new prominence in Kentucky. Because of Kentucky's strong military identity with installations such as Ft. Knox, Ft. Campbell, and Bluegrass Army Depot, opportunities for Kentucky to benefit from defense contracting are coming into focus. The nature of national defense and its ties to aerospace and aviation means opportunities in each sector must be considered individually as well as understanding where they overlap.

In a move to assure Kentucky realizes its full potential to leverage these opportunities, the Kentucky General Assembly passed House Joint Resolution 100 (HJR100)in 2015. The resolution directed the Kentucky Commission on Military Affairs (KCMA), the Kentucky Transportation Cabinet (KyTC), and the Cabinet for Economic Development (CED) to study the economic impact of the overall aerospace/aviation industry in the Commonwealth and to report the findings to the Governor and the Legislative Research Commission (LRC).

Following a competitive bidding process, a consulting team led by Thomas P. Miller and Associates (TPMA) was selected to provide the partner agencies listed in the resolution with a study analyzing the Aerospace, Aviation and Defense industry sectors. TPMA was charged with determining the annual economic impact, potential growth areas, education and workforce development issues, developing recommendations for sustained growth, and creating an online, interactive, data-driven mapping tool. The study and subsequent mapping tool will enable Kentucky companies to understand and participate in the aerospace, aviation and defense industries. Civic leaders and policy-makers will benefit from an effective, updated source to inform the legislative process and drive increased employment in this sector.

To better understand the aerospace, aviation and defense industries in Kentucky, TPMA utilized several sources of quantitative and qualitative data over the year-long project. In addition to the myriad of data sources accessed for quantitative review, representatives with TPMA hosted several topic-specific focus groups with industry leaders across Kentucky. Targeted interviews further refined the qualitative feedback, ultimately providing a more rich and in-depth analysis of the aerospace, aviation and defense industries in the state.

In addition, representatives of the TPMA team attended marketing and other public presentation opportunities to provide progress updates and gather additional viewpoints from across the state. Reports and presentations were provided to the project steering committee, state legislators, Kentucky's Aviation Day Conference, and the Kentuckians for Better Transportation Conference.

The defense industry in Kentucky has grown into a major contributor to the state's economic vitality. Military assets in Kentucky with considerable economic impact include installations such as Fort Knox, Fort Campbell, and the Bluegrass Army Depot. Lesser known, but important assets include the presence of the Kentucky National Guard, U.S. Coast Guard, U.S. Army Corps of Engineers, and military recruiting stations across the state. These operations provide positive economic impact through defense contracting and a gateway to careers and family-sustaining wages.

Along with this network of military installations, Kentucky has grown a defense industry within the state that provides the services, products and innovations that keep the military strong, robust and healthy.

Through a thorough analysis of Department of Defense contracting, the project team has provided an in-depth view into the defense industry and its supply chain within the Commonwealth.

Several common themes, synergies and obstacles exist in both the civilian aerospace and aviation industries and the defense industry in Kentucky. Each sector also has its own set of dynamic characteristics. In order to provide the most comprehensive analysis at each of the two areas, TPMA and the project team present this report into two distinct sections:

- The Kentucky Aerospace and Aviation Industry Study
- The Kentucky Defense Industry Study

The Kentucky Aerospace & Aviation Industry Study Team

Prime Consultant –

THOMAS P. MILLER & ASSOCIATES

Consulting Team –

Lieutenant General (Ret.) Benjamin Freakley

Fourth Economy Consulting

R.A. Wiedemann & Associates

Business Development Zone

Web and Mobile Visualization –

Heartland Communications Consultants

Executive Summary

Key Findings

The following represent the most high-level findings from the analysis of Kentucky's Defense industry. Additional and more detailed findings on specific topics are highlighted in the chapters, which follow.

- Kentucky is home to Ft. Knox, Ft. Campbell, the Bluegrass Army Depot as well as facilities operated by the U.S. Army Corps of Engineers, Kentucky Army National Guard and Reserves.
- Kentucky is part of the supply chain for the Virginia Class Submarine, the Patriot Missile System, the Super Hercules C130-J military transport aircraft, the Boeing KC-135 Stratotanker, and the Minuteman II Missile System (the largest aerospace system in the Kentucky defense supply chain).
- The U.S. Department of Defense (DoD) contracted for about $22.3 billion with just over 1,300 Kentucky companies in 505 different industries between FY12 and FY15. However, more than 90 percent of that amount was awarded to just 24 companies.
- The industry that receives the largest volume of DoD contracts in Kentucky is Direct Health and Medical Insurance Carriers.
- The top three Defense industry categories receiving these contracts dollars are Finance, Insurance, & Management; Admin, Support, & Waste Management; and Construction and Extraction.
- Ten industries have high potential for growth based on the industry's strength and the percentage of contract dollars being leaked to out of state firms. Other Heavy and Civil Engineering Construction is the industry with the largest potential for growth.
- There are more than 1,100 Kentucky companies able to contract with DoD. Most of these establishments are concentrated in the Louisville and Lexington regions.
- Jefferson County leads the state in defense establishments, employment, and total defense contracting dollars, due largely to Humana Military Healthcare Services' $13 billion in contracts between FY 2012-2015.
- Beyond health services and insurance, the largest DoD program activity in Kentucky is for the Chemical Demilitarization program at nearly $1.5 billion between FY 2012-2015.
- Although most DoD spending has declined since FY 2013, the Defense Information Systems Agency (DISA) has increased contracts by over $6.7 million. This trend could continue, based on DISA relocating major components of its operations to Fort Knox.
- More than 90 percent of all DoD contracts awarded to Kentucky companies are for services.
- Nearly 5,400 Kentucky companies are authorized to apply for DoD contracts, but did not receive awards between FY 2012 and FY 2015.
- The DoD has seven contracting offices in Kentucky. During FY 2015 these seven offices awarded over $582 million to organizations within Kentucky and $3.8 billion was awarded to organizations outside commonwealth.

Key Recommendations

The following is a preview of the recommendations for maximizing the economic potential of Kentucky's Defense industry. These recommendations are described in further detail in the following Chapters.

Enhancing Business Opportunities

- Develop a Kentucky Defense Industry Consortium to Further the Defense Industry in Kentucky
- Plug Supply-Chain Gaps by Connecting In-State Businesses or Attracting Out-of-State Businesses
- Build Partnerships with Defense Dependent Companies and Create Opportunities for Diversification

Leveraging Military Partnerships

- Create a Committee to Help the State Attract Additional Research, Missions, and Veterans

Managing the Cost of Doing Business

- Improve Military-Related Tax Issues

Developing Innovations

- Explore Creating an Innovation Hub to Act as an Incubator for Creative Technology and Manufactured Goods

Enhancing Workforce

- Develop Programs Designed to Attract Spouses to the State
- Develop Military Focused Apprenticeships

Capitalizing on Current Assets and Missions

- Explore Becoming a National/Regional Training Hub

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Chapter 1: Defense Industry Potential

Key Findings

This chapter provides an overview of the defense economy in the state of Kentucky. It focuses primarily on analysis of contracting activity between the United States Department of Defense (DoD) and business establishments throughout the state. Based on the underlying characteristics of Kentucky's defense economy at both the firm and industry levels, Thomas P. Miller and Associates (TPMA) has identified areas of high potential and high vulnerability within this sector. A key piece of this analysis is the identification of current contracting leakage to other states. Strategic recommendations for future job growth are informed by the supply chain gaps identified through this analysis of leakage, as well as the underlying data about contracting industries and firms. Highlights of these results are as follows:

- Between prime and subcontractors, U.S. DoD contracting between FY12 and FY15 spanned 532 industries and averaged around $5.6 billion per year. Despite the large number of industries covered, the vast majority of contracting dollars flow into just a few industries. The industry that receives the largest volume of DoD contracts in Kentucky is Direct Health and Medical Insurance Carriers.
- By Defense Industry Group, the top three broad industry categories receiving defense contract dollars are Finance, Insurance, & Management; Admin, Support, & Waste Management; and Construction and Extraction. These groups of industries account for $19.3 billion of the $22.3 billion in defense dollars that Kentucky businesses obtained between FY12 and FY15.
- Most industries are not highly-dependent upon defense contracts for their total statewide sales, but for 16 industries, defense contracting made up more than 40% of industry-wide sales in Kentucky from 2012-2015.
- Nine industries were identified as having high potential for growth based on the industry's strength and the amount of contract dollars being leaked to out of state firms. Based on this metric, NAICS 237990—Other Heavy and Civil Engineering Construction—is the industry with the largest potential for growth.
- Similarly, defense dependency and retention of defense contracting dollars were used to determine the six most vulnerable industries to changes in defense contracting patterns. Among these industries are All Other Support Services; Commercial and Institutional Building Construction; and Other Support Activities for Air Transportation.
- TPMA's research identified 1,361 defense establishments within Kentucky. The most common defense industry group among these establishments is Other Services & Trade, followed by Construction & Extraction. Most of these establishments are concentrated in the Louisville and Lexington regions. Jefferson County leads the state in defense establishments, employment, and total defense contracting dollars.

Overall, the theme of the defense industry in Kentucky is concentration. Just a few industries make up the majority of DoD contract dollars, and two counties rise well above all others in total defense activity. Importantly, two of the largest contracting industries are considered potentially vulnerable. Kentucky should work to ensure that it does not lose contracting dollars in vulnerable industries while also exploring the potential to diversify away from DoD reliance. Meanwhile the state can assist firms in industries that are poised for growth. Alongside this effort, the state may wish to support budding defense industries in parts of the state other than the two regions that dominate defense contracting—Louisville and Lexington.

Introduction

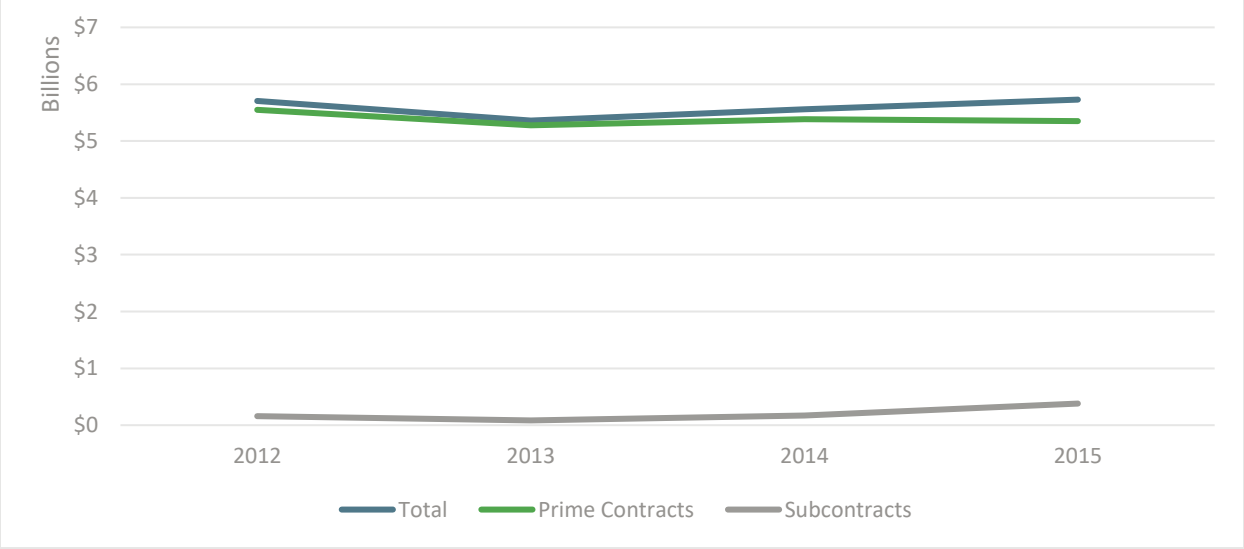
This chapter defines the current environment for the broader defense industry within Kentucky. Primarily, the analysis focuses on contracting activity between the United States Department of Defense (DoD) and business establishments throughout the state. As a component of this analysis and in conjunction with the identification of current contracting leakage to other states, Thomas P. Miller and Associates (TPMA) has identified areas of high potential and high vulnerability within this sector.

Defense Industry Potential

Industry-Level Overview

Each federally awarded prime and sub-contract is catalogued with an industry North American Industry Classification System (NAICS) code related to the type of service performed under that contract. These codes may not always correspond to the primary NAICS code of the contract's recipient. Thus, industry-level analysis of Kentucky DoD contracting is based on services performed and contract details, rather than individual company-level information. Overall, DoD contracts awarded to prime contractors and subcontractors in Kentucky between FY2012 and FY2015 were very widespread, involving 532 out of the possible 1,121 industries in the current NAICS coding taxonomy. Each year, total contracting among all these industries combined has hovered around $5.6 billion for Kentucky firms. The vast majority of DoD dollars awarded to Kentucky firms were in the form of Prime Contracts, but subcontracting dollars have risen in recent years.

Figure 1: KY DOD Contract Dollars, by Fiscal Year[1]



Although the number of industries involved in defense are considerable, the vast majority of contracts are concentrated within a handful of industries. As shown in Figure 2, 62.5% of all DoD dollars awarded to Kentucky firms between 2012 and 2015 went to just one industry, and over 86% went to the top five industries.

1 USASpending.gov. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Figure 2: FY12-15 Kentucky Contracting Dollars by NAICS Code[2]

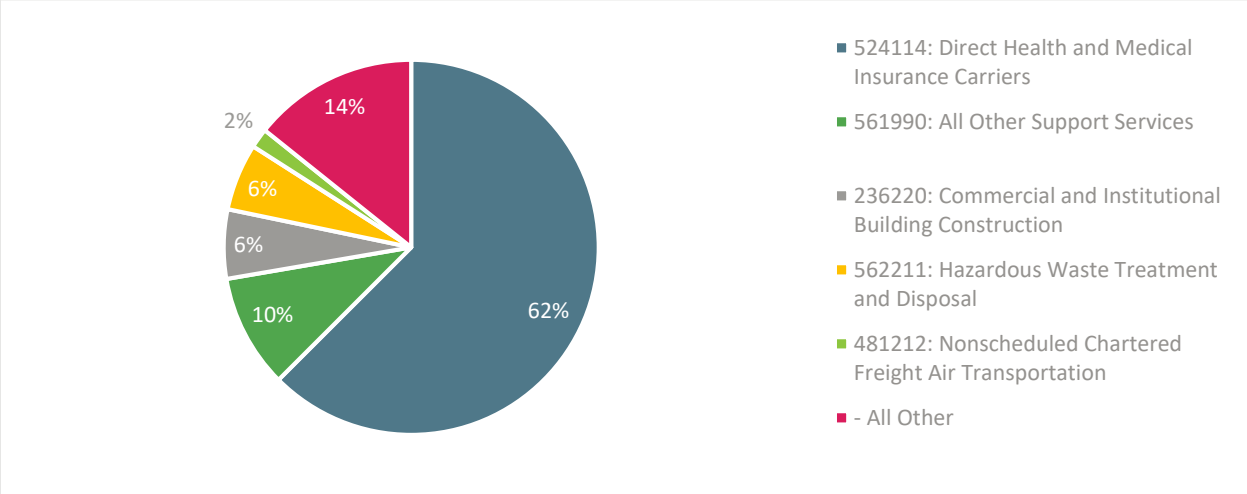


Table 1 shows further details about these top five DoD contracting industries. Direct Health and Medical Insurance Carriers make up the largest industry for defense contracting, followed by All Other Support Services and Commercial and Institutional Building Construction. Though each of these industries performs a large volume of defense contracting in Kentucky, not all provide significant jobs for the state. For example, the Hazardous Waste Treatment and Disposal industry employs only 491 people in Kentucky, while the Nonscheduled Chartered Freight Air Transportation industry employs only 292. At the industry level, contracting dollars are based on the industry code associated with each contract, which is not necessarily the predominant industry code assigned to those companies. For this reason, sales and job numbers for a particular industry may not perfectly align with industry contracting dollars.

Table 1: Top Five DOD Contracting Industries in Kentucky, FY12-15[3]

NAICS	Industry	Defense Industry Group	FY12-15 Contracting	2015 Sales	2015 Jobs
524114	Direct Health and Medical Insurance Carriers	Finance, Insurance, & Management	$13,973,158,507.14	$6,589,956,725.35	15,317
561990	All Other Support Services	Admin, Support, & Waste Management	$2,188,578,289.17	$281,976,625.71	3,963
236220	Commercial and Institutional Building Construction	Construction & Extraction	$1,333,259,542.69	$1,270,358,903.42	8,845
562211	Hazardous Waste Treatment and Disposal	Admin, Support, & Waste Management	$1,292,904,092.09	$121,156,597.79	491
481212	Nonscheduled Chartered Freight Air Transportation	Transportation, Warehousing, & Utilities	$378,115,088.14	$89,777,024.77	292

2 USASpending.gov. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.
3 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates utilizing additional data from USAspendimg.gov.

The 532 industries associated with Kentucky's DoD contracts were grouped into eight broad categories according to their two-digit NAICS.[4] This reveals some overall trends in the types of activities that are supported by defense contracts throughout the state. Once again, the majority of contracting dollars flow to only a few industries. The Finance & Insurance group includes just three industries but comprises nearly two-thirds of Kentucky's defense contracting. On the other hand, Durable Goods Manufacturing contractors come from many different industries, but fall in the middle in terms of total contract dollars. There may be more total contracts available for specialized manufactured inputs, but these contracts are not as valuable as those secured in the Finance & Insurance sectors. In Kentucky, manufacturing also takes a backseat as a source of defense contracting dollars to industries in the Administration, Support, & Waste Management and Construction & Extraction fields.

Table 2: KY FY12-15 Contracting by Industry Group[5]

Defense Industry Group	Number of Industries	Total 12-15 Contracting
Finance, Insurance, & Management	3	$13,973,195,138
Admin, Support, & Waste Management	33	$3,789,805,854
Construction & Extraction	36	$1,574,098,745
Durable Goods Manufacturing	183	$1,194,299,787
Transportation, Warehousing, & Utilities	29	$956,141,808
Non-Durable Manufacturing	68	$360,189,450
Information, Professional, & Scientific	45	$312,820,885
Other Services & Trade	135	$193,142,307
Unclassified NAICS		($239,495)
All	***532***	***$22,353,454,478***

Defense Dependency by Industry

For each of the 532 industries, average contracting dollars for fiscal years 2012 through 2015 were compared to average industry sales in Kentucky during those same years. The purpose of this exercise was to analyze each industry's dependence on defense contracts. These industries may be susceptible to changes in DoD spending, and identifying them helps with understanding the possible economic impact of defense contracting cuts. In order to assess the percent of an industry's sales that come from defense contracts, industries were grouped into dependency categories. This accounts for any discrepancies between sales numbers, which correspond to calendar years and contracting numbers, which correspond to fiscal years. These categories are shown in Table 3.

4 Each category was delineated primarily at the 2-digit NAICS level. Admin, Support, & Waste Management includes 56 and 92; Construction & Extraction includes 11, 21, and 23; Durable Goods Manufacturing includes 321, 327, and 33; Finance, Insurance, & Management includes 52 and 55; Information, Professional, & Scientific includes 51 and 54; Non-Durable Manufacturing includes 31 and 322-326; and Transportation, Warehousing, & Utilities includes 22, 48, and 49. Other Services & Trade is a miscellaneous category that includes 42-45, 53, 61, 62, 71, 72, and 81;

5 USASpending.gov. This data was analyzed by Thomas P. Miller & Associates. Figures may not add to total due to rounding. Negative values are the result of contract modifications or previously over-paid contracts.

Table 3: KY Defense Contract Dependency[6]

DoD$/Total Industry Sales	Number of Industries
>80%	12
60-79.9%	1
40-59.9%	3
20-39.9%	12
10-19.9%	4
5-9.9%	15
2-4.9%	19
1-1.9%	24
<1%	420
Sales Data Unavailable	22

Most industries that participate in defense contracting are not highly dependent upon defense dollars for overall Kentucky-wide sales. All but 32 industries in the state gain less than 10% of their total sales from defense contracts. However, for 13 industries, defense contracting comprised more than 60% of total industry sales between 2012 and 2015.

In order to focus on particularly important defense contracting industries in the state, the overall group of 532 industries was reduced based on total contracting dollars. The top 20% of contracting industries—106 total industries—were analyzed for their defense dependency, potential for growth, and potential vulnerability to defense dollar losses. Almost every highly-dependent industry was in the top 20% of contracting; that subset included 28 of the 32 industries with defense dependency above 10% and only excluded two—Other Metal Valve and Pipe Fitting Manufacturing and Small Arms Ammunition Manufacturing—that fell in the >80% category.

Of these 106 high-dollar defense-contracting industries, ten have defense dependency rates of greater than 80%, meaning that the majority of each industry's sales in Kentucky between 2012 and 2015 came from defense contracting. In addition, one of these industries had a defense dependency ratio of greater than 60%. All 11 of these industries are shown in the table below.

Table 4: High-Contracting Industries with Greater Than 60% Defense Dependency[7]

NAICS	Industry	FY12-15 Contracting	Dependency Category
561990	All Other Support Services	$2,188,578,289.17	>80%
562211	Hazardous Waste Treatment and Disposal	$1,292,904,092.09	>80%
481212	Nonscheduled Chartered Freight Air Transportation	$378,115,088.14	>80%
315210	Cut and Sew Apparel Contractors	$144,974,349.54	>80%
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	$104,708,820.03	>80%
481112	Scheduled Freight Air Transportation	$90,060,240.57	>80%
334210	Telephone Apparatus Manufacturing	$60,597,974.68	>80%
333316	Photographic and Photocopying Equipment Manufacturing	$22,929,300.17	>80%
332993	Ammunition (except Small Arms) Manufacturing	$10,177,433.90	>80%

6 Emsi 2016.4. This data was analyzed by Thomas P. Miller and Associates.
7 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

NAICS	Industry	FY12-15 Contracting	Dependency Category
315240	Women's, Girls', and Infants' Cut and Sew Apparel Manufacturing	$3,581,718.24	>80%
524114	Direct Health and Medical Insurance Carriers	$13,973,158,507.14	60-79.9%

Conversely, 39 of the 106 high-contracting industries were less than 1% defense dependent. These industries are listed in in Appendix A. Each of these industries perform large quantities of contracting with the DoD but do not rely on these contracts for a large portion of their sales in Kentucky. Therefore, they are less vulnerable to defense spending volatility than those in Table 4.

Top High Growth Potential Defense Industries

From the list of 106 industries with high overall contracting, TPMA analyzed industries with potential for growth in defense contracting. These "High Growth Potential Industries" were identified from among the top contractors based on three main criteria: location quotient, percent of Kentucky-based contracting that is going to out-of-state firms, and defense contracting dependency. Specific details for each variable are shown below:

- Location Quotients (2015)
  - Based on the amount of employment in Kentucky for a particular industry compared to the national average, this variable indicates Kentucky's relative strength in that field. A location quotient of 1.0 indicates equality with the national average. An industry with a location quotient higher than 1.25 is considered a strong industry for the state.
  - To be considered High Growth Potential, an industry must have a location quotient greater than 1.25.
- $ Out of State
  - This figure takes the total dollars in FY12-FY15 defense contracts awarded by DoD offices located in Kentucky and tracks the portion that was awarded to out-of-state firms. The contracts obtained by Kentucky and non-Kentucky firms from out-of-state offices are not considered in this figure.
  - This figure helps paint a picture of defense dollar leakage to other states. To be considered High Growth Potential, at least $250,000 a year ($1,000,000 total) must be leaking from Kentucky contracting offices to out-of-state firms in a particular industry.
- Defense Contracting Dependency
  - This figure is the same as the dependency ratios discussed in the previous section. It gauges the percent of an industry's sales that are driven by DOD contracts.
  - To be considered High Growth Potential, an industry must be less than 20% dependent upon defense contracts. This criterion is created with the assumption that industries with high defense dependency do not have much room to increase their current contracting levels.

Based on these three criteria, nine High Growth Potential Industries were identified. These are industries in which Kentucky has strong employment and sales that are not driven by defense contracting. Kentucky has the opportunity to leverage these strengths to obtain greater contracting dollars. Table 5 shows these

industries sorted by total dollars lost to out of state firms. This illustrates that Other Heavy and Civil Engineering Construction is the industry with the most to gain.

Table 5: Prominent Contracting Industries with High Growth Potential[8]

NAICS	Industry	FY12-15 Contracting	Dependency Category	% Out of State	$ Out of State	2015 Location Quotient
237990	Other Heavy and Civil Engineering Construction	$103,060,119	5-9.9%	98.0%	$750,872,944	1.4
236210	Industrial Building Construction	$27,380,568	1-1.9%	84.6%	$60,549,233	1.5
334290	Other Communications Equipment Manufacturing	$39,173,657	<1%	100.0%	$7,420,698	2.4
561320	Temporary Help Services	$3,645,312	<1%	100.0%	$7,154,149	1.5
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance	$5,089,096	<1%	67.7%	$6,864,148	1.3
315220	Men's and Boys' Cut and Sew Apparel Manufacturing	$14,484,494	5-9.9%	93.0%	$6,276,784	2.7
314910	Textile Bag and Canvas Mills	$250,813,539	10-19.9%	85.9%	$1,528,295	2.1
337215	Showcase, Partition, Shelving, and Locker Manufacturing	$50,405,777	2-4.9%	88.3%	$1,436,798	1.4
237130	Power and Communication Line and Related Structures Construction	$3,972,646	<1%	22.3%	$1,001,592	1.6

Vulnerable Industries

The opposite of High Growth Potential industries are those that are currently successful recipients of contracts in Kentucky, but are vulnerable to changes in DoD contracting volume or increased leakage of defense contracts from Kentucky-based offices to out-of-state industries. Vulnerable industries are identified from the list of 106 high-contracting industries using two of the same criteria used to identify High Growth Potential industries as well as consideration of dollars retained in-state.

- Location Quotients (2015)
  - As described above, this variable indicates Kentucky's relative strength in that field. An industry with a location quotient greater than 1.25 is considered a strong industry for the state.
  - To be considered Vulnerable, an industry must have a location quotient less than 1.25.
- $ In State
  - This figure takes the total dollars in FY12-FY15 defense contracts awarded by DoD offices located in Kentucky and tracks the portion that was awarded to *in-state* firms. The contracts obtained by Kentucky and non-Kentucky firms from out-of-state offices are not considered in this figure.

8 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller and Associates utilizing additional data from USAspendimg.gov.

- This figure helps paint a picture of potential defense dollar leakage to other states that is currently being obtained by Kentucky-based firms. To be considered Vulnerable, at least $250,000 a year ($1,000,000 total) must be received by Kentucky firms from Kentucky contracting offices in a particular industry.

- Defense Contracting Dependency
  - To be considered Vulnerable, an industry must be more than 20% dependent upon defense contracts. Industries such as these are more closely tied to potential volatility in the defense contracting market.

The six industries identified below are vulnerable to both decreases in total DoD contracting and increases in the percentage of defense contracts that are awarded to non-Kentucky firms. Notably, these industries include two of the top three defense contracting industries in the state: All Other Support Services and Commercial and Institutional Building Construction. Of the Kentucky firms identified as part of the defense cluster, approximately 95 have primary NAICS codes associated with one of these six industries.

Table 6: Potentially Vulnerable Prominent Contracting Industries[9]

NAICS	Industry	FY12-15 Contracting	Dependency Category	% Out of State	$ In State	2015 Location Quotient
561990	All Other Support Services	$2,188,578,289	>80%	0.8%	$2,176,695,161	1.02
236220	Commercial and Institutional Building Construction	$1,333,259,543	20-39.9%	88.7%	$274,192,325	1.00
488190	Other Support Activities for Air Transportation	$273,116,921	20-39.9%	9.8%	$14,131,527	1.14
561210	Facilities Support Services	$200,128,943	20-39.9%	97.7%	$5,609,944	0.61
337214	Office Furniture (except Wood) Manufacturing	$24,202,347	20-39.9%	93.1%	$2,385,612	0.43
315990	Apparel Accessories and Other Apparel Manufacturing	$34,223,199	40-59.9%	90.3%	$1,447,550	0.5

9 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller and Associates utilizing additional data from USAspendimg.gov.

Firm-Level Overview

The cluster of establishments in Kentucky's defense industry was built primarily from government contracting data. Lists of firms that have served as prime and subcontractors with the DoD between FY12 and FY15 were supplemented with survey information about defense industry establishments collected from the Kentucky Cabinet for Economic Development. In total, this process resulted in the identification of 1,361 establishments throughout Kentucky, 1,345 of which could be identified as geographically located in the state. A map of all active defense cluster firms can be found in Appendix A. Overall, the map highlights the strong concentration of firms in the Louisville and Lexington Regions as well as a scarcity of defense contractors particularly in the Ashland and Mountain Regions. Firms on this map are color-coded by the Defense Industry Group to which they belong. The most common groups are Other Services & Trade; Construction & Extraction; and Durable Goods Manufacturing—as shown in Table 7 below.

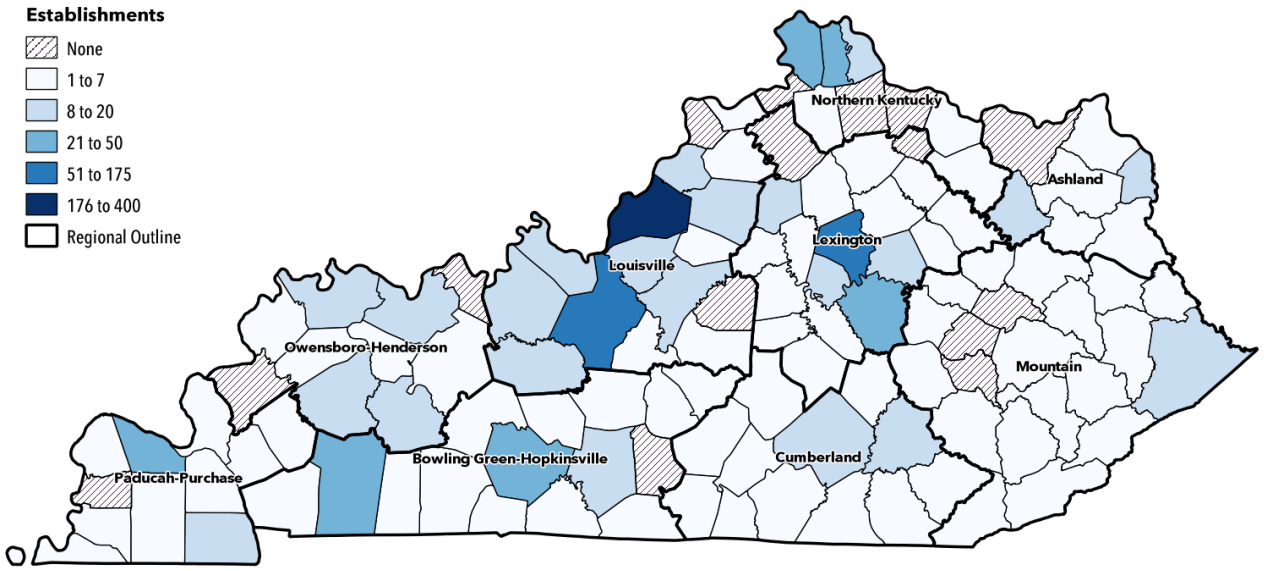
Table 7: Defense Establishments by Industry Group[10]

Defense Industry Group	# of Establishments
Other Services & Trade	469
Construction & Extraction	254
Durable Goods Manufacturing	235
Information, Professional, & Scientific	160
Admin, Support, & Waste Management	102
Non-Durable Manufacturing	67
Transportation, Warehousing, & Utilities	45
Finance, Insurance, & Management	7
Unidentifiable	6

Figures 3 through 5 present the distribution of defense establishments, employment, and contracting dollars by county throughout the state. Overall, most contracting activity is concentrated in the Louisville and Lexington regions, followed by Bowling Green-Hopkinsville, Owensboro-Henderson, and Northern Kentucky. Other areas of the state—especially the Mountain region—garner very few of Kentucky's defense dollars.

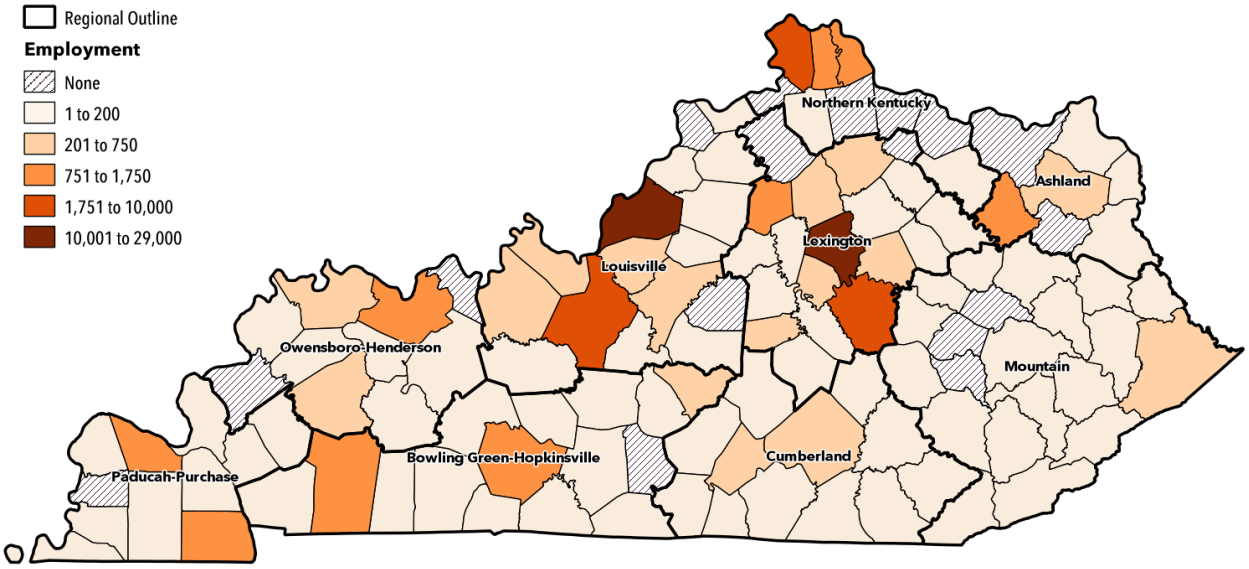
10 USASpending.gov. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates utilizing additional data from NETS.

Figure 3: Kentucky Defense Establishments by County[11]



Defense establishments are most prevalent in the Louisville and Lexington regions of Kentucky, with smaller clusters in Bowling Green-Hopkinsville and Northern Kentucky. Jefferson County leads all counties with 392 defense establishments, followed by Fayette County with 164.

Figure 4: Employment at Defense Establishments by County[12]



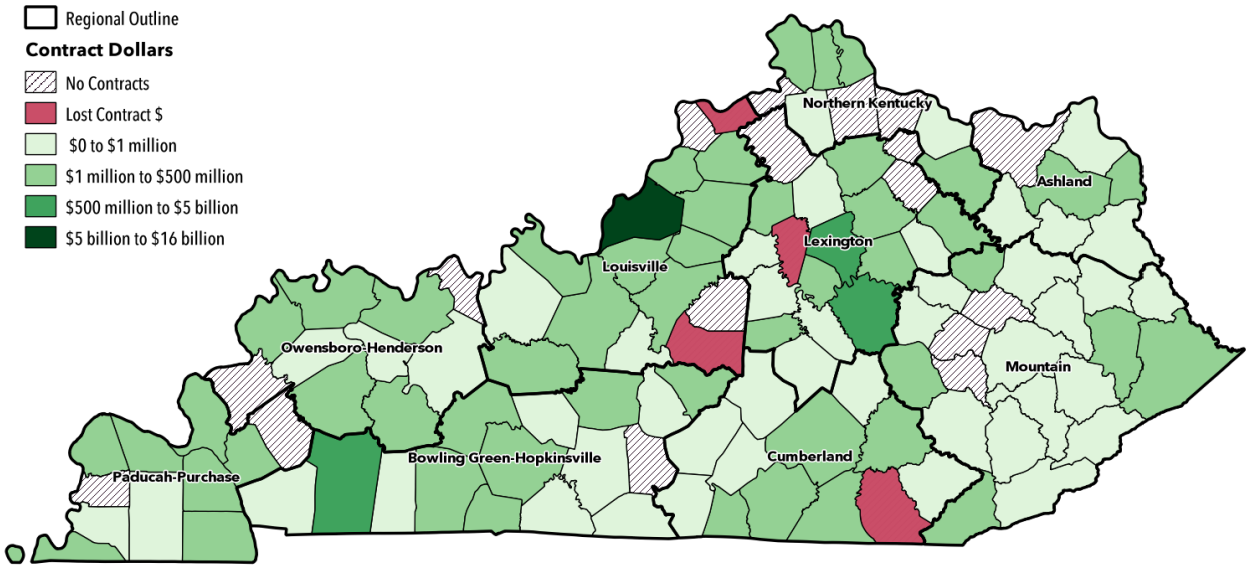
Overall, the counties that lead in defense establishments also dominate in defense-related employment. Figure 4 maps employment at defense establishments by county. Jefferson County once again leads with

11 USASpending.gov. This data was analyzed by Business Development Zone and Thomas P. Miller Associates utilizing additional data from KCED.

12 USASpending.gov. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates utilizing additional data from KCED.

just over 28,000 employees, followed by Fayette County with just over 26,000. A distant third is Boone County, with 4,055 employees at defense-contracting firms. It is important to note that not all firms within the defense cluster focus exclusively on DoD activity. Thus, not all employment can be credited purely to defense contracting.

Figure 5: FY12-FY15 Defense Contracting by County[13]



A more realistic picture of defense contracting impacts might be ascertained by looking solely at defense contracting dollars. This is depicted in Figure 5. With just over $15.5 billion in prime and subcontracting activity between 2012 and 2015, Jefferson County is the leader by far in this category. Counties in the Lexington Region, however, come in second and third. Fayette County received approximately $2.6 billion in defense contracts, and Madison County received $1.3 billion in defense contracts during this time. Elsewhere around the state, several regions received very few of the defense contracting dollars. Across the state, 17 counties did not participate in defense contracting at all. Lastly, four counties—including two in the Louisville Region—logged negative contracting activity between FY12 and FY15. None of these counties had more than six total firms participating in defense contracting, so negative totals are likely the result of a few large contracts that were overpaid in previous years.

13 USASpending.gov. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates utilizing additional data from KCED.

Kentucky Commission on Military Affairs &
the Commonwealth of Kentucky

Chapter 2: Department of Defense Contract Spending

Key Findings

This chapter provides an analysis of Department of Defense (DoD) contracting in Kentucky between fiscal years 2012 and 2015. In addition to providing an overview of DoD contracting in the state, the chapter offers an analysis of the companies, regions, and industries most reliant on DoD contracts. The following are key findings of the chapter:

- Between FY 2012 and FY 2015, over $22.3 billion in DoD contracts were awarded to 1,302 organizations in Kentucky. However, of the 1,302 organizations, 24 accounted for 93% of the amount awarded.
- During this time, the largest DoD agency to contract in Kentucky was the Defense Health Agency which contracted for $7.1 billion (32% of total amount awarded). The next largest contracts were awarded by its predecessor, Tricare Management Activity ($6.9 billion); the Department of the Army ($3.8 billion); and U.S. Special Operations Command ($2.6 billion).
- During this time, two agencies experienced significant growth. The Defense Threat Reduction Agency increased contracts by $2.3 million (1,150%) and the Defense Information Systems Agency (DISA), which increased contracts by over $7.1 million (888%). Contract spending within the DISA could continue, based on the recent news that DISA will be relocating major components of its operations from Fort Meade, Maryland to Fort Knox, Kentucky.
- Based on Claimant Codes, the largest category awarded to Kentucky organizations was Services, which accounted for 87% of all contracts during the time period.
- In addition to Claimant Codes, DoD identifies the appropriate 6-digit NAICS code for each contract it authorizes. Based on the aggregated 2-digit NAICS codes assigned to DoD authorized contracts, the largest category of contracts was in the Finance and Insurance sector. Specifically, this represents awards to Humana Military Healthcare Services, Inc.
- Of the 24 organizations that were awarded 93% of DoD funding, the largest organization, Humana Military Healthcare Services, represented nearly two out of every three dollars of DoD funding. Organizations that received the next highest amounts of funding include Lockheed Martin Corporation (10%) and Bechtel Parsons Blue Grass, A Joint Venture (6%).
- DoD funding to Kentucky-based organizations was concentrated in four counties: Jefferson, Fayette, Madison, and Christian. It should be noted that Jefferson County is home to Humana Military Healthcare Services, Inc., and thus received the largest amount. While Jefferson and Fayette are the two largest counties in Kentucky, this indicates that there may be opportunities for companies in other parts of the state to learn about and apply for DoD contracts.
- There are currently 6,774 organizations in Kentucky authorized to apply for and receive DoD funding. Between FY 2012 and FY 2015, only 1,302 organizations were awarded DoD funding. TPMA recommends further research into why the other registered organizations were not awarded contracts. Possible reasons may include lack of opportunities, lack of awareness of opportunities, and/or non-competitive bids.
- The DoD has seven contracting offices in Kentucky. The top contracting offices include those in Fort Knox, Louisville, and Lexington. These seven offices can hire businesses located inside or outside of the state. During FY 2015 these seven offices awarded nearly $773 million to organizations within Kentucky.

- While Kentucky-based DoD contracting offices awarded a significant amount to Kentucky-based companies, a significantly higher amount, $6 billion, was awarded to organizations located outside of the state. This indicates a significant opportunity to involve more Kentucky-based organizations in the bidding process. It may be worthwhile to analyze the contracts awarded, as well as the types of companies in the states winning the awards to determine potential gaps with Kentucky-based companies.
- Possible reasons to explore as to why a smaller percentage of DoD contracts were awarded to Kentucky-based organizations include 1) lack of awareness of contracting opportunities; 2) lack of necessary qualifications; and/or 3) not being properly registered to apply for the opportunity.

Introduction

This chapter provides a detailed analysis of all Department of Defense (DoD) contracting in the state of Kentucky between fiscal years 2012 and 2015. DoD contracting data for both prime and sub-contractors is used to model all aspects of contracting activity associated with Kentucky firms or DoD installations, including the economic and fiscal impacts of the awards. This analysis identifies the companies, regions, and industries most reliant on defense contracts and will be used to inform and organize efforts to anticipate and offset potential defense spending reductions.

In addition, this chapter includes an evaluation of the participation and success of Kentucky firms with the DoD Small Business Innovation Research (SBIR) program and provides recommendations for increasing participation and further developing an SBIR support ecosystem to improve the potential for success.

Key Statistics for the DoD Defense Market in Kentucky

(FY 2012 – FY 2015)

1,302
The number of Kentucky organizations awarded DoD funding

24
The number of organizations that account for 93% of all DoD contracts

23
The number of active DoD agencies that awarded contracts

$22.3 billion
The total value of authorized funding

5,588
The number of contracts authorized to Kentucky companies

24
The number of DoD claimant codes represented in the performance of these contracts

Data Sources

Unless otherwise noted, the period of analysis for all contract data is fiscal year (FY) 2012 through FY 2015. SBIR data are available for a broader range of time and are analyzed for FY 2006 through 2015.

Throughout this chapter, there are occasions where federal contract data for a given year can appear as a negative number. Since it is counterintuitive to see a negative number associated with a contract, some explanation of this will be helpful for interpretation. When the DoD awards a contract, it obligates funding. If the DoD de-obligates funding for a prior year award, a negative number can occur. De-obligation can occur for a variety of reasons, including reductions in quantities, changes in the delivery schedule, and modification or elimination of a contract task.

For this Chapter, all data are sourced from the following:

- DIBBS Navigator: Data for federal defense contractors, sub-contracting, and contracting activity is sourced from DIBBS Navigator by Business Development Zone (BDZ), LLC., a comprehensive database for defense-related procurement, including data on companies' operational capabilities, industry membership, and federal product and service codes. Unless otherwise noted, all data contained within this chapter is from BDZ. Data that feed DIBBS Navigator are derived from the Federal Procurement Data System (FPDS) and the System for Award Management (SAM).
- Economic Modeling Specialists International (Emsi): Emsi utilizes data from a wide variety of government databases including the Bureau of Labor Statistics, the US Census Bureau and the Bureau of Economic Analysis. Each of these government agencies has multiple data products that provide helpful input to Emsi's data process. Emsi has an input-output model that allows practitioners to measure the total economic impact of a change in employment, sales or earnings on a regional economy. Emsi's model is a multi-regional social accounting matrix (MR SAM), built using a gravitational flows methodology, that estimates the flow of goods and services between consumers and businesses within a geographic are. A fuller description of Emsi's sources and methodology can be found on their website.[1]

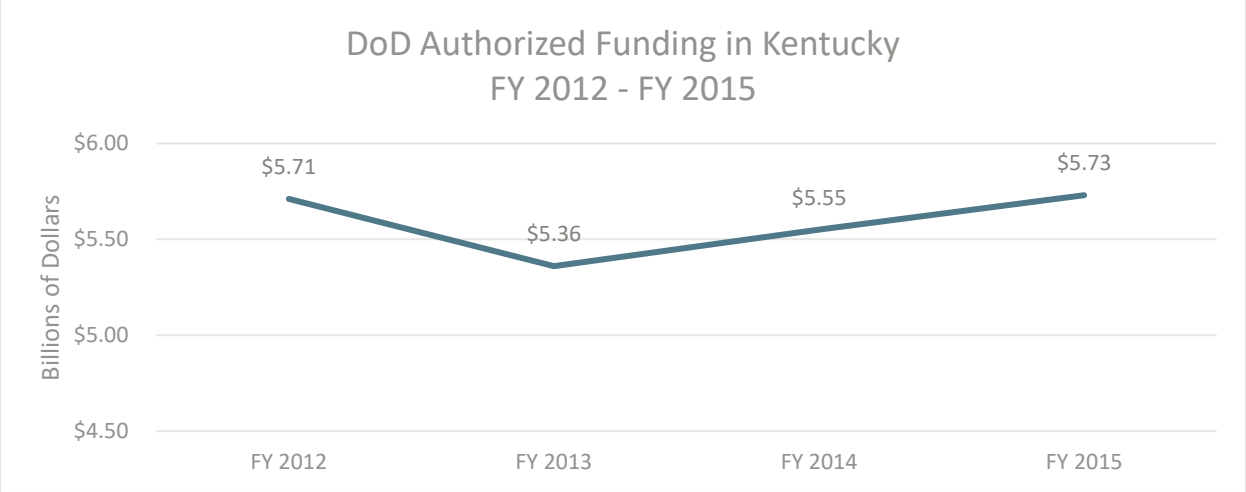
1Emsi. http://kb.economicmodeling.com/whats-the-complete-list-of-sources-emsi-uses-2/?hlst=emsi+data+sources

Defense Contract Spending in Kentucky

DoD Contracting in Kentucky

Between fiscal years (FY) 2012 and 2015, over $22.3 billion in DoD contracts were awarded within the state of Kentucky, with an average of $5.6 billion per year.

Figure 1: DoD Authorized Funding in Kentucky (FY2012-FY2015)[2]



DoD funding obligations to Kentucky organizations peaked in FY 2015 at $5.73 billion. The only decrease was between FY 2012 and FY 2013, which saw a $345 million decrease (6%). Between FY 2013 and FY 2015 there was an increase of $368 million (7%).

DoD Funding in Kentucky by Agency

Multiple DoD agencies are authorized to enter into contractual arrangements with organizations for products and/or services. The DoD agencies listed in Table 1 entered into such arrangements with organizations located in Kentucky between FY 2012 and FY 2015. Each of these agencies has multiple Contracting Offices which are authorized to enter into contracts.

From FY 2012 to FY 2015, the largest DoD agencies to contract in Kentucky were the Defense Health Agency and its predecessor, Tricare Management Activity, which accounted for 62.5% of all awards to the state. The next largest contracts were awarded by the Department of the Army ($3.8 billion) and U.S. Special Operations Command ($2.6 billion) with a combined 28% share of the total contracts during this period.

During this time, two agencies experienced significant growth. The Defense Threat Reduction Agency increased contracts by $2.3 million (1,150%) and the Defense Information Systems Agency (DISA) increased contracts by over $7.1 million (888%). Contract growth within the DISA could continue in the future, given the recent news that DISA will be relocating major components of its operations from Fort Meade, Maryland to Fort Knox, Kentucky. The U.S. Transportation Command saw the greatest contract

2 DIBBS Navigator. This data was analyzed by Business Development Zone.

reductions between FY 2012 and FY 2015 with $405.4 million (90.8%), while the Defense Advanced Research Projects Agency experienced the most rapid decline at 100% ($0.0 funded in FY 2015).

Table 1: DoD Funding in Kentucky by Agency ($mil.)[3]

DOD Agency	FY 2012	FY 2013	FY 2014	FY 2015	Period Total
Defense Health Agency	$0.0	$0.0	$3,520.5	$3,542.3	$7,062.8
Tricare Management Activity (TMA)	$3,455.1	$3,453.4	$0.0	$0.0	$6,908.5
Department of the Army	$870.0	$825.2	$1,083.6	$979.3	$3,758.1
U.S. Special Operations Command	$562.5	$674.2	$599.0	$770.8	$2,606.5
Department of the Navy	$141.0	$181.7	$127.7	$170.8	$621.2
U.S. Transportation Command	$446.2	$28.8	$19.9	$40.8	$535.7
Defense Logistics Agency	$149.9	$119.2	$124.9	$132.0	$526.1
Department of the Air Force	$62.2	$65.8	$62.4	$70.7	$261.1
Dept. of Defense Education Activity	$6.2	$8.0	$8.2	$8.9	$31.3
Defense Information Systems Agency	$0.8	$0.8	$5.6	$7.9	$15.1
Defense Financing and Accounting Service	$4.5	$1.5	$0.0	$0.1	$6.1
Washington Headquarters Services	$1.2	$1.2	$1.0	$1.8	$5.2
Defense Security Cooperation Agency	$1.8	$1.1	$1.2	$0.9	$5.0
Defense Commissary Agency	$2.9	$0.1	$0.4	$0.4	$3.9
Defense Threat Reduction Agency	$0.2	$0.0	$1.0	$2.5	$3.7
Defense Advanced Research Projects Agency	$2.8	$0.0	$0.4	$0.0	$3.2
Federal Acquisition Service	$0.0	$0.0	$2.8	$0.0	$2.8
Defense Media Center	$0.4	$0.2	$0.2	$0.1	$0.8
Defense Security Service	$0.0	$0.7	$0.0	$0.0	$0.6
Missile Defense Agency	$0.0	$0.1	$0.2	$0.1	$0.4
Uniformed Services University of the Health Services	$0.0	$0.0	$0.2	$0.1	$0.3
Defense Human Resources Activity	$0.0	$0.0	$0.0	$0.1	$0.1
Defense Microelectronics Agency	$0.0	$0.0	$0.0	$0.0	$0.0
Defense Contract Management Agency	($1.8)	($1.1)	($1.4)	($2.4)	($6.8)
Unknown	$0.0	$0.0	($0.1)	$1.8	$1.7
Total	$5,705.9	$5,360.8	$2,037.2	$2,186.7	$22,353.5

3 DIBBS Navigator. This data was analyzed by Business Development Zone.

Contract Length for DoD Funding in Kentucky

The following table shows the effective date for contracts awarded during Fiscal Years 2012 through 2015 and the subsequent completion year.[4] Note that the vast majority of contracts awarded during this time period are expected to be completed by 2018. As can be seen below, the majority of awarded contracts are completed within one to two years. However, a larger number of contracts awarded in FY 2012, FY 2013, and FY 2014 had completion dates beyond one year.

Table 2: DoD Contract Length in Kentucky[5]

	Completion Year								
Effective Year	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020+
FY 2012	6,874	2,237	232	175	109	252	17	0	15
FY 2013		5,085	2,143	212	209	249	133	5	10
FY 2014			5,968	2,672	361	313	155	49	21
FY 2015				7,818	1,520	306	179	59	61

DoD Funding in Kentucky by Claimant Code

The DoD groups its contract actions into subcategories called Claimant Codes. There are twenty-six (26) such codes that serve to aggregate contracts for like-type procurements. See the Appendix B for a complete list of Claimant codes.

Between FY 2012 and FY 2015, the DoD authorized funding to organizations located in Kentucky for twenty-four (24) of these claimant codes, as shown in Table 3. By far, the largest category by obligation is Services, accounting for 87.3% of all contracts during the period. The next largest categories are Construction (3.5%); All Other Not Identifiable to Any Other Procurement Program (3.3%); Other Aircraft Equipment and Supplies (1.4%); Textiles, Clothing and Equipage (1.4%); and Weapons (1.0%).

Table 3: DoD Funding within Kentucky by Claimant Code ($mil.)[6]

Claimant Name	FY 2012	FY 2013	FY 2014	FY 2015	FY '12-'15 Total
Services	$4,810.8	$4,658.7	$4,671.0	$4,683.0	$18,823.4
Construction	$217.1	$130.9	$229.3	$174.8	$752.1
All Others Not Identifiable to Any Other Procurement Program	$174.5	$231.1	$167.0	$131.3	$703.9
Other Aircraft Equipment and Supplies Not Included in A1A and A1B	$5.2	$65.7	$112.1	$116.8	$299.8
Textiles, Clothing and Equipage	$73.6	$63.3	$102.9	$51.0	$290.7
Weapons	$77.0	$17.3	$19.9	$99.2	$213.4
Airframes and Related Assemblies and Spares	$92.1	$46.2	$9.6	$22.5	$170.3

4 Please note, for reasons yet to be determined, a number of contracts within the BDZ data had either contracts with effective dates prior to the given year or contracts completed before the given year. Roughly 1,000 records where this is the case have been removed from this table.

5 USASpending.Gov. Includes all actions on each contract, so numbers do not accurately reflect the exact number of contracts. This reflects prime contracts only. This data was analyzed by Thomas P. Miller & Associates.

6 DIBBS Navigator. Reflects prime contracts only. This data was analyzed by Business Development Zone.

Claimant Name	FY 2012	FY 2013	FY 2014	FY 2015	FY '12-'15 Total
Ships	$16.0	$17.6	$20.9	$12.5	$67.0
Electronics and Communication Equipment	$28.5	$17.5	$9.9	$6.7	$62.6
Petroleum	$13.8	$12.7	$4.5	$11.8	$42.8
Missile and Space Systems	$7.1	$6.0	$13.9	$8.9	$36.0
Medical and Dental Supplies and Equipment	$20.4	$3.6	$3.1	$7.8	$34.9
Aircraft Engines and Related Spares and Spare Parts	$1.8	$1.0	$10.1	$11.3	$24.1
Ammunition	$0.9	($0.4)	$6.1	$3.7	$10.3
Combat Vehicles	$4.2	$2.2	$0.3	$2.8	$9.4
Subsistence	$3.0	$0.4	$2.1	$1.3	$6.8
Non-Combat Vehicles	$0.1	$0.8	$1.5	$3.3	$5.6
Construction Equipment	$1.1	$0.4	$0.6	$0.3	$2.4
Materials Handling Equipment	$0.2	$1.7	$0.2	$0.3	$2.4
Separately Procured Containers and Handling Equipment	$1.1	$0.0	$0.1	$0.0	$1.2
Production Equipment	$1.0	$0.0	$0.5	($0.6)	$0.9
Photographic Equipment and Supplies	$0.0	$0.0	$0.4	$0.0	$0.5
Building Supplies	$0.0	$0.1	$0.3	$0.0	$0.4
Other Fuels and Lubricants	$0.0	$0.0	$0.0	$0.0	$0.0
Total	$5,549.3	$5,276.9	$5,386.2	$5,348.5	$21,560.9

DoD Funding by 2-Digit NAICS Code

The DoD identifies the appropriate 6-digit North American Industry Classification System (NAICS) code for each contract it authorizes. For the purposes of understanding high level trends in DoD contracting, these 6-digit NAICS codes have been aggregated to the 2-digit NAICS level. This information, along with the average number of offers received by the DoD for every contract, is contained in the following table.

The vast majority (63%) of DoD contracts in Kentucky between FY 2012 and FY 2015 were in the Finance and Insurance sector, specifically with Humana Military Healthcare Services. The next largest industry sectors for DoD contracts were Administrative and Support and Waste Management and Remediation Services (17%), followed by Construction (7%), Manufacturing (7%) and Transportation and Warehousing (4%).

The higher the number of offers received, the higher the level of competition for that particular product. This relative scale of competition is only for DoD contracts with organizations located in Kentucky. The most significant competition for contracts is found within the Professional, Scientific, and Technical Services sector, with an average of nearly 12 offers received for each contract offered, followed by Construction (6.5), Mining (6.3) and Manufacturing (6.1).

Table 4: DoD Funding in Kentucky by 2-Digit NAICS Code[7]

2-Digit NAICS	NAICS Description	FY '12 –'15 Total	Average # of Offers Received
11	Agriculture, Forestry, Fishing and Hunting	$189,792	2.1
21	Mining	$1,448,153	6.3
22	Utilities	$96,250,499	3.0
23	Construction	$1,572,460,800	6.5
31-33	Manufacturing	$1,554,489,237	6.3
42	Wholesale Trade	$53,575,202	1.7
44-45	Retail Trade	$9,911,279	2.1
48-49	Transportation and Warehousing	$859,891,309	6.1
51	Information	$9,029,711	1.3
52	Finance and Insurance	$13,973,195,138	2.0
53	Real Estate and Rental and Leasing	$13,062,069	3.4
54	Professional, Scientific, and Technical Services	$303,791,174	11.9
56	Administrative and Support and Waste Mgmt. and Remediation Services	$3,767,961,977	4.3
61	Educational Services	$14,149,061	1.5
62	Health Care and Social Assistance	$19,382,235	4.5
71	Arts, Entertainment, and Recreation	$1,472,728	1.0
72	Accommodation and Food Services	$63,284,871	3.2
81	Other Services (except Public Administration)	$18,304,862	1.9
92	Public Administration	$21,843,877	1.1
	None Specified	($239,495)	4.0

DoD Funding by 4-Digit NAICS Code

To provide greater specificity into the contracting data, the following table illustrates the top 20 industry groups by 4-digit NAICS code. As can be seen below, the greatest DoD approved contracts are found within NAICS 5241, Insurance Carriers (63% of all contracts). The next largest industry groups include: Other Support Services (10%); Nonresidential Building Construction (6%); Waste Treatment and Disposal (6%); and Nonscheduled Air Travel (2%). After these top five, the contracting values for the remaining sectors drop off significantly.

The highest levels of competition for contracts are found within Architectural, Engineering, and Related Services (average of 13.9 offers per contract) and the Air Travel sectors: Nonscheduled Air Travel (average of 11.5 offers per contract) and Scheduled Air Travel (average of 12.2 offers per contract).

7 DIBBS Navigator. This data was analyzed by Business Development Zone.

Table 5: DoD Funding in Kentucky by 4-Digit NAICS Code[8]

4-Digit NAICS	NAICS Description	FY '12 – '15 Total	Average # of Offers Received
5241	Insurance Carriers	$13,973,195,138	2.0
5619	Other Support Services	$2,188,569,846	4.0
2362	Nonresidential Building Construction	$1,360,640,111	8.1
5622	Waste Treatment and Disposal	$1,292,904,092	3.0
4812	Nonscheduled Air Travel	$380,005,088	11.5
4881	Support Activities for Air Travel	$273,116,921	2.3
3329	Other Fabricated Metal Product Manufacturing	$271,293,416	3.3
3364	Aerospace Product and Parts Manufacturing	$212,254,736	2.2
5612	Facilities Support Services	$200,128,943	4.4
3152	Cut and Sew Apparel Manufacturing	$195,498,008	3.9
3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing	$176,424,122	2.4
3342	Communications Equipment Manufacturing	$168,952,107	3.8
5413	Architectural, Engineering, and Related Services	$156,882,131	13.9
2379	Land Subdivision	$103,060,119	4.8
4811	Scheduled Air Transportation	$90,060,241	12.2
4921	Couriers and Express Delivery Services	$65,735,899	4.7
5419	Other Professional, Scientific, and Technical Services	$58,613,838	4.7
7223	Special Food Services	$58,453,770	3.6
3149	Other Textile Product Mills	$52,024,022	1.9
2371	Hardware Merchant Wholesalers	$51,745,556	4.6

DoD Funding by 6-Digit NAICS Code

Table 6 lists the top industries for contracts at the 6-digit level. As mentioned, most funding obligations are found within the insurance sector, or more specifically Direct Health and Medical Insurance Carriers. The next three largest categories include All Other Support Services; Commercial and Institutional Building Construction; and Hazardous Waste Treatment and Disposal. Together, these four categories made up 84% of the total of all funding obligations in Kentucky between fiscal year 2012 and fiscal year 2015.

Table 6: DoD Funding by 6-Digit NAICS Code[9]

6-Digit NAICS	NAICS Description	FY '12-'15 Total
524114	Direct Health and Medical Insurance Carriers	$13,973,158,507
561990	All Other Support Services	$2,188,578,289
236220	Commercial and Institutional Building Construction	$1,333,259,543
562211	Hazardous Waste Treatment and Disposal	$1,292,904,092
481212	Nonscheduled Chartered Freight Air Transportation	$378,115,088
488190	Other Support Activities for Air Transportation	$273,116,921

8 DIBBS Navigator. This data was analyzed by Business Development Zone.
9 DIBBS Navigator. This data was analyzed by Business Development Zone.

6-Digit NAICS	NAICS Description	FY '12-'15 Total
332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing	$250,813,539
561210	Facilities Support Services	$200,128,943
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	$161,945,835
315210	Cut and Sew Apparel Contractors	$144,974,350
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	$140,852,015
541330	Engineering Services	$137,602,622
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	$104,708,820
237990	Other Heavy and Civil Engineering Construction	$103,060,119

DoD Funding by Broad Federal Product Service Code

The United States government has established the Federal Product and Service Codes (FPSC) to describe the products and services that are purchased by federal agencies. There are over 300 such codes, which are subdivided at the highest level of aggregation into three major areas: Research & Development, Services, and Products.

The summary of the contracts awarded to organizations in Kentucky for FY 2012 thru FY 2015 is noted in Table 7. Note that the average number of competitors for Research & Development is large (49.3), while the number of competitors for Products is much lower (4.7). However, the total number of contracts for Research & Development is significantly lower than it is for the other categories. Because of the low number of available contracts, there is significant competition amongst organizations bidding on Research & Development contracts. Alternatively, the pool of Services contracts is significantly larger but experiences far less competition, based on the number of offers received per contract.

Table 7: DoD Funding by Broad Federal Product Service Code[10]

Federal Product Service Groups	Period Total	Average # Offers Received	# Contract Actions
Research & Development	$105,739,111	49.3	271
Service	$19,609,911,569	5	20,480
Products	$1,845,295,100	4.7	23,174
Totals	$21,560,945,780		43,925

Top Kentucky Organizations Receiving DoD Funding

1,302 Kentucky organizations were awarded DoD funding between FY 2012 and FY 2015. Of these, 24 organizations (or 2% of the organizations) were awarded 93% of all funding. In other words, the majority of DoD funding awarded within the state went to a relatively small number of organizations. In fact, one company, Humana Military Healthcare Services, Inc. represented nearly two out of every three dollars of

10 DIBBS Navigator. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

DoD funding during the time period analyzed. Organizations that received the next largest shares of funding include Lockheed Martin Corporation (10%) and Bechtel Parsons Blue Grass, A Joint Venture (6%).

Table 8: DoD Funding in Kentucky by Organization[11]

Company	City	County	FY '15	FY '12-'15 Total
Humana Military Healthcare Services, Inc.	Louisville	Jefferson	$3,525,723,606	$14,008,492,964
Lockheed Martin Corporation	Lexington	Fayette	$480,078,119	$2,191,661,215
Bechtel Parsons Blue Grass, JV	Richmond	Madison	$432,918,762	$1,292,857,337
ABM Government Services, LLC	Hopkinsville	Christian	$99,014,551	$453,342,877
Boeing Sikorsky Aircraft Support	Fort Campbell	Christian	$113,116,726	$390,722,349
UPS Contractor Team	Louisville	Jefferson	-$4,298,809	$380,000,678
BAE Systems Land & Armaments LP	Louisville	Jefferson	$63,827,301	$303,299,199
Whitehead Electric Company, Inc.	Sturgis	Union	$176,892,265	$279,420,863
DRS Environmental Systems, Inc.	Florence	Boone	$42,485,544	$187,996,956
Strategic Communications, LLC	Louisville	Jefferson	$27,111,557	$178,302,995
United Parcel Service Co.	Louisville	Jefferson	$24,211,064	$155,790,438
GCCS, Inc.	Louisville	Jefferson	$73,506,423	$129,999,849
Herring Construction Inc.	Eddyville	Lyon	$69,849,485	$103,577,198
Southeastern Kentucky Rehabilitation Industries, Inc.	Corbin	Laurel	$49,264,525	$102,717,691
Federal Prison Industries, Inc.	Lexington	Fayette	$16,868,723	$72,217,695
Lusk Mechanical Contractors, Inc.	Muldraugh	Meade	$29,925,944	$69,618,748
Pride Industries, Inc.	Clay	Union	$23,262,864	$69,293,504
Kentucky Logistics Center	Lexington	Fayette	$19,184,434	$65,349,984
Drywall Systems Plus, Inc.	Murray	Calloway	$35,642,442	$63,417,412
Scottys Contg & Stone LLC	Bowling Green	Warren	$0	$60,063,078
Spiral Solutions and Technologies	Lexington	Fayette	$9,744,784	$59,274,425
LBL Contracting Company	Calvert City	Marshall	$3,614,822	$56,679,329

DoD Funding by Congressional District

During the period of analysis, 70% of the DoD funding was awarded to District 3. Jefferson County falls within this district, and as noted above, is the home of Humana Military Healthcare Services, Inc. The next largest share of awards was in District 6, which received 18% of all funding. The remaining four districts and all contracts where no district was noted account for only 12% of the total contracts awarded.

11 DIBBS Navigator. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Table 10: DoD Funding by Congressional District[12]

Kentucky Congressional District	FY 2012	FY 2013	FY 2014	FY 2015	Period Total
None Noted	$11,783,292	$38,480,604	$87,696,069	$73,870,640	$211,830,605
1	$263,131,281	$284,100,908	$417,727,186	$660,672,478	$1,625,631,853
2	$176,106,229	$88,124,442	$113,096,303	$74,683,486	$452,010,459
3	$4,172,127,422	$3,721,643,264	$3,796,170,058	$3,850,005,266	$15,539,946,010
4	$106,732,129	$64,602,600	$71,391,249	$49,219,657	$291,945,634
5	$141,432,544	$51,747,540	$73,622,571	$34,275,192	$301,077,847
6	$834,635,421	$1,112,123,281	$998,028,684	$985,923,400	$3,930,710,785
Total	$5,705,948,317	$5,360,822,638	$5,557,732,120	$5,728,951,404	$22,353,454,478

Prime Contracting Flows

The purpose of this section is to identify prime contracting flows within and outside of the state of Kentucky. Specifically, the data in this section will address:

- Contracts awarded to Kentucky organizations from DoD contracting offices located in Kentucky
- Contracts awarded to organizations *not* located in Kentucky by DoD contracting offices located in Kentucky
- Contracts awarded to organizations located in Kentucky from DoD contracting offices located outside of the state and worldwide.

Kentucky Organizations Registered for DoD Contracting

To obtain funding from the United States government, an organization must register with the System for Awards Management (SAM). Upon completion of this registration, the organization is issued a Contractor and Government Entity Code (CAGE) code. There are currently 6,774 organizations located in Kentucky with active CAGE codes, including commercial companies; not-for-profit organizations; institutions of learning; and government organizations.

Table 11: Kentucky Organizations Newly Registered for DoD Contracting[13]

Fiscal Year	Number of Companies
2012	622
2013	631
2014	494
2015	506

During the analysis period FY 2012 – FY 2015, only 1,302 companies were awarded DoD Funding. These 1,302 commercial companies were awarded 5,588 contract actions.

12 DIBBS Navigator. This data was analyzed by Business Development Zone.
13 DIBBS Navigator. This data was analyzed by Business Development Zone.

The number of companies within Kentucky receiving DoD funding peaked in 2013 and fell significantly in 2014. However, there was a slight increase between 2014 and 2015. As indicated at other points in this analysis, the main share of activity is held by a small number of companies. While 1,302 organizations were awarded DoD contracts, 24 (or 2% of all organizations) received over 90% of all funding.

Kentucky DoD Contracting Offices

The DoD has seven contracting offices in Kentucky. These contracting offices are generally co-located with well-known DoD installations located in Kentucky. The top contracting offices include those in Fort Knox, Louisville, and Lexington. Just as companies in Kentucky can contract with DoD offices outside of the state, Kentucky based DoD contracting offices can hire businesses located inside or outside of the state.

From FY12 to FY15, these seven DoD Contracting Offices awarded a total $2.7 billion in prime contracts to organizations located in Kentucky—from 12,482 contract actions. In comparison, these offices awarded $6.3 billion to non-Kentucky organizations. Of all dollars awarded by these offices to Kentucky organizations in FY15, 95% were under the Services claimant code, followed by Construction with 4%.

Table 12: Kentucky DoD Contracting Offices[14]

Office Name	City	Total Contracting Actions with KY Companies, FY2012-FY2015
Naval Reserve Center	Louisville	82
Special Operations Forces SPT ACTY	Lexington	6,073
WOL7 BLUE GRASS ARMY DEPOT	Richmond	653
W6QM MICC-FT CAMPBELL	Fort Campbell	1,487
W6QM MICC-FT KNOX	Fort Knox	1,513
W7NA USPFO Activity KY ARNG	Frankfort	362
XU W072 ENDIST Louisville	Louisville	2,312
Total		12,482

Table 13: DoD FY2015 Contract Awards to Organizations in Kentucky by Claimant Type[15]

Contract Offices	Claimant Name					
	Other Aircraft Equipment and Supplies	Subsistence	Construction	Services	All Others	Total
Naval Reserve Center					$60,212	$60,212
Special Operations Forces SPT ACTY	$2,857,224		$98,930	$648,886,891	$1,264,964	$653,107,969
W0L7 STK REC ACCT BGAD			$1,824,876	$2,206,800	$1,445,434	$5,477,110
W6QM Fort Campbell DOC			$28,635,830	$5,699,259	$968,545	$35,393,634

14 DIBBS Navigator. This data was analyzed by Business Development Zone.
15 DIBBS Navigator. This data was analyzed by Business Development Zone.

Contract Offices	Claimant Name					
	Other Aircraft Equipment and Supplies	Subsistence	Construction	Services	All Others	Total
W6QM Ft Knox CONTR CTR		$48,668	$5,928,586	$30,195,447	$3,591,074	$39,763,774
W7NA USPFO Activity KY ARNG				$1,601,060	$553,760	$2,154,820
XU W072 ENDIST Louisville			$22,970,363	$13,606,105	$423,780	$37,000,249
Total	$2,857,224	$48,668	$59,458,585	$702,195,562	$8,247,557	$772,897,556

Distribution of DoD Funding by Contracting Office Location

Table 14 provides an overview of the locations of DoD contracting offices awarding funding to Kentucky organizations, as well as the location of organizations awarded from DoD contracting offices located within Kentucky. Based on this analysis, a much higher funding amount for contracts is awarded to Kentucky-based organizations from DoD contracting offices located outside of Kentucky than within state. Further, $6.3 billion in contracts awarded by Kentucky-based DoD contracting offices go to organizations located out of the state. This indicates that there is a significant opportunity to involve more Kentucky-based organizations in the DoD bidding process.

Table 14: Distribution of FY 2012-2015 DoD Funding by Location of Contracting Office and Organization Awarded Funding[16]

Location of Company Awarded DoD Funding	In Kentucky			Outside of Kentucky
Awarded by Contracting Offices in:	Kentucky	Outside of Kentucky	Total	Kentucky
	$2,738,507,783	$18,772,756,874	$21,560,945,780	$6,331,912,035

Table 15 lists the top 6-digit NAICS codes representing DoD products and services that were awarded to Kentucky companies in fiscal years 2012-2015.[17] As can be seen, contracts within NAICS 524114 (Direct Health and Medical Insurance Carriers) were all awarded by non-Kentucky-based contracting offices. The majority of contracts also came from out-of-state offices for NAICS 562211 (Hazardous Waste Treatment and Disposal). In the Commercial and Institutional Building Construction Industry (NAICS 236220), the majority of contracts from Kentucky-based offices were given to out-of-state organizations.[18] This indicates that there may be opportunities for Kentucky-based organizations operating within this NAICS code to receive more contracts. However, it will be important to further determine why this is the case.

16 DIBBS Navigator. This data was analyzed by Business Development Zone.
17 Only top five national industries relative to total funding awarded to Kentucky organizations are shown. Similar details for all of 469 NAICS Codes are in accompanying Microsoft Excel Workbook.
18 Further Analysis on industries for which Kentucky contracting offices award a high proportion of contracts to out-of-state firms can be found in the Top High Growth Potential Defense Industries section of Chapter 1.

Potential causes include:

1) Kentucky organizations were simply not aware of the solicitations that resulted in the DoD funding being awarded;
2) Kentucky organizations were not deemed either qualified nor competitive for the award; and/or;
3) Kentucky organizations, which may have had the requisite qualifications, were not properly registered in System for Award Management (SAM) and, therefore, simply could not respond to solicitation.

Table 15: Distribution of FY 2012-2015 DoD Funding by 6-Digit NAICS and by Location of DoD Contracting Office and Organization Awarded Funding[19]

Location of Company Awarded DoD Funding:		In Kentucky			Outside of Kentucky
Awarded by Contracting Offices in:		Kentucky	Outside of Kentucky	Total	Kentucky
NAICS	NAICS Description				
524114	Direct Health and Medical Insurance Carriers	$0	$13,973,077,507	$13,973,077,507	$0
561990	All Other Support Services	$2,176,695,161	$1,229,967	$2,177,924,947	$17,241,930
562211	Hazardous Waste Treatment and Disposal	$6,868	$1,247,315,978	$1,292,904,092	$57,725
236220	Commercial and Institutional Building Construction	$274,192,325	$320,434,116	$601,949,915	$2,149,416,612
481212	Nonscheduled Chartered Freight Air Transportation	$378,115,088	$0	$378,115,088	$3,424

Contract Activity by Place of Performance

Due to the complexities of DoD acquisitions and contracting activity, there are several ways to analyze defense contracts. Every DoD contract has at least three location designations: 1) location of awarding agency (or DoD installation); 2) primary location of contractor awarded the work; 3) the primary "place of performance" for the contracted activity. Though looking at company locations is a preferred method for many objectives of this analysis, including discovering clustering of companies by geographic area and presence of supply chains, there is value in assessing contracts by place of performance. Chapter 4 is based entirely on place of performance, so great detail is not required in this portion of the analysis. However, presenting some high level statistics for the state will be a helpful preface to later parts of this analysis.

Though much of the money awarded to these contractors will be paid out to employees working within the state of Kentucky, the contracts will not have the same level of local impact as contracts that are awarded and performed within the state. In some cases, it may make sense to encourage Kentucky- based companies to compete with out of state contractors for these awards.

19 DIBBS Navigator. This data was analyzed by Business Development Zone.

There are clear similarities between the list in Table 16 and the list of top DoD contractors by place of location presented in Table 8. In fact, six of the top 10 companies in Table 16 appear in the top 10 in Table 8 as well. Notable differences include companies such as Raytheon Company, which performed $630 million on contracts in Kentucky, most of which were awarded to Raytheon divisions in other states such as Arizona and Florida. Likewise, Treviicos Soletanche, a Joint Venture, has a headquarters office in Massachusetts that was awarded the $165 million on work performed in Jamestown between FY 2012 and 2015.

Table 16: Top DoD Contracting Companies by Place of Performance in Kentucky[20]

Company	City of Performance	County of Performance	FY 2015 Contracts	FY '12 - '15 Total
Humana Military Healthcare Services, Inc.	Louisville	Jefferson	$3,542,159,270	$13,973,123,206
Lockheed Martin Corporation	Multiple	Multiple	$548,243,268	$1,927,658,358
Bechtel Parsons Blue Grass, A Joint Venture	Richmond	Madison	$218,138,789	$1,294,732,426
Raytheon Company	Multiple	Multiple	$192,167,381	$630,328,469
Boeing Sikorsky Aircraft Support	Multiple	Multiple	$111,626,669	$393,462,668
Bae Systems Land & Armaments Inc.	Multiple	Multiple	$59,498,166	$254,669,595
DRS Environmental Systems, Inc.	Multiple	Multiple	$32,167,082	$188,216,796
Treviicos Soletanche JV	Jamestown	Russell	$0	$165,840,141
Sourceamerica	Multiple	Multiple	$54,809,466	$165,655,187
Dyncorp International LLC	Fort Campbell	Christian	$1,629,442	$158,529,293
Serco Inc.	Multiple	Multiple	-$33,381	$153,718,756
Strategic Communications, LLC	Multiple	Multiple	$7,214,498	$148,799,130
L-3 Services, Inc.	Multiple	Multiple	$1,651,479	$140,444,340
Southeastern Kentucky Rehabilitation Industries, Inc.	Corbin	Whitley	$11,992,730	$102,683,683
International Development & Resources, Inc.	Multiple	Multiple	$20,265,023	$74,439,179
Lusk Mechanical Contractors, Inc.	Multiple	Multiple	$991,237	$69,622,256
Whitehead Electric Company, Inc.	Multiple	Multiple	$17,287,829	$67,029,753
Kentucky Logistics Center	Lexington	Fayette	$17,054,521	$65,349,984
International Business Machines Corporation	Fort Knox	Hardin	$21,947,587	$61,288,548
Scotty's Contracting and Stone, LLC	Fort Knox	Hardin	$0	$60,063,078
Spiral Solutions And Technologies	Lexington	Fayette	$29,531,761	$59,274,425
All Cities Enterprises	Fort Knox	Hardin	$989,350	$59,148,297
GCCS, Inc.	Multiple	Multiple	$14,942,359	$59,018,845
Archer Western Federal JV	Fort Campbell	Christian	$167,570	$57,978,360
NANA Development Corporation	Multiple	Multiple	$792,360	$56,679,558

[20] Some companies aggregated by Parent DUNS number. These data taken from USASpending.gov.

Economic and Fiscal Impact of DoD Funding

The DoD and its operations have a multi-faceted impact in many communities across the United States. As discussed throughout this chapter, military installations are considerable purchasers of goods and services from private sector companies. Furthermore, in many communities DoD can employ a large number of active and reserve military members.[21] This economic impact analysis attempts to estimate the core regional impact of DoD by capturing all rounds of economic impact attributable to these two sources of direct impact.

The impact analysis that follows displays the economic impact and the fiscal (or tax) impact of DoD funding on the state of Kentucky. To measure DoD funding, the prime contracts awarded by DoD performed in Kentucky and military employment in the nine constituent regions of Kentucky and the state of Kentucky were considered. Jobs for NAICS code 901200 (Federal employment, military) in each region and the state were used to measure the DoD employment, after making necessary adjustments for the area of residence for the employees.

Metrics used to demonstrate the impact include total economic output (or sales), jobs, earnings (or payroll), and taxes on production & imports. This economic impact analysis displays several tables according to each of the following impact categories:

- **Direct impact** – represents the impact of DoD on sales, jobs, and earnings, prior to considering additional multiplier effects on other sectors of the economy.[22]
- **Total impact** – represents the total impact of DoD within defense installations and on the larger economic areas in the state.
- **Multipliers** –indicate the degree of impact by dividing total impact by direct impact. Multipliers provide a helpful tool for interpreting the magnitude of impact.
- **Fiscal impact-** indicate the estimated amount of tax revenue generated by DoD and all other sectors that it influences.

Department of Defense contracts are responsible for $19.4 billion in economic impact, or 4.5% of the state's economic activity. DoD supports 102,349 jobs and over $5 billion in employee compensation. The state's economy is highly reliant on the military and its surrounding contracting community to create jobs in other fields, as indicated by the combined jobs multiplier of 2.07. This means that every one job in the military or its direct contractors registers an additional 1.07 jobs within the state's economy. Regional data indicates that contracts performed in the Louisville region account for 71% of all total contracts performed in the state of Kentucky between FY12 and FY16. The Louisville region also has the highest

21 Some economic impact analyses will also take account of civilian and contractors as direct impacts, but since such data were not available from every military installation within the state, our model relies on multiplier effects to estimate the extent of in-region civilian and contractor activity.

22 Direct impact in these tables represents TPMA's direct count of employment and contract values by the sources listed. However, before these values are entered into our economic impact model the "imputed" values are created which estimate the full impact of both DoD employment and DoD contracts in terms of sales, jobs and earnings.

share in total DoD employment. Given the strong clustering of military installations and contractors in this region, it is not surprising that the region has the highest jobs multiplier of any region in the state at 2.36.

To add more depth to this analysis, the top 10 industries that added jobs as an impact of DoD spending are shown in Table 16. The highest number of jobs were created in Insurance Agencies and Brokerages followed by Full Service Restaurants, Limited-Service Restaurants; General Medical and Surgical Hospitals; and Temporary Help Services.

As a direct result of DoD spending, many communities throughout the state benefit. Due to DoD employment and contracts, roughly $506.18 million is generated as federal, state and local taxes. In particular, the state and local component, which totals $414.60 million, directly benefits the people of Kentucky.

Table 17: Direct Economic Impact of DoD on State of Kentucky and Nine Sub-regions[23]

Region	DoD Inputs		Direct Effects		
	DoD Contracts ($ millions)	DoD Employment	Imputed Economic Output (Sales) ($ millions)	Imputed Jobs	Imputed Earnings ($ millions)
Ashland	$14.97	520	$81.78	634	$12.91
Bowling Green-Hopkinsville[24]	$504.22	3,806	$1,987.55	7,841	$433.04
Cumberland	$86.26	961	$206.60	2,491	$50.26
Lexington	$946.47	2,606	$1,318.32	11,341	$427.25
Louisville	$4,253.97	9,134	$7,376.12	22,692	$1,634.51
Mountain	$6.48	1,213	$167.09	1,276	$28.01
Northern Kentucky	$62.68	1,492	$263.91	1,705	$47.42
Owensboro-Henderson	$16.50	939	$138.06	1,015	$24.00
Paducah-Purchase	$36.05	725	$137.78	1,031	$31.48
State of Kentucky	$5,927.13	21,395	$13,112.32	49,353	$2,935.19

23 USASpending.gov for DoD contracts data; Emsi 2017.1 for military employment.
24 The Bowling Green- Hopkinsville area hosts the headquarters for Fort Campbell, an installation that stretches across the Kentucky-Tennessee border. To arrive at an employment and payroll estimates that do not include DoD employees living in Tennessee, TPMA used the US Census' Onthemap tool.

Table 18: Total Economic Impact of DoD on State of Kentucky and Nine Sub-regions[25]

Region	Total Economic Impact		
	Total Economic Output (Sales) ($ millions)	Total Jobs	Total Earnings ($ millions)
Ashland	$96.93	854	$21.89
Bowling Green-Hopkinsville	$2,274.43	10,701	$536.16
Cumberland	$250.00	2,978	$66.20
Lexington	$2,028.66	18,132	$699.24
Louisville	$11,440.29	53,570	$3,159.93
Mountain	$190.24	1,555	$37.29
Northern Kentucky	$337.90	2,301	$74.55
Owensboro- Henderson	$164.97	1,301	$35.15
Paducah- Purchase	$178.10	1,439	$46.91
State of Kentucky	$19,379.10	102,349	$5,226.90

Table 19: Sales, Jobs and Earnings Multipliers of DoD on State of Kentucky and Nine Sub-regions[26]

Region	Multipliers		
	Sales Multiplier	Jobs Multiplier	Earnings Multiplier
Ashland	1.19	1.35	1.70
Bowling Green-Hopkinsville	1.14	1.36	1.24
Cumberland	1.21	1.20	1.32
Lexington	1.54	1.60	1.64
Louisville	1.55	2.36	1.93
Mountain	1.14	1.22	1.33
Northern Kentucky	1.28	1.35	1.57
Owensboro- Henderson	1.19	1.28	1.46
Paducah- Purchase	1.29	1.40	1.49
State of Kentucky	1.48	2.07	1.78

Table 20: Fiscal Impact of DoD Kentucky and Nine Sub-regions[27]

Region	Taxes Generated			
	Taxes on Production & Imports ($ millions)	Local Taxes ($ millions)	State Taxes ($ millions)	Federal Taxes ($ millions)
Ashland	$0.68	$0.30	$0.26	$0.12
Bowling Green-Hopkinsville	$17.74	$7.12	$6.54	$4.08
Cumberland	$2.70	$1.06	$0.98	$0.65
Lexington	$49.63	$21.49	$19.05	$9.08
Louisville	$386.98	$171.29	$150.30	$65.38

25 USASpending.gov for DoD contracts data; Emsi 2017.1 for military employment.
26 USASpending.gov for DoD contracts data; Emsi 2017.1 for military employment.
27 USASpending.gov for DoD contracts data; Emsi 2017.1 for military employment.

Region	Taxes Generated			
	Taxes on Production & Imports ($ millions)	Local Taxes ($ millions)	State Taxes ($ millions)	Federal Taxes ($ millions)
Mountain	$1.02	$0.42	$0.38	$0.22
Northern Kentucky	$3.57	$1.49	$1.34	$0.74
Owensboro- Henderson	$1.25	$0.52	$0.47	$0.26
Paducah- Purchase	$2.08	$0.86	$0.78	$0.43
State of Kentucky	$506.18	$219.95	$194.65	$91.58

Table 21: Top 10 Industries by Jobs Impact within Kentucky[28]

Industry	Jobs Supported
Insurance Agencies and Brokerages	4,289
Full-Service Restaurants	2,156
Limited-Service Restaurants	1,758
General Medical and Surgical Hospitals	1,262
Temporary Help Services	1,200
Third Party Administration of Insurance and Pension Funds	1,119
Elementary and Secondary Schools (Local Government)	1,009
Local Government, Excluding Education and Hospitals	962
Supermarkets and Other Grocery (except Convenience) Stores	837
Offices of Physicians (except Mental Health Specialists)	766

SBIR Spending Analysis

Kentucky has a relatively robust program supporting Small Business Innovation Research (SBIR), although it could be improved. The following section details best practices from states that have had significant success with SBIR and explains how Kentucky could benefit from similar programs.

Dedicated Funding to Support SBIR

Like Kentucky, Massachusetts and Virginia have dedicated funding to leverage SBIR investment. Massachusetts has set up its funding through Mass Ventures, which is a venture capital firm. It takes the form of an "evergreen fund" or revolving loan fund, which helps companies commercialize technology developed under SBIR and Small Business Technology Transfer (STTR). In Virginia, funding is routed through an entity called the Center for Innovative Technology, which is a non-profit organization that uses state, federal, and private sector funds to invest in high-growth, early stage technology.

Both of these entities also offer support, such as workshops and informative websites, to companies seeking SBIR funds. The Kentucky Science and Engineering Foundation (KSEF)[29] is similar to these groups.

28 Emsi 2017.1. Economic Impact Model 2015. Estimates of jobs impact include direct, indirect, and induced impacts.

29 Kentucky Science and Engineering Foundation. (2016). The Kentucky Science and Engineering Foundation: KSEF. Retrieved from http://ksef.kstc.com

KSEF provides services, such as meetups, workshops, and consulting, for organizations seeking to understand the mechanics of preparing proposals to the DoD. In addition to these services, the organization also administers funding programs. KSEF is an initiative of the Kentucky Science and Technology Corporation and is a non-profit enterprise. It is an important part of Kentucky's SBIR efforts; as such, the state may want to consider ways to further support the organization.

Coordinated Effort

One thing that states with high levels of success in SBIR have in common is the coordination of all relevant state agencies around the effort. One common major partner is Manufacturing Extension Partnerships (MEPs). MEPs are public-private partnerships with the National Institute of Standards and Technology, which exist in all 50 states and are dedicated to serving small and medium-sized manufacturers. MEPs can play a pivotal role in helping SBIR research move from concept to market through services in areas such as product design, manufacturing engineering, product concept testing, quality control/management, supplier scouting, and certification. MEP also connects SBIR awardees to other agencies and organizations for additional services and support.

SBIR support programs are often built into MEPs, such as in California where California Manufacturing Technology Consulting has a program devoted to defense services. Alternatively, MEPs and SBIR-focused groups often work together, as in Virginia, where MEP GENEDGE has partnered with CIT to hold events and provide counseling.

Kentucky's MEP is the Advantage Kentucky Alliance (AKA). Like KSEF, it is funded by the Kentucky Science and Technology Consortium, and it has many of the same partners as KSEF, such as the Kentucky Innovation Network. However, there does not seem to a strong partnership between KSEF and AKA. One step in improving success rates of SBIR funding may be to establish a stronger relationship between the two groups.

Coordination with other groups is also essential. The Kentucky Small Business Development Center assists small businesses with applying for many forms of funding, including SBIR. A more robust SBIR program may be similar to the Massachusetts Small Business Development's Government Sales Advisory Program, which provides free assistance for firms applying to SBIR, including proposal review and understanding and interpreting reviewer comments.

Position Dedicated to Educating Small Business on DoD Needs

The critical element in the pursuit and acquisition of DoD SBIR solicitations is an extensive knowledge base of DoD mission requirements, which drive the need for the DoD to advance technologies. Gathering the knowledge that links DoD mission objectives to underlying technology research and development needs is an ongoing process. The majority of large DoD prime contractors have a technical staff dedicated to accomplishing this understanding of mission to technology.

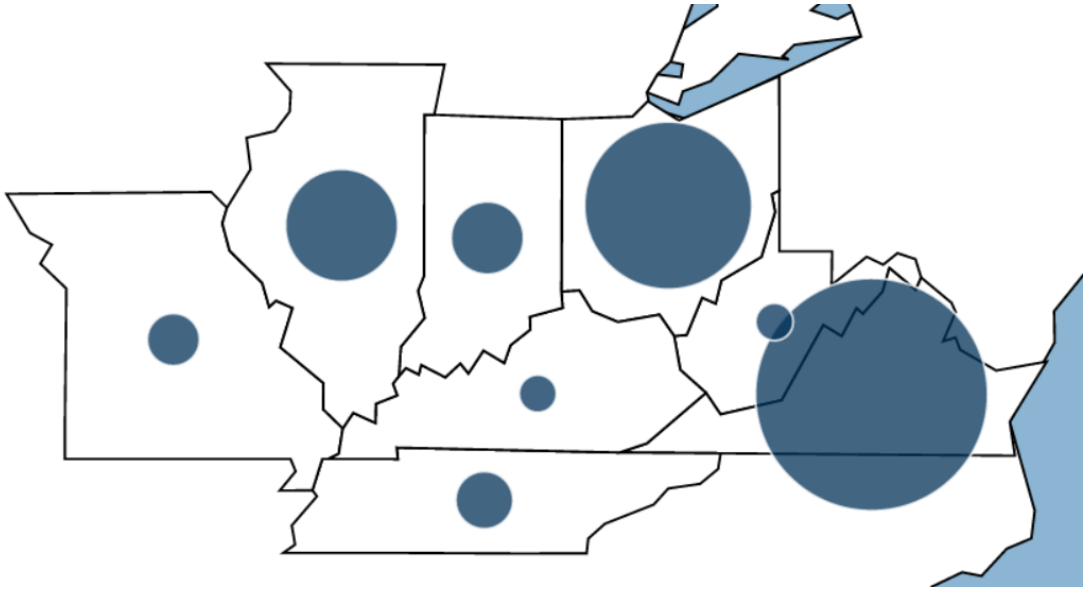
Unfortunately, in the case of most small to medium companies, the desire to create this critical element of the DoD solicitation pursuit exists while the financial depth to accomplish this task simply is not available.

Establishing a position, either in AKA or KSEF, to facilitate dissemination of DoD mission research and development shortfalls would close this gap and ultimately result in more SBIR funding for those companies that need it most. Responsibilities of this position should include:

- Attending conferences held by various federal departments that fund SBIR, such as:
  - SBIR/STTR Innovation Summit, which features representatives from all 11 federal agencies with SBIR programs, in addition to other SBIR/STTR experts and trainers.
  - Air Force Small Business Industry Days, which focuses on small business capabilities, Air Force business opportunities, and matching Air Force subject matter experts with the large and small business communities.
- Developing an enhanced capability to communicate to institutions of higher learning, small-to medium-sized research-oriented companies, and current DoD prime contractors the R&D budget required to assist with DoD missions. This can be done through events, newsletters, webinars, in-state conferences, and other means.
- Developing a mechanism to link institutions of higher learning and current DoD prime and small-to-medium research-oriented companies for the primary purpose of identification of potential partnering to satisfy the unfilled DOD R&D shortfalls.
- Expanding training and counseling opportunities and establishing a mentoring program, using current DoD SBIR company staff, as well as academic institution staff, to assist companies new to the DoD SBIR community.

SBIR (Small Business Innovation Research) spending can be an important gateway for building a long and sustained partnership with the DoD. Small, innovative firms that develop specialized capabilities or innovative new systems or equipment can form the core of new supply chains that can last for decades. The map below depicts regional funding levels for DoD SBIR funding for the years 2006 through 2015 for states surrounding Kentucky.[30] Kentucky trails all neighboring states in this regard, except for West Virginia, which is a far smaller state in terms of population.

30 SBIR data are available for a longer duration of time than standard contracting data, which is only accessible for FY 2012-2015. When analyzing data for Kentucky in particular, SBIR data are analyzed for years 2012 through 2015 in order to maintain consistency with the defense contracts data.



The Small Business Innovative Research (SBIR) awards to organizations located within the geographical bounds of Kentucky and the surrounding states are shown in Table 21. The table depicts the number of awards for the time frame of 2006-2015. The states included in this analysis are: Kentucky, Illinois, Indiana, Virginia, West Virginia, Tennessee, and Missouri.

The largest number of SBIR awards by DoD branch given during the time period were from the Navy, Air Force, and Army. The states with organizations that received the largest number of awards were Virginia (2,579); Ohio (1,355); and Illinois (571). Kentucky had the second fewest awards during the time period, with 65. The majority of the awards for Kentucky-based organizations were from the Navy and Air Force.

Table 21: Number of SBIR Awards by DoD Branch per State 2006 - 2015[31]

Branch	IL	IN	KY	MO	OH	TN	VA	WV	Total
NA	1	0	0	0	1	0	6	0	8
Air Force	168	76	21	47	673	40	655	7	1,687
Army	111	38	4	34	174	23	424	10	818
Defense Advanced Research Projects Agency	37	16	2	2	46	12	153	5	273
Defense Health Program	5	5	0	1	9	2	31	0	53
Defense Logistics Agency	2	3	0	0	4	1	3	0	13
Defense Microelectronics Activity	0	0	0	0	1	0	0	0	1
Defense Threat Reduction Agency	0	0	1	0	7	0	18	0	26
Missile Defense Agency	62	13	6	7	74	14	131	7	314
National Geospatial-Intelligence Agency	0	0	0	0	0	0	2	0	2
Navy	174	79	29	35	347	43	1,102	22	1,831
Office for Chemical and Biological Defense	7	0	0	1	6	0	19	0	33
Office of the Secretary of Defense	2	3	0	1	3	0	7	1	17
Special Operations Command	2	3	2	0	10	2	28	1	48
State Totals	571	236	65	128	1,355	137	2,579	53	5,124

31 DIBBS Navigator. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

The largest SBIR funding amounts awarded by a DoD branch were from the Navy, with $661.8m, followed by the Army, with $291.4m awarded. Virginia received the greatest SBIR funding amount, with over $984 million awarded over the period. Kentucky received the lowest SBIR amount, with $11.7 million awarded.

Table 22: SBIR Funding Amounts by DoD Branch per State 2006 – 2015 ($ millions)[32]

Branch	IL	IN	KY	MO	OH	TN	VA	WV	Total
NA	$0.6	$0	$0	$0	$0	$0	$4.5	$0	$5.8
Air Force	$67.6	$27.8	$4.9	$16.2	$259.7	$14.3	$227.3	$2.9	$620.7
Army	$42.2	$15.8	$1.0	$12.1	$59.3	$9.0	$147.8	$4.2	$291.4
Defense Advanced Research Projects Agency	$12.5	$8.1	$0.2	$0.2	$15.2	$6.4	$65.8	$1.1	$109.5
Defense Health Program	$1.2	$2.8	$0	$0.1	$5.5	$0.9	$12.4	$0	$22.9
Defense Logistics Agency	$0.2	$0.9	$0	$0	$1.1	$0.1	$0.3	$0	$2.6
Defense Microelectronics Activity	$0	$0	$0	$0	$1.0	$0	$0	$0	$1.0
Defense Threat Reduction Agency	$0	$0	$0.2	$0	$1.4	$0	$5.4	$0	$7.0
Missile Defense Agency	$24.0	$6.5	$0.7	$1.5	$25.8	$4.1	$56.3	$2.3	$121.2
National Geospatial-Intelligence Agency	$0	$0	$0	$0	$0	$0	$0.6	$0	$0.6
Navy	$54.3	$24.7	$4.1	$11.0	$101.9	$15.8	$440.7	$9.3	$661.8
Office for Chemical and Biological Defense	$2.9	$0	$0	$0.7	$2.8	$0	$5.0	$0	$11.4
Office of the Secretary of the Defense	$1.7	$3.6	$0	$1.0	$3.5	$0	$7.5	$0.8	$18.1
Special Operations Command	$0.2	$1.8	$0.6	$0	$2.7	$0.8	$11.1	$0.1	$17.3
State Totals	$207.4	$92.0	$11.7	$42.8	$480.6	$51.4	$984.7	$20.7	$1,891.3

Between 2012 and 2015, Kentucky received 35 SBIR awards. The distribution of the 35 awards by Department of Defense branch from 2006-2015 is shown below. The branches with the most SBIR awards are the Air Force and Navy. Both branches make up almost 75% of all DoD awards in Kentucky since 2012.

Table 23: Number of SBIR Awards in Kentucky by DoD Branch, 2012 - 2015[33]

Branch	2012	2013	2014	2015	Agency/Branch Totals
Air Force	4	3	5	3	15
Army	0	0	0	1	1
Defense Advanced Research Projects Agency	0	0	0	1	1
Defense Threat Reduction Agency	1	0	0	0	1
Missile Defense Agency	0	2	1	3	6
Navy	3	3	3	2	11
Special Operations Command	0	0	0	0	0
Yearly Totals	8	8	9	10	35

32 DIBBS Navigator. This data was analyzed by Business Development Zone and Thomas P. Miller and Associates.
33 DIBBS Navigator. This data was analyzed by Business Development Zone Thomas P. Miller & Associates.

Between 2012 and 2015, the largest SBIR funding amounts awarded in Kentucky by DoD branches were from the Air Force, with $3.7 million, followed by the Navy, with $1.3 million. The largest total amount awarded was in 2014 ($2.3 million). However, around 85% of the funding that year was awarded from the Air Force. It is interesting to note that while Kentucky has a large number of Army installations in the state, the smallest amount of SBIR funding given to Kentucky companies came from the Army, and funding began only as recently as 2015.

Table 24: SBIR Funding Amounts in Kentucky by DoD Branch, 2012 – 2015[34]

Branch	2012	2013	2014	2015	Agency/Branch Totals
Air Force	$499,968	$802,367	$1,942,909	$449,998	$3,695,242
Army	$0	$0	$0	$99,998	$99,998
Defense Advanced Research Projects Agency	$0	$0	$0	$148,722	$148,722
Defense Threat Reduction Agency	$150,000	$0	$0	$0	$150,000
Missile Defense Agency	$0	$245,980	$99,975	$299,999	$645,954
Navy	$560,677	$308,150	$239,898	$160,000	$1,268,725
Special Operations Command	$0	$0	$0	$0	$0
Yearly Totals	$1,210,645	$1,356,497	$2,282,782	$1,158,717	$6,008,641

Generally, the location of companies awarded DoD SBIR contracts is either closely associated with the location of DoD installations or research universities. This is the case with Kentucky, as most grant award winners are located in Lexington or Louisville, the cities nearest to Fort Knox, the University of Louisville, and the University of Kentucky. The location by city of the Kentucky-based organizations awarded SBIR contracts is shown in Table 25. Between 2012 and 2015, Tier 1 Performance Solutions, LLC; nGimat, LLC; and InfoBeyond Technology LLC received the largest SBIR contracts.

Table 25: Kentucky Companies Awarded SBIR Funding 2012 – 2015[35]

Company	City	2012	2013	2014	2015
Advanced Dynamics, Inc.	Lexington	$99,996			
ATI Inc.	Lexington				$179,998
CEPEDA Associates, Inc.	Louisville	$79,989			
Enomalies	Mt. Vernon			$80,000	
FunDo Science Corp	Lexington				$100,000
Hitron Technologies	Lexington			$79,985	
InfoBeyond Technology LLC	Louisville	$580,688	$79,999	$300,000	$250,000
Mercury Data Systems	Lexington		$294,393		
Minerva Systems & Technologies, LLC	Lexington			$150,000	$150,000
Nanowise LLC	Lexington			$79,913	
nGimat, LLC	Lexington	$149,999		$743,080	$80,000
NuForm Materials, LLC	Sadieville	$150,000			
ScienceTomorrow, LLC	Lexington		$79,801		
Tier 1 Performance Solutions, LLC	Covington	$149,973	$902,304	$849,804	$249,997
True Secure SCADA	Goshen				$148,722

34 DIBBS Navigator. This data was analyzed by Business Development Zone Thomas P. Miller & Associates.
35 DIBBS Navigator. This data was analyzed by Business Development Zone Thomas P. Miller & Associates.

As shown in Table 26, between 2012 and 2015 the largest SBIR contracts were awarded by the Air Force and Navy. Overall, 10 of the 15 companies below received awards from a single DoD branch. For those receiving awards from multiple branches, there were three that received awards from either the Air Force or Navy, along with the Missile Defense Agency. These three are InfoBeyond Technology LLC; Mercury Data Systems; and Tier 1 Performance Solutions, LLC.

Table 26: Kentucky Companies by DoD Branch Awarded SBIR Funding 2012 – 2015[36]

Company	Air Force	Army	Defense Advanced Research Projects Agency	Defense Threat Reduction Agency	Missile Defense Agency	Navy	Grand Total
Advanced Dynamics, Inc.	$99,996	$0	$0	$0	$0	$0	$99,996
ATI Inc.	$0	$99,998	$0	$0	$0	$80,000	$179,998
CEPEDA Associates, Inc.	$0	$0	$0	$0	$0	$79,989	$79,989
enomalies	$0	$0	$0	$0	$0	$80,000	$80,000
FunDo Science Corp	$0	$0	$0	$0	$100,000	$0	$100,000
Hitron Technologies	$0	$0	$0	$0	$0	$79,985	$79,985
InfoBeyond Technology LLC	$550,000	$0	$0	$0	$100,000	$560,687	$1,210,687
Mercury Data Systems	$0	$0	$0	$0	$146,043	$148,350	$294,393
Minerva Systems & Technologies, LLC	$300,000	$0	$0	$0	$0	$0	$300,000
Nanowise LLC	$0	$0	$0	$0	$0	$79,913	$79,913
nGimat, LLC	$893,079	$0	$0	$0	$0	$80,000	$973,079
NuForm Materials, LLC	$0	$0	$0	$150,000	$0	$0	$150,000
Sciencetomorrow, LLC	$0	$0	$0	$0	$0	$79,801	$79,801
Tier 1 Performance Solutions, LLC	$1,852,167	$0	$0	$0	$299,911	$0	$2,152,078
True Secure SCADA	$0	$0	$148,722	$0	$0	$0	$148,722
Grand Total	$3,695,242	$99,998	$148,722	$150,000	$645,954	$1,268,725	$6,008,641

The vast majority of SBIR award funding went to companies located in Covington and Lexington. The majority of these awards were from the Air Force. Companies in Louisville also received significant SBIR awards from both the Air Force and Navy.

Table 27: Kentucky Cities by DoD Branch Awarded SBIR Funding 2012 – 2015[37]

City	Air Force	Army	Defense Advanced Research Projects Agency	Defense Threat Reduction Agency	Missile Defense Agency	Navy	Grand Total
Covington	$1,852,167	$0	$0	$0	$299,911	$0	$2,152,078
Goshen	$0	$0	$148,722	$0	$0	$0	$148,722
Lexington	$1,293,075	$99,998	$0	$0	$246,043	$548,049	$2,187,165

36 DIBBS Navigator. This data was analyzed by Business Development Zone Thomas P. Miller & Associates.
37 DIBBS Navigator. This data was analyzed by Business Development Zone Thomas P. Miller & Associates.

City	Air Force	Army	Defense Advanced Research Projects Agency	Defense Threat Reduction Agency	Missile Defense Agency	Navy	Grand Total
Louisville	$550,000	$0	$0	$0	$100,000	$640,676	$1,290,676
Mt. Vernon	$0	$0	$0	$0	$0	$80,000	$80,000
Sadieville	$0	$0	$0	$150,000	$0	$0	$150,000
Grand Total	$3,695,242	$99,998	$148,722	$150,000	$645,954	$1,268,725	$6,008,641

Kentucky ranks 38th in the United States in the award of DoD Research & Development contracts. While there is not a direct correlation between DoD Prime Contractor R&D funding and SBIR Funding, it is an indication of the intensity of research and development activities in Kentucky, which are applicable to the DoD. Table 28 is a compilation of DoD prime contractors who were funded for DoD R&D during FY 2012 thru FY 2015.

Table 28: Kentucky Companies Awarded DoD Research & Development Contracts 2012-2015[38]

Company	Total DoD R&D Funding FY 2012-2015
ABM Government Services, LLC	$10,000
Alliant Technologies, LLC	$2,501
BAE Systems Land & Armaments Inc.	$293,000
BMAR & Associates, LLC	$7,430,969
Constellation Newenergy – Gas Division, LLC	$205,868
Directed Energy Inc.	$490,752
Innovative Productivity, Inc.	($13,410)
Innovative Technical Solutions, LLC	$2,501
Kentucky Bioprocessing, Inc.	$2,510,263
Kentucky Bioprocessing, LLC	$368,469
Lockheed Martin Corporation	$41,728,480
M2 Technologies, Inc.	($8,216)
M2 Technologies, Inc.	$50,490
Machristom LLC	$2,501
MCP Orientation and Mobility Services, LLC	$190
Nanowise LLC	$79,913
Outdoor Venture Corporation	($9,042)
Strategic Communications, LLC	$2,501
University of Louisville	($5,912)
Vanguard Contractors LLC	($7,938)
Waldrop and Waldrop, LLC	$1,500

38 DIBBS Navigator. This data was analyzed by Business Development Zone Thomas P. Miller & Associates.

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Kentucky Commission on Military Affairs &
the Commonwealth of Kentucky

Chapter 3: Defense Industry Supply Chain

Key Findings

This chapter provides a summary of the defense industry supply chain in Kentucky. It focuses primarily on analysis of contracting activity between the United States Department of Defense and business establishments throughout the state. The supply chain maps illustrate the relationships between purchasers and suppliers. The purchasers in these examples may be an industry or an agency. The suppliers in the following analysis are industries. The industry analysis was conducted at the three-digit level of the North American Industry Classification System (NAICS), which includes 86 industries. The six-digit NAICS level includes 1,218 industries, but in Kentucky 836 of these industries have supply chain flows of $100,000 or less. This large number of small transactions is not easily represented on a supply chain map. For that reason, Thomas P. Miller and Associates (TPMA) and Fourth Economy aggregated these transactions to the three-digit NAICS level.

This information is useful to determine the downstream impacts of changes in DoD purchasing. Changes that occur within a specific industry segment can be traced through the supply chain maps for that industry segment. Similarly, the industries that may be impacted by changes in agency spending can be identified on the agency supply chain maps. Finally, the information on the major DoD systems at least partially produced in Kentucky can be monitored for changes in DoD spending priorities.

- The DoD spends an average of $5.6 billion per year in Kentucky, distributed to more than 1,300 contractors in 532 industries.
- Humana Military Healthcare Services, accounted for $14 billion of the total $22.3 billion spent between FY 2012-2015. Excluding Humana, average contract value is $1.6 million per year.
- Many of the purchasing flows occur between companies in the same industry.
- The Defense Health Agency (DHA) accounts for the largest value of contracts awarded in Kentucky, at more than $7 billion for FY 2012-2015. Its predecessor, Tricare Management Activity (TMA), is the second largest with $6.9 billion. The third largest agency is the Army, spending $3.8 billion in Kentucky, followed by the U.S. Special Operations Command (USSOCOM) at $2.6 billion. The Navy is spending $621 million, and U.S. Transportation Command is spending $535 million.
- Outside of Health Services and Insurance, the largest DoD program activity is for the Chemical Demilitarization program at nearly $1.5 billion between FY 2012-2015.
- Kentucky is part of the supply chain for the Virginia Class Submarine; Kentucky firms performed $41.8 million of work between FY2012-2015 for these submarines.
- Kentucky firms performed nearly $28 million worth of work on the Minuteman II Missile System, making it the largest Aerospace system in the Kentucky Defense Supply Chain.
- The Boeing KC-135 Stratotanker is the second largest defense Aerospace system in the Kentucky Defense Supply Chain, with more than $14.8 million from the DoD.
- The other major systems made in part in Kentucky are related to Aerospace, including the Patriot Missile System ($6.7 million) and the Lockheed Martin C-130J Super Hercules C130-J military transport aircraft ($3.9 million).
- Several of the DoD systems, which are partially made in Kentucky, are nearing the end of their production life and are undergoing modification or redevelopment. These changes may require R&D support and/or manufacturing modernization to help Kentucky firms maintain their defense production capabilities.

Introduction

This chapter provides a detailed analysis of the Department of Defense (DoD) supply chain based on contracting and sub-contracting activity in Kentucky between fiscal years 2012 and 2015. This analysis examines the industry-to-industry flow for major contracting sectors, as well analyses of the supply chains and purchasing for specific DoD agencies in Kentucky. It also includes an overview of the major DoD systems in which Kentucky firms are part of the supply chain.

Key Statistics for the DoD Supply Chain in Kentucky

(FY 2012 – FY 2015)

532
Industries in the DoD supply chain in Kentucky

1,302
The number of companies in Kentucky with DoD obligations between FY 2012 and 2015

814
The number of companies with DoD contracts of $100,000 or less

62.5
The percent of DoD dollars that went to the Direct Health and Medical Insurance Carriers Industry

$14 billion
The total value of obligations to Humana Military Healthcare Services, the state's largest contractor

$7 billion
The total value of obligations from the Defense Health Agency, the largest DoD purchaser in Kentucky

$1.5 billion
The amount spent for the Chemical Demilitarization Program in Kentucky in FY 2012 to 2015

Data Sources[1]

- DIBBS Navigator: Data for federal defense contractors, sub-contracting, and contracting activity is sourced from DIBBS Navigator by Business Development Zone, LLC., a comprehensive database for defense-related procurement, including data on companies' operational capabilities, industry membership, and federal product and service codes. Unless otherwise noted, all data contained in this chapter is from DIBBS Navigator. Data that feed DIBBS Navigator are derived from USASpending.gov, which pulls in data from the Federal Procurement Data System (FPDS) and the System for Award Management (SAM).
- EMSI: Data for the total supply chain flows from purchase to supplier industries, as well as the estimates on economic and job impacts, were sourced from EMSI, a world leader in providing economic impact data and modeling to governments, universities, and public and private sector organizations for assessing the economic impacts of project decisions in all industry sectors.
- DoD Agency Budgets: Agency budgets and forecasts were sourced from the DoD Green Book, the U.S. Navy Program Guide, the U.S. Army Acquisition Center, the U.S. Air Force Fact Sheets, the Defense Acquisition Portal, and other defense budget and news reports.
- AeroWeb / Forecast International Inc.: Descriptions of major defense systems that are produced with the participation of Kentucky contractors. The DoD systems were identified in the data feeds provided by DIBBS Navigator.

Defense Industry Supply Chain Map

Contracting Overview

As mentioned in Chapter 1, United States DoD contracts awarded to prime contractors and subcontractors in the state of Kentucky between FY2012 and FY2015 covered 532 industries and averaged around $5.5 billion annually.[2] However, the vast majority of contracts are concentrated within a handful of industries. Approximately 62.5% of all DoD dollars awarded to Kentucky firms between 2012 and 2015 went to just the Direct Health and Medical Insurance Carriers Industry, and an additional 23% went to the next four most common industries.

In Chapter 1, the 532 industries associated with Kentucky's DoD contracts were grouped into eight broad categories according to their two-digit NAICS.[3] The Finance & Insurance group comprises around two-thirds of Kentucky's defense contracting. The second and third-highest dollar contracting groups were as follows: 2) Admin, Support, & Waste Management and 3) Construction & Extraction. In Kentucky, manufacturing takes a backseat as a source of defense contracting dollars to service industries.

1 Unless otherwise noted, the period of analysis for all contract data is FY2012-2015.
2 According to aggregations of Business Development Zone and USA Spending data.
3 Each category was delineated primarily at the 2-digit NAICS level. Admin, Support, & Waste Management includes 56 and 92; Construction & Extraction includes 11, 21, and 23; Durable Goods Manufacturing includes 321, 327, and 33; Finance, Insurance, & Management includes 52 and 55; Information, Professional, & Scientific includes 51 and 54; Non-Durable Manufacturing includes 31 and 322-326; and Transportation, Warehousing, & Utilities includes 22, 48, and 49. Other Services & Trade is a miscellaneous category that includes 42-45, 53, 61, 62, 71, 72, and 81.

By firm, Humana Military Healthcare Services accounts for $14 billion of the total – 63% of all defense dollars in the state of Kentucky. The rest of defense contracting in the state is dispersed to a wide array of industries and companies. Excluding Humana, the average contractor receives $1.6 million per year. There are relatively few companies with DoD funding greater than $5 million, and 804 companies—62% of the total—have total DoD obligations less than $100,000.

Table 1: Number of Companies Receiving DoD Contracts from FY12-FY15, Grouped by Contract Size[4]

DoD Funding FY 2012-2015	Number of Companies	Percent of Companies
Greater than $5,000,000	106	8%
Greater than $1,000,000	106	8%
Greater than $500,000	66	5%
Greater than $100,000	220	17%
$100,000 or less	804	62%
Total	**1,302**	**100%**

Supply Chain Maps by Industry Group

In order to understand critical supply chain paths in Kentucky's defense industries, TPMA and Fourth Economy mapped supply chains in several ways. Unless otherwise specified, all supply chains were mapped at the 3-digit NAICS level. First, supply chains were analyzed for the industries that are greater than 80% dependent upon defense contracts. Then, supply chains for all industries in the top 20% of defense contracting activity were mapped by industry group. In the following pages, each map shows supply chain flows within Kentucky, with defense-related purchasers on the right and their suppliers on the left. In each map, purchases within the state are weighted by total contracting dollars, to account for the relative impact of defense contracting on each supplying industry.

4 DIBBS Navigator. This data was analyzed by Business Development Zone.

Figure 1: Defense Dependent Purchasers: 80% or more[5]

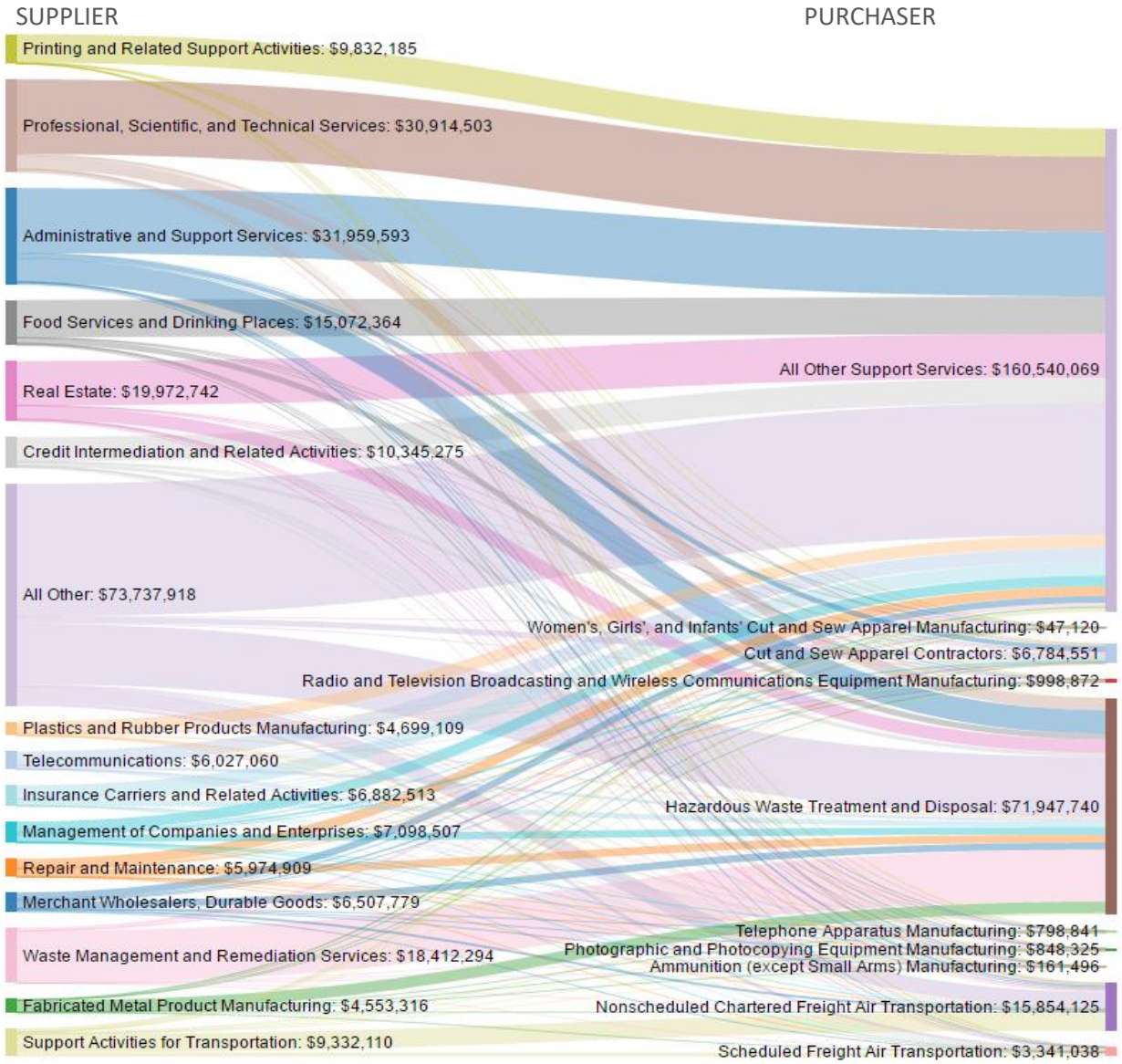
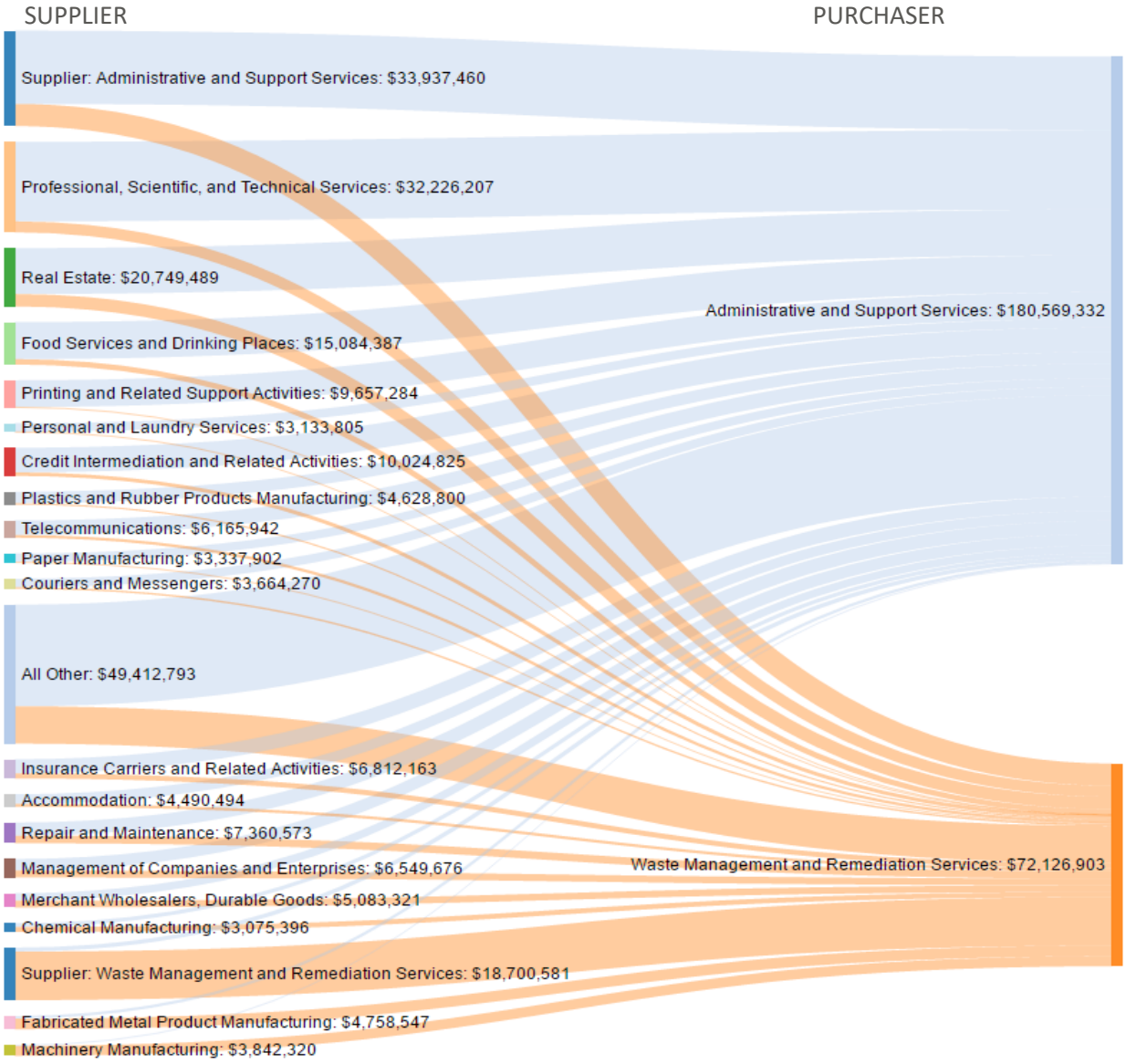


Figure 1 lists the six-digit contracting industries that are more than 80% dependent on DoD contracts on the right, and their suppliers within Kentucky on the left. There are four supplier industries with more than $15 million in sales to these highly defense dependent purchasers. These industries could be susceptible to disruptions in defense spending. They include the following industries (excluding All Other Industries, which is a catch-all category):

- Administrative and Support Services: $31,959,593
- Professional, Scientific, and Technical Services: $30,914,503
- Waste Management and Remediation Services: $18,412,294
- Food Services and Drinking Places: $15,072,364

5 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Figure 2: Administrative, Support, & Waste Management Supply Chain[6]

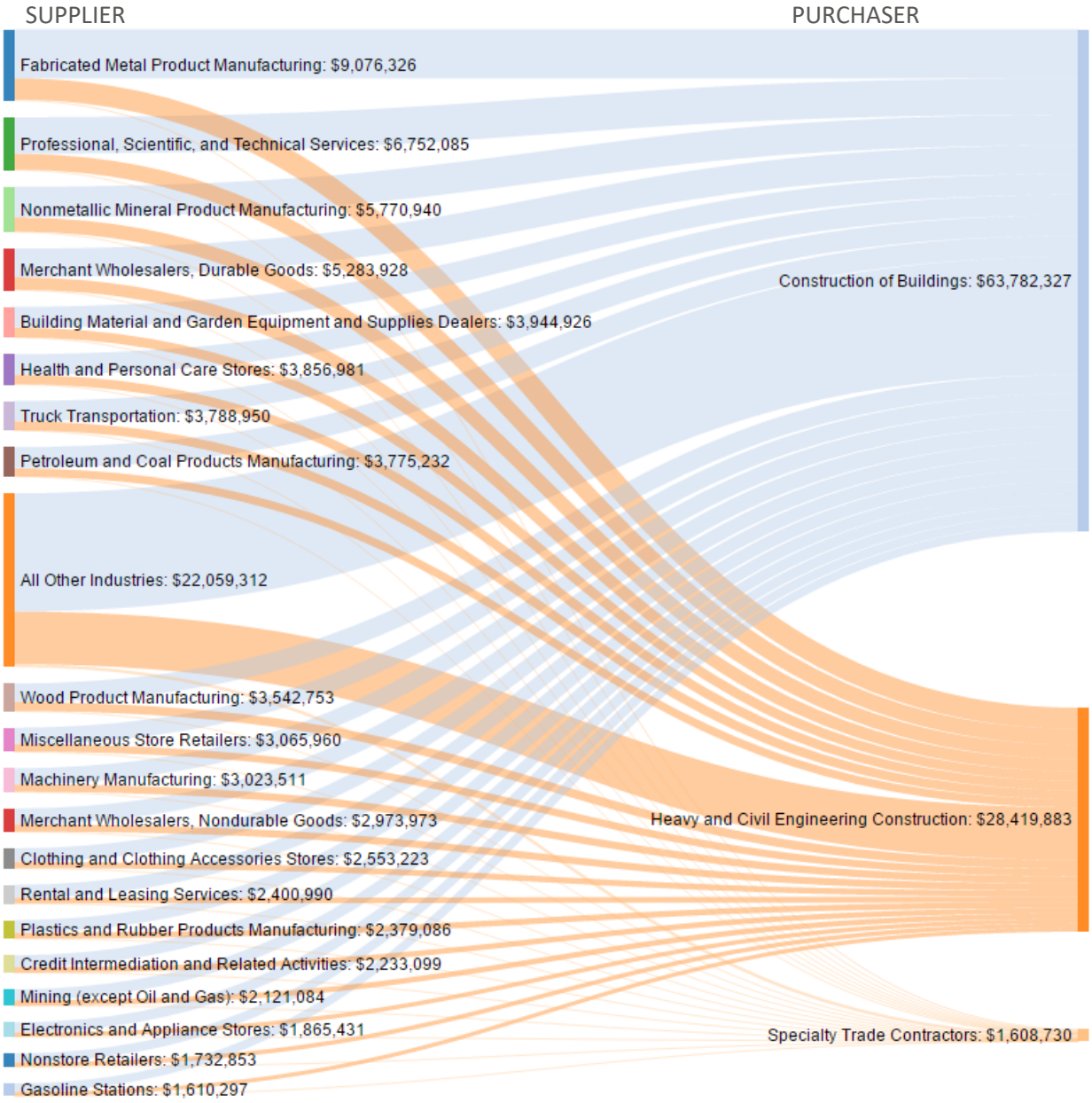


The Administrative and Support Services and Waste Management and Remediation Services industry group demonstrates a highly dispersed supply chain. However, the presence of Admin and Support Services and Waste Management industries as suppliers indicates that this sector is also highly dependent on transactions between companies in the same industry. Overall, the most impacted suppliers include the following industries:

- Administrative and Support Services: $33,937,460
- Professional, Scientific, and Technical Services: $32,226,207
- Real Estate: $20,749,489

6 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Figure 3: Construction & Extraction Supply Chain[7]

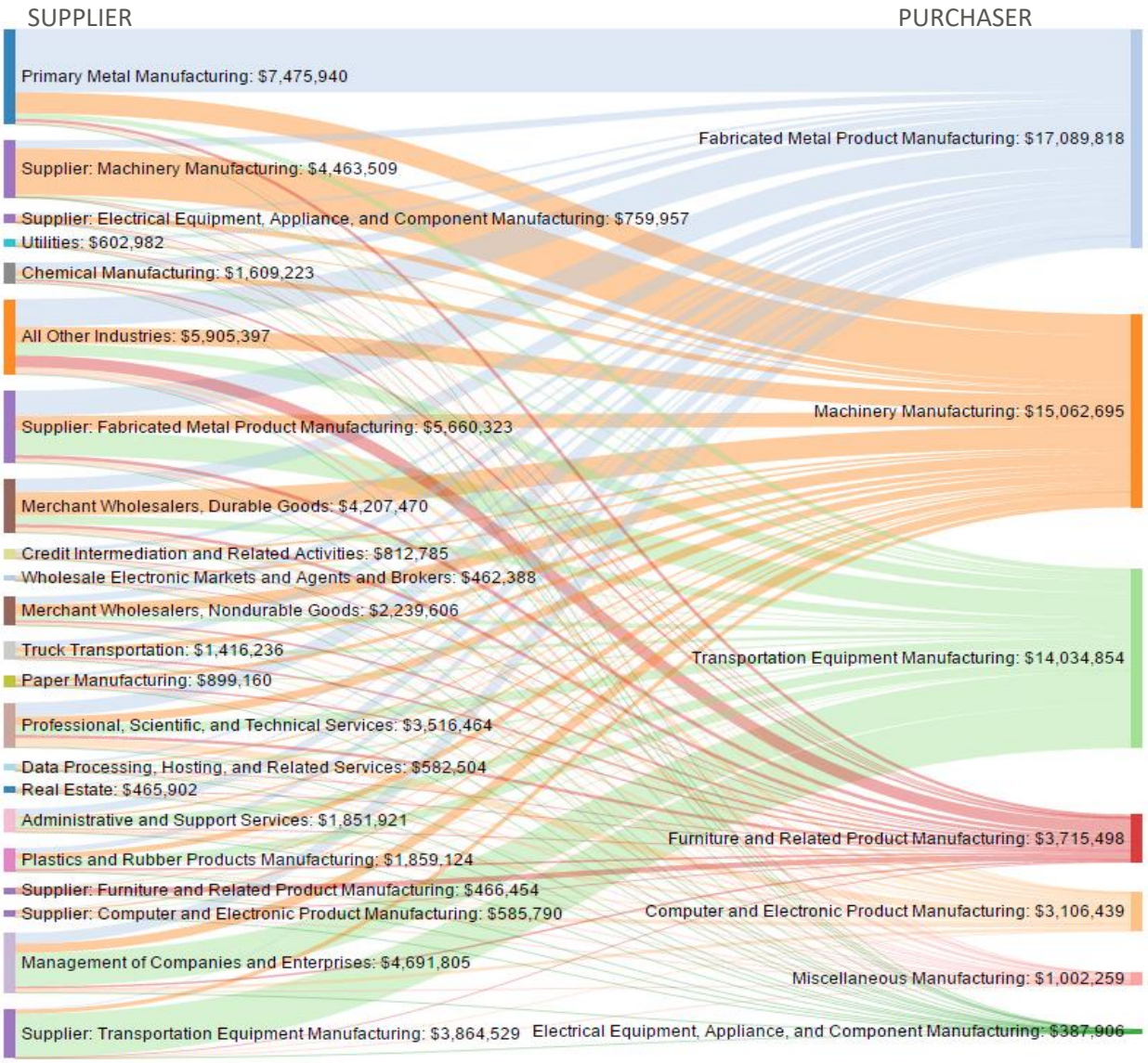


For the Construction and Extraction Supply Chain, no industries supply more than $10 million to construction and extraction contractors. However, four industries supply more than $5 million. The most impacted industries include the following:

- Fabricated Metal Product Manufacturing: $9,076,326
- Professional, Scientific, and Technical Services: $6,752,085
- Nonmetallic Mineral Product Manufacturing: $5,770,940
- Merchant Wholesalers, Durable Goods: $5,283,928

7 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Figure 4: Durable Goods Manufacturing Supply Chain[8]

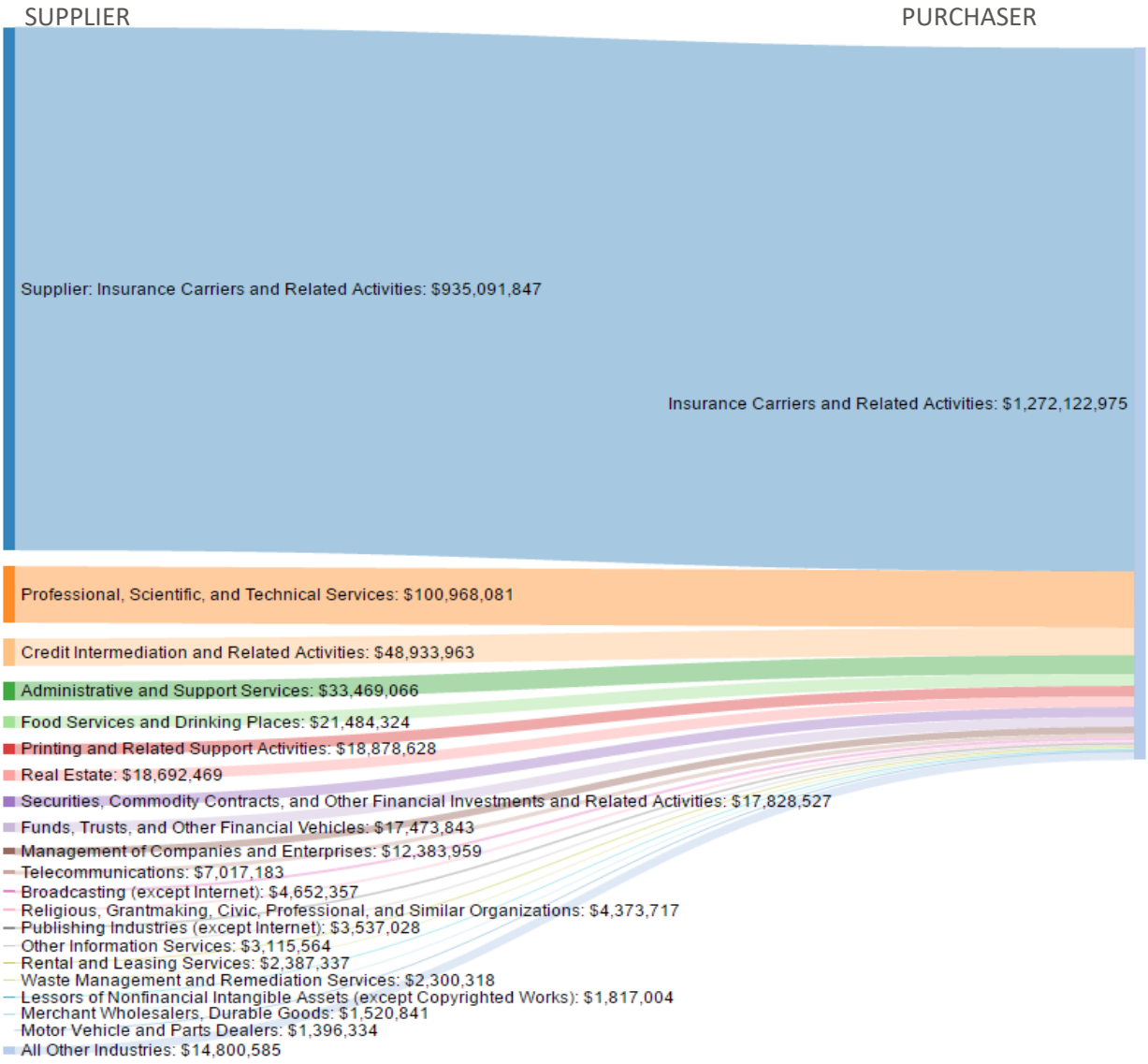


The Durable Goods Manufacturing Supply Chain is quite varied, with no supplier having more than $7.5 million in defense-driven sales to contracting industries. There are also several industries with supply chains flows between firms within that industry. Overall, there are 5 supplier industries with more than $4 million in purchases for Durable Goods. The most impacted suppliers include the following industries:

- Primary Metal Product Manufacturing: $7,475,940
- Fabricated Metal Product Manufacturing: $5,660,323
- Management of Companies and Enterprises: $4,691,805
- Machinery Manufacturing: $4,463,509
- Merchant Wholesalers, Durable Goods: $4,207,470

8 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Figure 5: Finance, Insurance and Management Supply Chain[9]

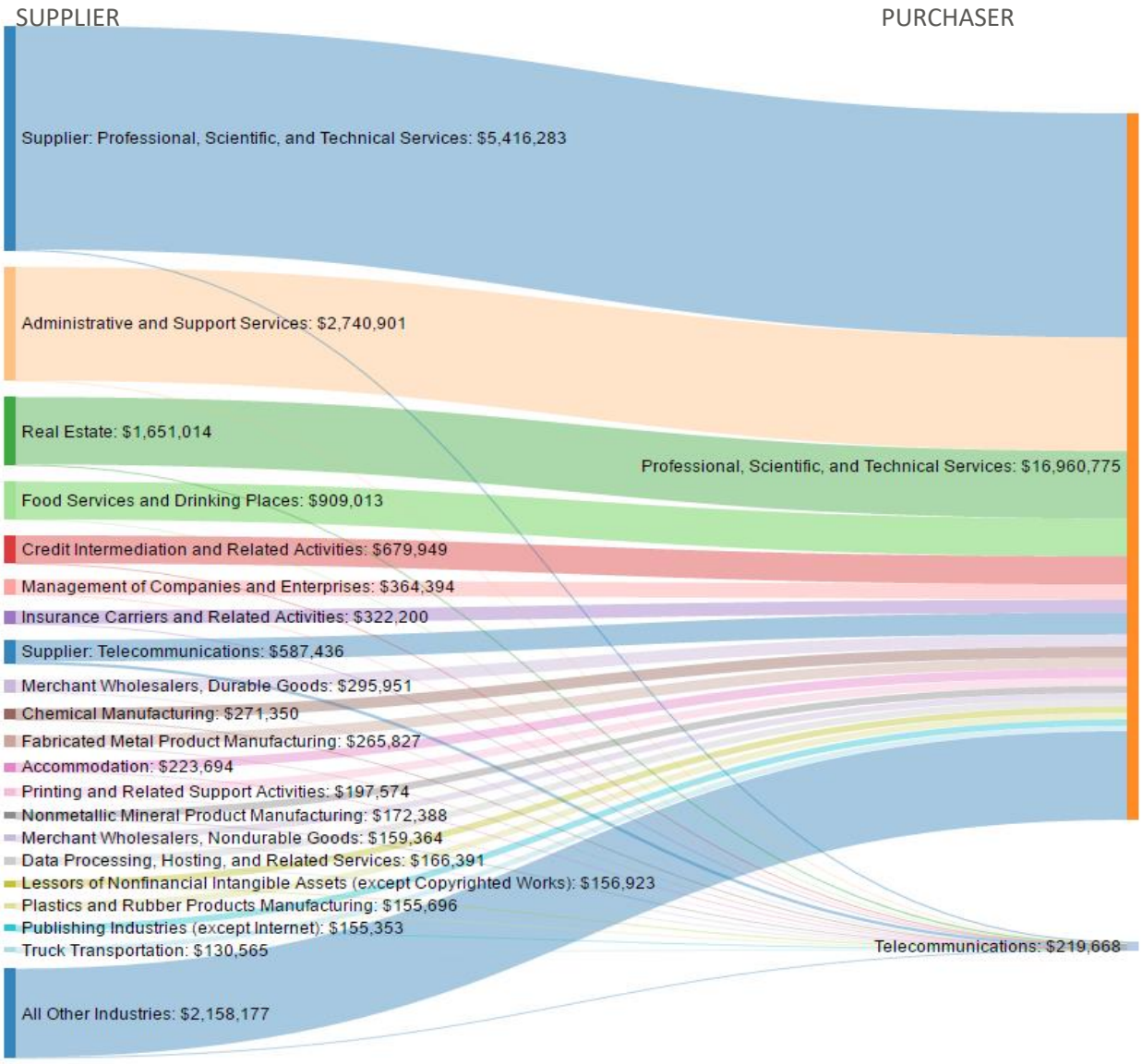


The Finance, Insurance, and Management Supply Chain is dominated by one purchaser—Insurance Carriers, and Related Activities—and 74% of defense-driven Finance, Insurance, and Management purchases are internal to that sector. The next largest supplier, Professional, Scientific, and Technical Services, has only 8% of the total supplying activity. Still, the large supplying volume of several industries in this diagram reflects the influence of Humana on Kentucky's defense economy. The most impacted suppliers include the following industries:

- Insurance Carriers and Related Activities: $935,091,847
- Professional, Scientific, and Technical Services: $100,968,081
- Credit Intermediation and Related Activities: $48,933,963
- Administrative and Support Services: $33,469,066

9 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Figure 6: Information, Professional, & Scientific Supply Chain[10]

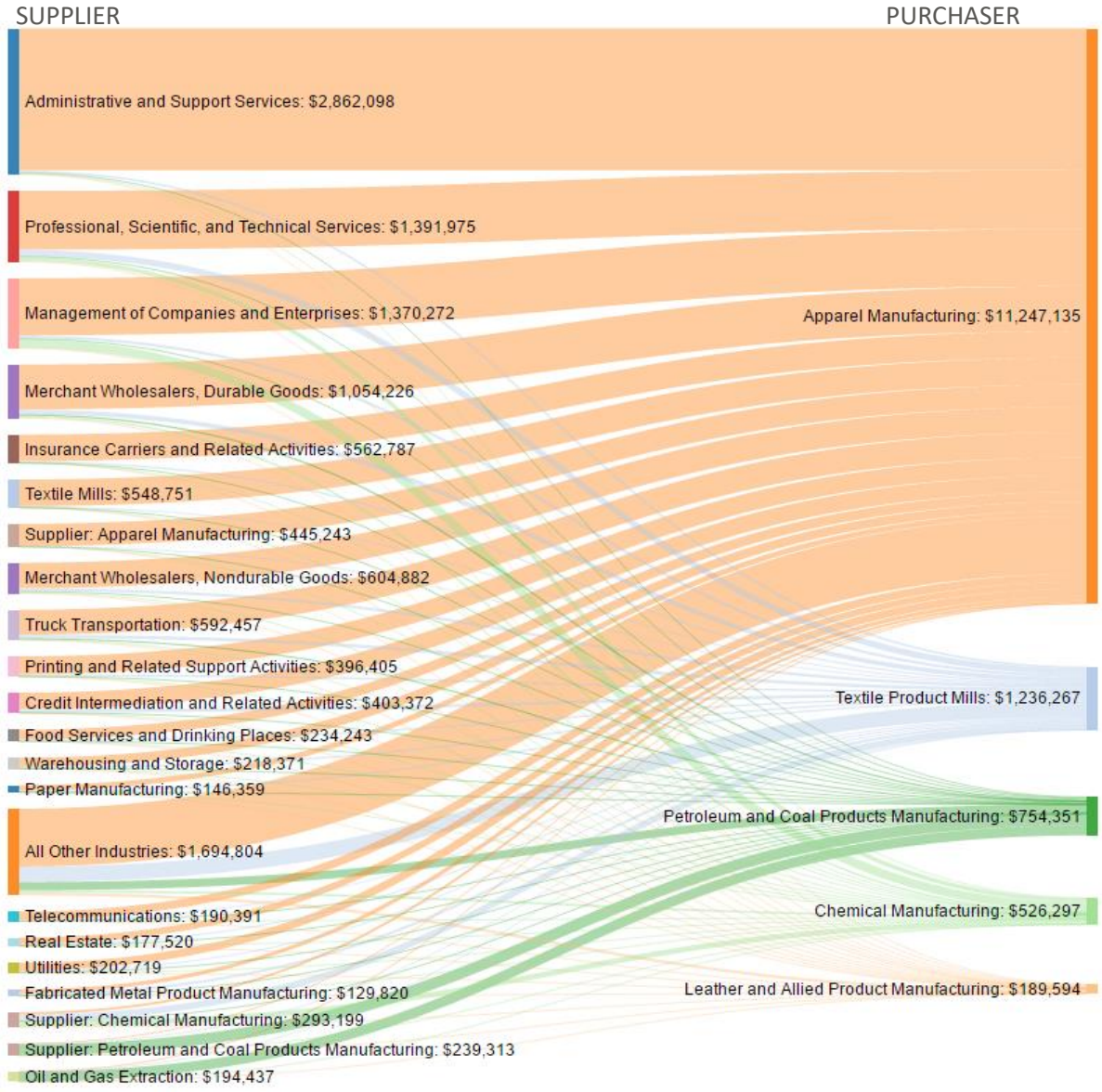


Overall, Kentucky's Information, Professional, and Scientific defense activity is largely related to Professional, Scientific, and Technical Services rather than Telecommunications. Its supply chain includes significant internal flows within the Professional, Scientific and Technical Services sector. Two additional industries rely on these purchasers for more than $1 million. The most impacted suppliers include the following industries:

- Professional, Scientific, and Technical Services: $5,416,283
- Administrative and Support Services: $2,740,901
- Real Estate: $1,651,014

10 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Figure 7: Non-Durable Goods Manufacturing Supply Chain[11]

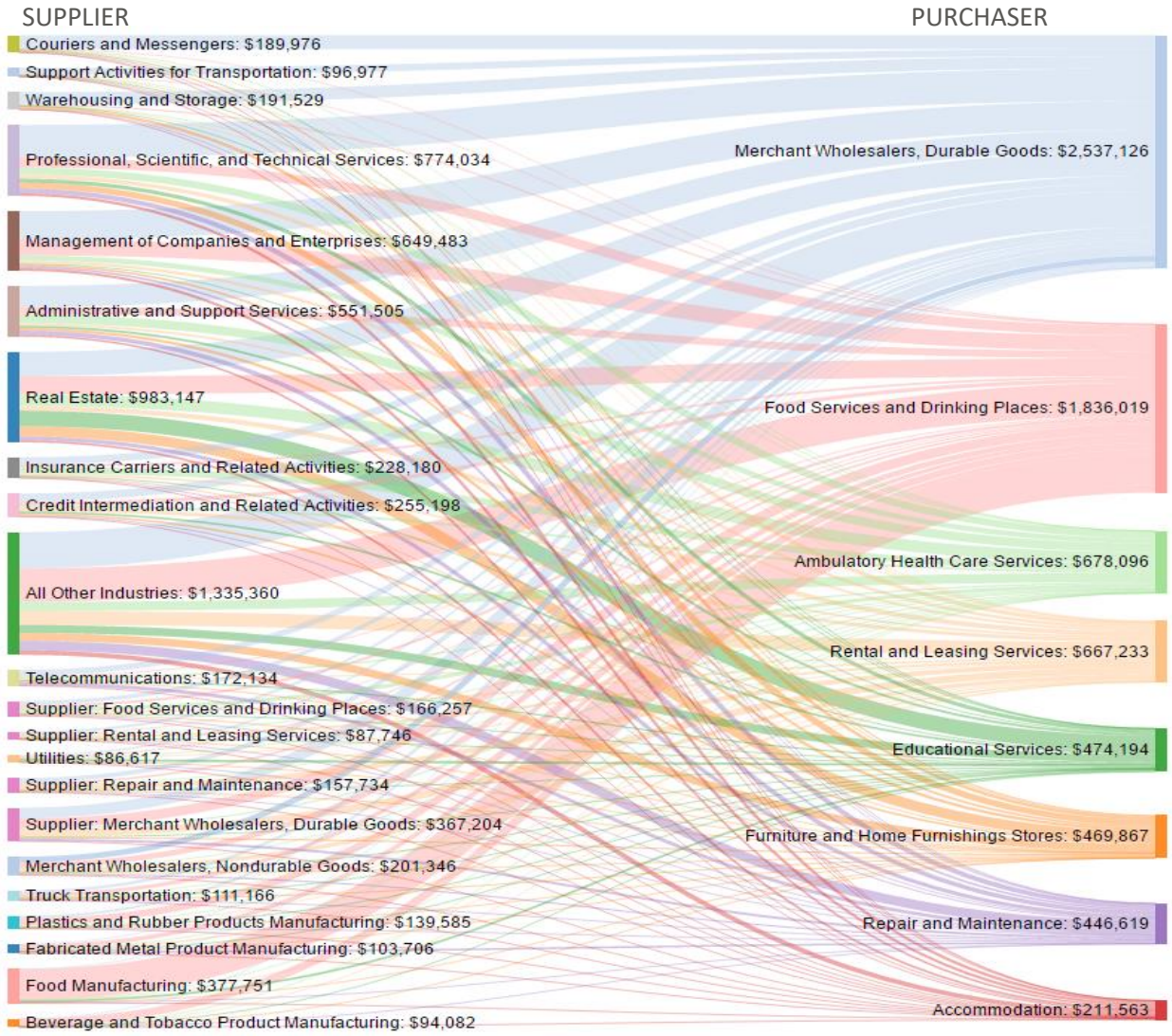


The Nondurable Goods Manufacturing Supply Chain includes three primary defense-related purchasing industries. Administrative and Support Services is the supplier that benefits most from this sector's defense activities. The remainder of the supply chain consists of smaller flows (less than $1.5 million) to a number of industries. The most impacted suppliers include the following industries:

- Administrative and Support Services: $2,862,098
- Professional, Scientific, and Technical Services: $1,391,975
- Management of Companies and Enterprises: $1,370,272
- Merchant Wholesalers, Durable Goods: $1,054,226

11 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Figure 8: Other Services & Trade Supply Chain[12]

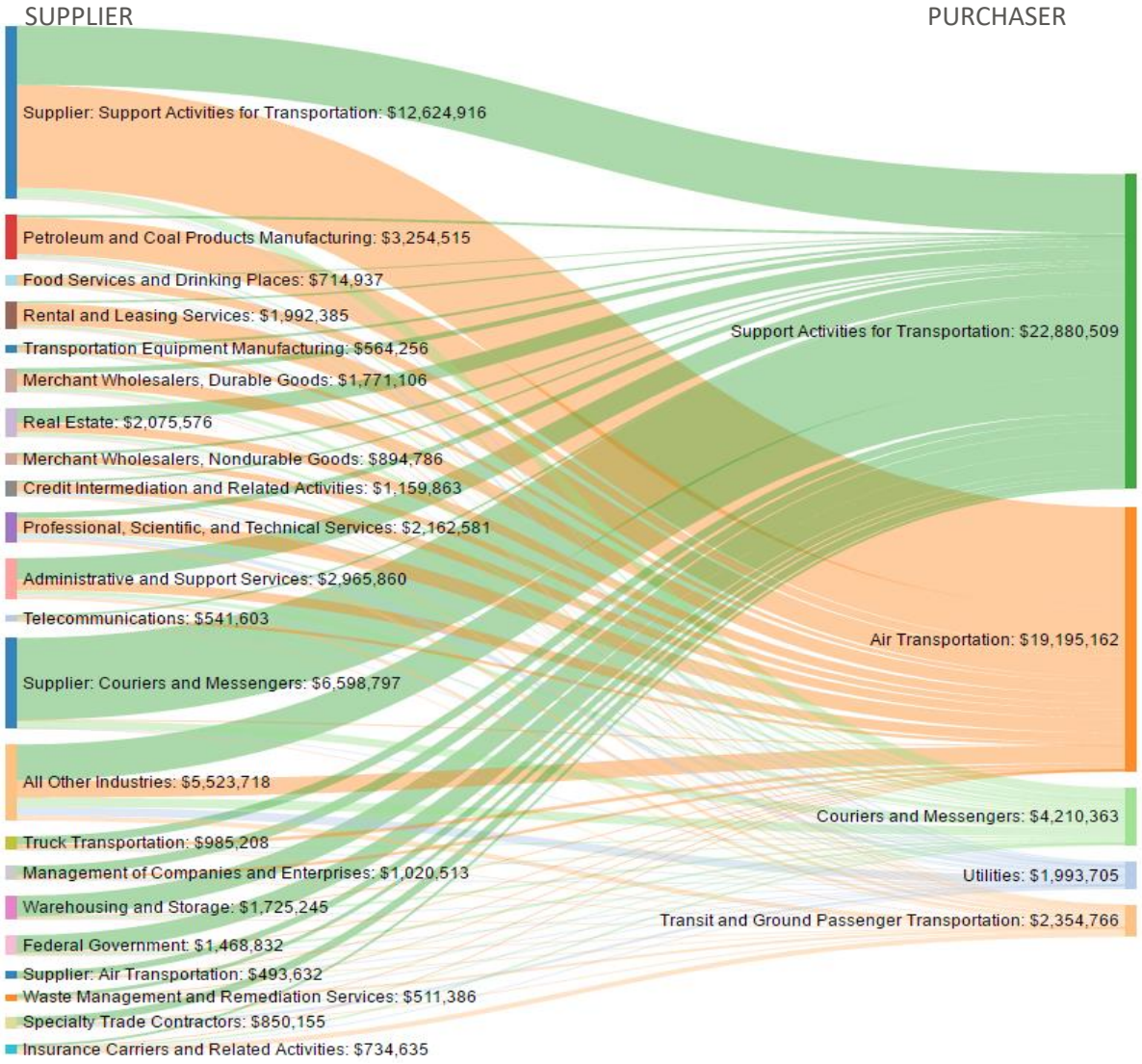


The Other Services and Trade Supply Chain is one of the more dispersed supply chains in the defense sector; it is a collection of defense industries that do not fit well in another group. The majority of the flows are small, averaging less than $150 thousand between supplier and purchaser. Thus, none of the top four impacted industries supply more than $1 million to contractors in this sector:

- Real Estate: $983,147
- Professional, Scientific, and Technical Services: $774,034
- Management of Companies and Enterprises: $649,483
  Administrative and Support Services: $551,505

12 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Figure 9: Transportation, Warehousing & Utilities Supply Chain[13]



The Transportation, Warehousing, and Utilities Supply Chain is another highly dispersed supply chain in the defense sector. However, its top two suppliers both see more than $5 million in defense-related sales, and six other industries receive more than $1.5 million. They are as follows:

- Support Activities for Transportation: $12,624,916
- Couriers and Messengers: $5,598,797
- Petroleum and Coal Products Manufacturing: $3,254,515
- Administrative and Support Services: $2,965,860
- Professional, Scientific, and Technical Services: $2,162,581
- Rental and Leasing Services: $1,992,385
- Merchant Wholesalers, Durable Goods: $1,771,106
- Warehousing and Storage: $1,725,245

13 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Supply Chain Gaps

Though the supply-chain maps shown above describe detailed purchasing flows in defense-related industries, they do not fully capture the supply needs of defense contractors. For example, the maps above only show purchases by defense-related industries in Kentucky to supplying industries *in Kentucky.* Many defense-related industries are obtaining inputs or services from other states. For the purpose of leakage analysis, TPMA identified all suppliers to the 106 Kentucky industries that make up the top 20% of defense contracting industries. Within these supplying industries, a total of $1.4 billion of defense-related goods and services are being imported from businesses outside the state. From this list, Tables 2 and 3 display industries for which more than 75% of products are imported to the state *and* imports to the state surpass $2 million. Table 2 looks at service industries, while Table 3 looks at manufacturing industries.

Table 2: Services Imported to Kentucky by Defense Industries[14]

NAICS	Industry Description	Imported Purchases	% of Purchases Imported
519130	Internet Publishing and Broadcasting and Web Search Portals	$26,547,104.09	83.1%
425120	Wholesale Trade Agents and Brokers	$13,153,229.50	85.8%
533110	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	$12,159,290.12	75.2%
524130	Reinsurance Carriers	$9,976,523.92	81.8%
481111	Scheduled Passenger Air Transportation	$8,095,312.73	85.5%
211111	Crude Petroleum and Natural Gas Extraction	$5,264,610.56	95.8%
532490	Other Commercial and Industrial Machinery and Equipment Rental and Leasing	$5,223,734.11	78.4%
522120	Savings Institutions	$4,535,570.25	82.4%
551112	Offices of Other Holding Companies	$2,766,274.19	89.6%
522210	Credit Card Issuing	$2,665,331.95	98.7%
524128	Other Direct Insurance (except Life, Health, and Medical) Carriers	$2,624,061.36	92.4%
515210	Cable and Other Subscription Programming	$2,421,058.55	92.0%
721120	Casino Hotels	$2,105,166.65	100.0%

Table 2 provides a list of services that are imported to Kentucky in large quantities by defense industries. Though service industries like these often benefit from clusters of related activities, they may be less geographically constrained than manufacturing activities that require raw materials. Conversely, Table 3 shows imports specifically from manufacturing industries. Though some of these industries, like Petroleum Refineries, may be difficult to develop in Kentucky, others may be examples of supply chain gaps that firms in Kentucky could fill. For example, every industry except Asphalt Shingle and Coating Materials is currently sourced in-state to at least a small degree.

14 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

Table 3: Manufactured Goods Imported to Kentucky by Defense Industries[15]

NAICS	Industry Description	Imported Purchases	% of Purchases Imported
324110	Petroleum Refineries	$52,511,969.48	88.46%
331110	Iron and Steel Mills and Ferroalloy Manufacturing	$10,303,361.40	87.15%
324122	Asphalt Shingle and Coating Materials Manufacturing	$3,150,835.09	100.00%
332321	Metal Window and Door Manufacturing	$2,887,801.52	79.78%
322130	Paperboard Mills	$2,514,978.24	93.14%
321113	Sawmills	$2,394,514.54	83.88%
321911	Wood Window and Door Manufacturing	$2,342,070.34	89.39%
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	$2,322,010.25	94.37%
334413	Semiconductor and Related Device Manufacturing	$2,154,497.22	98.75%
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	$2,322,010.25	94.37%

Spending by Agency

In addition to tracing supply chain flows from contracting industries to their suppliers, flows can be analyzed from DoD agencies to their contracting industries. Kentucky has 23 DoD agencies providing contracts to firms in the state. Table 4 shows spending by the top defense agencies in Kentucky. The Defense Health Agency (DHA) and Tricare Management Activity (TMA) combined account for 63 percent of the total spending in Kentucky. TMA provided the majority of contracts to Kentucky in FY12 and FY13, but was replaced by DHA starting in FY2014. The DHA provides wartime and peacetime medical support for members of the Army, Navy, and Air Force. The spending of this agency is largely tied to personnel and operations worldwide, not specifically in Kentucky. The next largest agency is the Army, spending $3.8 billion in Kentucky, followed by the U.S. Special Operations Command at $2.6 billion. The next three agencies accounted for 7% of total spending, and all other agencies accounted for 1.5%.

Table 4: Spending by top Defense Agencies in Kentucky[16]

Agency	Share	Total
Defense Health Agency (DHA)	32%	$7,062,775,712
Tricare Management Activity (TMA)	31%	$6,908,455,398
Department of the Army	17%	$3,758,147,730
U.S. Special Operations Command (USSCOM)	12%	$2,606,507,401
Department of the Navy	3%	$621,191,442
U.S. Transportation Command (USTRANSCOM)	2%	$535,746,116
Defense Logistics Agency	2%	$526,123,896
All Others	1%	$332,831,506
Grand Total	**100%**	**$22,351,779,201**

15 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.
16 USASpending.Gov. This data was analyzed by Thomas P. Miller & Associates.

Figure 10: Top Ten Contracting Industries Funding by Agency[17]

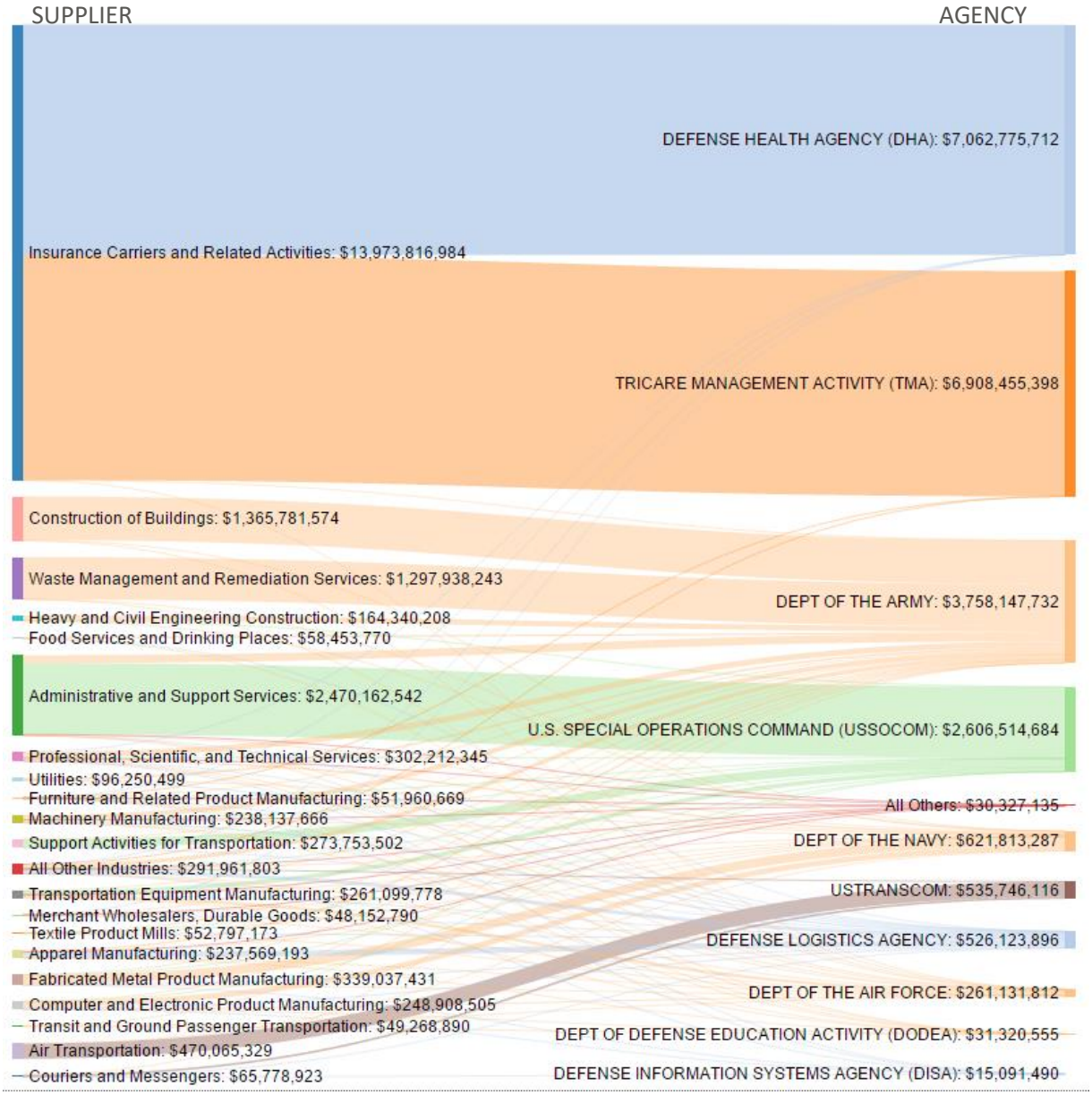


Figure 10 shows the flows between these agencies and their supplying industries. DHA and TMA almost exclusively support insurance carriers and related activities, which in Kentucky is Humana Military Healthcare Services. The Army gives the majority of its contracts to Construction of Buildings and to Waste Management and Remediation Services. Administrative and Support Services receives the majority of its DoD dollars from the USSOCOM and Air Transportation receives the majority of its DoD dollars from USTRANSCOM.

17 USASpending.Gov. This data was analyzed by Thomas P. Miller & Associates.

Major Defense Systems Made in Kentucky

A significant amount of defense spending in Kentucky is dedicated to the operational support of the bases and personnel in Kentucky, including food services, commissary, and healthcare. The funding for these activities is dependent on the number of personnel in Kentucky. The following sections cover the major defense systems and programs in Kentucky that may be impacted by targeted budget actions and/or strategic shifts in defense activities such as the termination or creation of a major weapons system. These systems are identified by the System Equipment Codes in the contract transactions data.

Table 5: Major Defense Systems in Kentucky[18]

System/Program	Total
Chemical Demilitarization (CHEM DEMIL-ACWA)	$1,467,389,118
Virginia Class Submarine (SSN 774)	$41,801,733
Minuteman III Missile System	$27,937,671
KC-135R	$14,833,674
PATRIOT	$6,673,158
C130-J	$3,941,264
BRAC ACTIVITIES	$1,950,077
BLACK HAWK (UH-60A/L)	$1,581,390
MDA SUPPORT	$1,549,684
EA-18G	$766,920
E-3A	$757,832
UH-60M BLACK HAWK	$746,441
FMTV	$570,575
Artillery Ammunition	Not reported
Hydra-70 Rocket System	Not reported
Joint Service Transportable Decontaminating System Small Scale	Not reported

Chemical Demilitarization Program

Description[19]

"The Chemical Demilitarization Program is composed of two Major Defense Acquisition Programs, which are The Assembled Chemical Weapons Alternatives (ACWA) Program and the U. S. Army Chemical Materials Agency (CMA), with the goal of destroying a variety of U.S. chemical agents and weapons, including the destruction of former chemical weapon production facilities. This program is designed to eliminate the existing U.S. chemical weapons stockpile in compliance with the Chemical Weapons Convention (CWC) signed in 1997 – while ensuring the safety and security of the workers, the public, and the environment."

18 DoD Major Acquisition Program Data Book and AeroWeb/Forecast International Inc.
Note: This table provides reported funding amounts for these systems. Additional systems are made in Kentucky but the funding amounts are embedded in other programs or classified.
19 Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer. (2016). Program Acquisition Cost by Weapon System. United States Department of Defense Fiscal Year 2017 Budget Request. Retrieved from http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2017/FY2017_Weapons.pdf

"There are four mission areas in the Chemical Demilitarization Program:

1. Destroy the remaining 10 percent of the U.S. chemical weapons stockpile at the ACWA Program sites (Colorado and Kentucky);
2. Close the remaining CMA sites, which completed destruction of nearly 90 percent of the U.S. stockpile;
3. Chemical stockpile emergency preparedness (CSEP) and emergency response planning;
4. Assess and destroy recovered chemical warfare material (RCWM) within the U.S., and pending authorization, the ex gratia destruction of eight identified World War II-era U.S. origin chemical munitions located on San Jose Island, Republic of Panama."

Activities

- Destruction operations and emergency response planning are budgeted through FY 2017.

Kentucky Contractors

- Bechtel Parsons, Joint Venture is in charge of this project.

Artillery Ammunition

Description[20]

"The Army's artillery ammunition program includes 75 mm (used for ceremonies and simulated firing), 105 mm and 155 mm projectiles and their associated fuses and propelling charges.

Semifixed ammunition for short and intermediate ranges, used in 105 mm Howitzers, is characterized by adjusting the number of multiple propelling charges. Semifixed ammunition for long ranges contains a single bag of propellant optimized for obtaining high velocity, and is not adjustable. The primer is an integral part of the cartridge case, and is located in the base. The 105 mm cartridges are issued in a fused or unfused configuration. Both cartridge configurations are packaged with propellant.

Separate-loading ammunition, used in 155 mm Howitzers, has separately issued projectiles, fuses, propellant charges and primers. After installing the appropriate fuse on the projectile, the fused projectile is loaded into the cannon along with the appropriate amount of propellant charges and a primer.

The artillery ammunition program includes fuses for cargo-carrying projectiles, such as smoke and illumination, and bursting projectiles, such as high explosives. This program also includes bag propellant for the 105 mm semifixed cartridges and a modular artillery charge system for 155 mm Howitzers."

Activities

- Procurement and delivery activities are budgeted through FY 2106. New primers will undergo operational test and evaluation in 2016-Q4.

Kentucky Contractors

- Bluegrass Army Depot

20 U.S. Army website. Artillery Ammunition. Retrieved from http://asc.army.mil/web/portfolio-item/artillery-ammunition/

2.75 Inch Rocket Systems (Hydra-70)

Description[21]

"The Hydra-70 Rocket System of 2.75-inch air-launched rockets is employed by tri-service and special operating forces on both fixed- and rotary-wing aircraft and is inherently immune to countermeasures. This highly modular rocket family incorporates several different mission-oriented warheads for the Hydra-70 variant, including high-explosive, anti-personnel, multipurpose submunition, red phosphorus smoke, flechette, training, visible-light illumination flare, and infrared illumination flare."

Activities

- Production and assessment activities are budgeted through FY 2017.

Kentucky Contractors

- CONCO—shipping container

Joint Service Transportable Decontaminating System Small Scale (JSTDS-SS) M26

Description[22]

"The Joint Service Transportable Decontaminating System Small Scale (JSTDS-SS) M26 provides the military and first responders with a lightweight, transportable decontamination system. It uses water from any source—fresh, still or salt—and offers variable-pressure and high-pressure operating modes. The JSTDS-SS can be used to decontaminate people or equipment; for cleaning, personnel showers and laundries; and for field hospital use. Weighing only 560 pounds, the JSTDS-SS can fit in a standard truck bed and requires minimal operator training. Two people can set it up in less than 15 minutes."

Activities

- No further projected activities

Kentucky Contractors

- DRS Technologies is in charge of this system.

Improved Environmental Control Units (IECU)

Description[23]

"The Improved Environmental Control Unit (IECU) program consists of three standard shelter-mounted systems in the following sizes: 9,000 British thermal units per hour (Btuh); 18,000 Btuh; 36,000 Btuh; and one skid-mounted unit of 60,000 Btuh. The IECU systems provide critical cooling to vital military electronic and support systems and equipment for the Army and DoD.

21 U.S. Army. 2.75 Inch Rocket Systems (Hydra-70). Retrieved from http://asc.army.mil/web/portfolios/ky/
22 U.S. Army. Joint Service Transportable Decontaminating System Small Scale (JSTDS-SS) M26. Retrieved from http://asc.army.mil/web/portfolios/jpeo/
23 U.S. Army. Improved Environmental Control Units (IECU). Retrieved from http://asc.army.mil/web/portfolio-item/cs-css-improved-environmental-control-units-iecu/

The IECU systems provide quality cooling, heating and dehumidification for command posts; command, control, communications, computers, intelligence, surveillance and reconnaissance systems; weapon systems; and other battlefield operating systems while using a non-ozone depleting refrigerant."

Activities

- Production activities are budgeted through FY 2017-Q1.

Kentucky Contractors

- DRS Environmental Systems, Inc—60,000 Btuh unit.

Virginia Class Submarine (SSN 774 Class)

Description[24]

"The Virginia Class Submarine (SSN 774 Class) is a nuclear-powered multimission attack submarine that provides the U.S. Navy with the capabilities to maintain undersea supremacy in the 21st century. The Virginia Class submarine is intended to replace the fleet of Los Angeles Class submarines (SSN 688 Class) - the backbone of the U.S. submarine force (39 in service - 23 retired). The Virginia Class is designed to meet U.S. Navy requirements for undersea warfare in the post-Cold War era. As of August 2015, 12 submarines have entered service with the U.S. Navy (SSNs 774 to 785)."

Activities

- The unit cost of a Virginia Class Submarine is more $2.6 billion. Significant procurement and RDT&E activities area budgeted through FY 2018.

Kentucky Contractors

- BAE Systems Land & Armaments Inc.—propulsors.

F-16 Fighting Falcon

Description[25]

"The F-16 Fighting Falcon is a light weight, high performance, multi-role fighter capable of performing a broad spectrum of tactical air warfare tasks at affordable cost well into the 21st century. F-16 aircraft provide a high-performance air-to-air and air-to-surface attack capability."

Activities

- Funding for modifications, training and RDT&E is budgeted through FY 2016. However, no more new aircraft will be purchased. Focus is on upgrades and modifications.

Kentucky Contractors

- Phoenix Products, Inc.—brackets
- Federal Prison Industries Inc.—furniture

24 Balle, J. (2015). SSN 774 Virginia Class Submarine. Aeroweb. Retrieved from http://www.bga-aeroweb.com/Defense/Virginia-Class-Submarine.html

25 Balle, J. (2015). F-16 Fighting Falcon. Aeroweb. Retreived from http://bga-aeroweb.com/Defense/F-16-Fighting-Falcon.html

E-3A Sentry (AWACS)

Description[26]

"The E-3 Sentry is an airborne warning and control system (AWACS) aircraft with an integrated command and control battle management (C2BM) surveillance, target detection, and tracking platform. The aircraft provides the Joint Air Operations Center (JAOC) with a precise, real-time picture of the battlespace. The E-3 is a heavily modified Boeing 707-320B Advanced (commercial airframe).

The E-3 Sentry provides an accurate, real-time picture of the battlespace to the Joint Air Operations Center (JAOC). The AWACS provides situational awareness of friendly, neutral and hostile activity, command and control of an area of responsibility, battle management of theater forces, all-altitude and all-weather surveillance of the battle space, and early warning of enemy actions during joint, allied, and coalition operations."

Activities

- Funding for modifications, spares and RDT&E is budgeted through FY 2017. Significant new purchases are not expected with the primary focus on upgrades and sustainment.

Kentucky Contractors

- Meggitt Aircraft Braking Systems Corporation
- The Boeing Company

KC-135 Stratotanker

Description[27]

"Boeing KC-135 is a long range cargo, passenger airlift, and aerial refueling aircraft (+military special missions (RC-135)). The KC-135 Stratotanker variant provides aerial refueling. Nearly all internal fuel can be pumped through the flying boom, which is the KC-135's primary fuel transfer method. A special drogue attached to and trailing behind the flying boom, may be used to refuel aircraft fitted with probes. Some KC-135s have been configured with the Multipoint Refueling System or MPRS. MPRS configured aircraft are capable of refueling two receiver aircraft simultaneously from special pods mounted on the wingtips."

Activities

- The KC-135 is no longer in production. FY 2015 budgets included more than $200 million for modifications however, no more new aircraft will be procured. Focus is on upgrades and sustainment.

Kentucky Contractors

- Messier-Bugatti-Dowty (Safran Landing Systems)—wheels and braking

26 Balle, J. (2016). E-3 Sentry (AWACS). Aeroweb. Retrieved from http://www.bga-aeroweb.com/Defense/E-3-Sentry-AWACS.html

27 Balle, J. (2014). KC-135 Stratotanker. Aeroweb. Retrieved from http://www.bga-aeroweb.com/Defense/KC-135-Stratotanker.html

C-130J Hercules

Description[28]

"The Lockheed Martin C–130 Hercules is an advanced tactical airlifter. The C-130J is the latest addition to the C-130 fleet and will replace aging C-130Es. The C-130J is the newest generation of the C-130 Hercules and primarily performs the tactical portion of the airlift mission. The aircraft is capable of operating from austere, rough, dirt airstrips and is the prime transport for air dropping troops and equipment into hostile areas. The C-130 operates throughout the U.S. Air Force, serving with the Air Mobility Command, the Air Force Special Operations Command (AFSOC), theater commands, the Air National Guard and the Air Force Reserve Command (AFRC), fulfilling a wide range of operational missions.

The flexible design of the Hercules enables it to be configured for many different missions, allowing for one aircraft to perform the role of many. Much of the special mission equipment added to the Hercules is removable, allowing the aircraft to revert back to its cargo delivery role if desired. Additionally, the C-130 can be rapidly reconfigured for the various types of cargo such as palletized equipment, floor-loaded material, airdrop platforms, container delivery system bundles, vehicles, and personnel or aeromedical evacuation. "

Activities

- The unit cost for the C-130J is more than $68 million. Significant procurement activities ($17 billion) are budgeted through FY 2018 with additional funds for RDT&E and operations and maintenance.

Kentucky Contractors

- Phoenix Products, Inc.—cargo buffer stop assembly
- Meggitt Aircraft Braking Systems Corporation—wheel and brake equipment

LGM-30G Minuteman III

Description[29]

"The LGM-30G Minuteman Intercontinental Ballistic Missile (ICBM) is a key element of the U.S. strategic deterrent forces. The Minuteman III is a strategic missile capable of delivering special weapons against a full range of targets. The missiles were manufactured by The Boeing Company and production ended in December 1978.

The Minuteman Program began in 1958 and by April 1967, 1,000 Minuteman missiles were operational and installed in six sites across the U.S. The Minuteman II (first launched in 1964) was capable of striking from six to eight targets with far greater accuracy than its predecessor. The current version, Minuteman III, was first launched in 1968 and provides better accuracy, range and target capability. The latest configuration is the LGM-30G Minuteman III. "

28 Balle, J. (2015). C-130J Hercules. Aeroweb. Retrieved from http://www.bga-aeroweb.com/Defense/C-130J-Hercules.html

29 Balle, J. (2014). LGM-30 Minuteman III. Aeroweb. Retrieved from http://bgaaeroweb.com/Defense/Minuteman.html

Activities

- $82 million was budgeted through FY 2018 for procurement and modifications. No more new missiles planned. Focus is on upgrades and sustainment.

Kentucky Contractors

- DRS Environmental Systems, Inc.—guided missile handling and servicing equipment
- Parker-Hannifin Corporation—packing and gasket materials

Patriot

Description[30]

"The U.S. Army's Patriot Advanced Capability (PAC-3) missile, developed and produced by Lockheed Martin, is the primary interceptor for Raytheon's Patriot Air and Missile Defense System. Patriot is the only combat-proven system capable of defeating tactical ballistic missiles, cruise missiles, and aircraft worldwide. Patriot replaced the MIM-14 Nike Hercules and MIM-23 Hawk systems.

The PAC-3 missile is the world's most advanced, capable and powerful terminal air defense missile (information about the latest variant here: PAC-3 MSE). The baseline PAC-3 missile is a high-velocity interceptor that defeats incoming targets by direct impact. When deployed in a Patriot battery, PAC-3 missiles significantly increase the missile system's firepower, since 16 PAC-3s load-out on a Patriot launcher compared to just four Patriot PAC-2 missiles. The PAC-3 Missile is equipped with a solid propellant rocket motor from Aerojet Rocketdyne; 180 small attitude control motors (Aerojet Rocketdyne); a Boeing Ka band millimeter wave active radar seeker; aerodynamic controls; and an inertial guidance system (INS) to navigate."

Activities

- Each Patriot missile costs more than $3.4 million. FY 2016 and 2017 budgets include nearly $600 million for modifications and RDT&E.

Kentucky Contractors

- Raytheon Company—radar equipment
- Federal Prison Industries Inc.—cable assembly
- Phoenix Products, Inc.—panel assembly

UH-60 Black Hawk

Description[31]

"The Sikorsky UH-60 Black Hawk is a four-bladed, single-rotor, medium-lift, utility helicopter. The latest configuration, the UH-60M, is powered by two General Electric T700-GE-701D turboshaft engines with 1,994 shp each. The older UH-60L is powered by the less powerful 1,890 shp T700-GE-701C.

30 Balle, J. (2016). Patriot PAC-3. Aeroweb. Retrieved from http://www.bga-aeroweb.com/Defense/Patriot-PAC-3.html

31 Balle, J. (2015). UH-60 Black Hawk. Aeroweb. Retrieved from http://www.bga-aeroweb.com/Defense/UH-60-Black-Hawk.html

The Black Hawk provides a highly maneuverable, air transportable, troop carrying helicopter for all intensities of conflict, without regard to geographical location or environmental conditions. It moves troops, equipment and supplies into combat and performs aeromedical evacuation and multiple functions in support of the U.S. Army's air mobility doctrine for employment of ground forces."

Activities

- The unit cost of a UH-60M is nearly $17 million. The procurement is budgeted at $1.6 billion through FY 2016 which completes a five-year multi-purchase contract.

Kentucky Contractors

- Phoenix Products, Inc.—airframe structural components
- Lockheed Martin Corporation—electrical control box
- Federal Prison Industries Inc.—cable assembly
- L-3 Communications Integrated Systems L.P.—miscellaneous aircraft components

EA-18G Growler

Description[32]

"The Boeing EA-18G Growler is a tandem two-seat, carrier-based, electronic attack variant of the F/A-18F Super Hornet strike fighter. The EA-18G Growler is the first electronic warfare aircraft produced in more than 35 years. The EA-18G is the replacement platform for the EA-6B Prowler. The Growler delivers higher speed, greater maneuverability, more reliability, and reduced operating costs.

The EA-18G provides one of the most flexible offensive electronic warfare capabilities available across the spectrum of conflict from irregular warfare to major contingency operations. The EA-18G supports naval, joint, and coalition strike aircraft, providing radar and communications jamming and kinetic effects to increase the survivability and lethality of all strike aircraft. The EA-18G can operate autonomously or as a major node in a network centric operation. The EA-18G's electronic suite can both detect, identify, and locate emitters + suppress hostile emitters through jamming and kinetic effects."

Activities

- Each EA-18G Growler costs more than $80 million. More than $13.8 billion is budgeted for procurement through FY 2016, but no new aircraft will be purchased after 2016. An additional $ billion is budgeted for RDT&E and modifications for the EA-18G and related components through FY 2017.

Kentucky Contractors

- Raytheon Company--antenna

32 Balle, J. (2016). Boeing EA-18G Growler. Aeroweb. Retrieved from http://www.bga-aeroweb.com/Defense/EA-18G-Growler.html

Family of Medium Tactical Vehicles (FMTV)

Description[33]

"The Family of Medium Tactical Vehicles (FMTV) is a family of diesel powered U.S. Army supply trucks in the 2.5 to 5-ton payload class. The FMTV consists of the Light Medium Tactical Vehicle (LMTV) and the Medium Tactical Vehicle (MTV). The trucks are manufactured by Oshkosh Corporation. A five-year contract was awarded to Oshkosh Trucks in August 2009, unseating incumbent FMTV producers BAE Systems and Navistar Defense. The FMTV Family of Vehicles has 80% part commonality.

The LMTV is a family of 4-wheel (4x4) diesel powered trucks with a 275 hp Caterpillar C7 6 cylinder engine. The LMTV has a 2.5-ton payload capacity and consists of the M1078 Cargo and M1079 Van models. The M1082 2.5-ton payload trailer is designed to be pulled by LMTV trucks.

The FMTV provides unit mobility and resupply of equipment and personnel for rapidly deployable worldwide operations on primary and secondary roads, trails, cross-country terrain, and in all climatic conditions. It is strategically deployable in C-5 Galaxy, C-17 Globemaster, and C-130 Hercules military transport aircraft. Experience in Iraq led to the development of an up-armored cab known as the Low Signature Armored Cab (LSAC) for installation on FMTV vehicles that adds ballistic and mine blast protection for crew survivability."

Activities

- $16.5 billion is budgeted for procurement through FY 2016, but this may not include all of the procurement to replace units lost in combat or other operations.

Kentucky Contractors

- Clarke Power Services, Inc.—transmission components

Conclusion and Recommendations

While the majority of DoD contracting funds in Kentucky flow to just a few industries, a total of 532 industries are impacted in some way by DoD spending. The same is true for contracting companies; while Humana Military Healthcare receives the majority of Kentucky's contract dollars, over 1,200 other firms have received DoD contracts since FY2012. Dollars from these contracts flow from recipient industries to businesses throughout the state, impacting the economy in many ways.

Consequently, analysis of supply chain flows can provide crucial insight about which industries may be impacted by fluctuations in defense spending. This is especially true for the handful of industries that are heavily dependent upon DoD contracts for their sales in Kentucky. Though these industries are varied, they make purchases from some common industries. In particular, Professional, Scientific, and Technical Services; Administrative and Support Services; and Waste Management and Remediation Services are heavily supported by purchases from defense contracting industries.

Further analysis of supply chains by Defense Industry Groups provides a different lens for analysis. Some groups are highly diversified—like Construction & Extraction and Durable Goods Manufacturing—while others are heavily concentrated, like Finance, Insurance, & Management. Common supplier industries

33 Balle, J. (2015). FMTV – MTV & LMTV. Aeroweb. Retrieved from http://www.bga-aeroweb.com/Defense/FMTV.html

across industry groups include Administrative and Support Services; Management of Companies and Enterprises; Merchant Wholesalers, Durable Goods; Professional, Scientific, and Technical Services; and Real Estate. The diversity of these industries provides an indication of the breadth of DoD impact on Kentucky's economy.

Despite the strengths of Kentucky's defense supply chain, it does have some gaps. Businesses in defense industries are heavily relying on out-of-state suppliers for many services, including:

- Internet Publishing and Broadcasting;
- Wholesale Trade Agents and Brokers;
- Leasing of Nonfinancial Intangible Assets;
- Reinsurance;
- Scheduled Passenger Air Transportation;
- Crude Petroleum and Natural Gas Extraction; and
- Commercial and Industrial Machinery and Equipment Rental and Leasing.

Additionally, defense industries are heavily importing manufactured goods in the following industries:

- Petroleum Refineries;
- Iron and Steel Mills and Ferroalloy Manufacturing;
- Asphalt Shingle and Coating Materials Manufacturing; and
- Metal Window and Door Manufacturing.

While some of these industries may be more conducive to instate growth than others, the state of Kentucky should consider how local firms could be used to fill supply chain gaps in areas that are a good fit with the State's Economy.

By agency, Kentucky's top DoD purchasers are the DHA, TMA, and the Army. While the DHA and TMA purchase almost exclusively from Insurance Carriers and Related Activities, other DoD agencies have more diversified supply chains, purchasing from Construction of Buildings; Waste Management and Remediation; and Administrative and Support Services. Despite this diversity, the supply chain map provides another indication of just how significant Humana's health insurance services are to Kentucky's defense contracting economy.

Lastly, in addition to broader agency budgets, some specific defense programs and systems have significant impacts on Kentucky's economy. Chief among these are the Chemical Demilitarization Program, the Virginia Class Submarine, and the Minuteman III Missile System. Kentucky's inclusion in most of the 16 defense systems and programs described in this chapter is tied to just one or two firms. Kentucky's ability to secure and retain these highly-qualified Aerospace, Aviation, and Defense firms is therefore crucial for its participation in defense systems manufacturing.

Overall, the story is that majority of defense spending in Kentucky is highly concentrated in just a few industries and firms. Still, the breadth of DoD impacts is broad; DoD spending affects many industries to at least a small degree. This chapter has identified four broad industries that are heavy suppliers to defense-dependent industries and 23 broad industries where Kentucky maintains a defense supply-chain gap. By focusing its efforts on increasing resiliency to defense spending in the former, and developing in-state suppliers in the latter, Kentucky can ensure a strong defense economy for years to come.

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Kentucky Commission on Military Affairs &
the Commonwealth of Kentucky

Chapter 4: Regional Reports

Key Findings

This chapter provides detailed information specific to defense spending and is divided by economic sub-region for the state of Kentucky. The impact of DoD spending has not been the same throughout the state; some areas have benefited more than others. To understand how different areas are affected by DoD spending, they are compared below, in summary, and in the following pages in detail.

Due to the complexities of DoD acquisitions and contracts data there are many ways to analyze defense spending data. For the majority of the Defense analysis, the consulting team has focused on contracts according to the location of the company awarded. However, for this section the consulting team elected to focus on another field of information called "place of performance." Focusing on place of contract is helpful to economic development purposes as it identifies the location of businesses and decision makers, but for the sake of measuring the local impact of defense spending place of performance is the Office of Economic Adjustment's preferred method of analysis.

The Cabinet for Economic Development and the KY Commission on Military Affairs requested that, for reasons of comparison, Kentucky be broken up into nine static regions already defined in a previous report, *The Economic Impact of the Automotive Industry in Kentucky*, completed by the Urban Studies Institute at the University of Kentucky. These regions are:

- Ashland
- Bowling Green-Hopkinsville
- Cumberland
- Lexington
- Louisville
- Mountain
- Northern Kentucky
- Owensboro-Henderson
- Paducah-Purchase

The figures and tables included in this chapter illustrate both quantity and impact of DoD spending across the state. This information is useful to determine defense dependency across the state, as well as other specific trends such as impact on employment.

- The lowest risk regions, in terms of defense dependency, are Owensboro-Henderson, Northern Kentucky, Paducah-Purchase, Ashland, and Mountain.
- Louisville, Lexington, and Bowling Green-Hopkinsville are three regions that are defense dependent, but which are buffered by overall job growth in their regional economies.
- The regions of Louisville and Lexington are the state's top performers when ranking GRP and defense spending together.
- Louisville has the largest share of all defense contract performance in Kentucky, with 70%.
- The employment change between 2005 and 2016 was most drastic in the Louisville region; it grew by 10%.
- For fiscal year 2015, across Kentucky, an estimated 21,395 people were employed by funds from DoD contracts, while 102,349 people were employed due to the impact of those contracts.

Introduction

The purpose of this chapter is to present regional data profiles for Kentucky's nine economic development regions as defined by the Cabinet for Economic Development.

Each profile includes the following key information specific to the region:

- A comparative visualization of defense spending as a % of GRP
- Regional outlook and population information
- Top industries by job
- A heat map of DoD funding by County
- Total economic impact of DoD funding, including multipliers
- Top contractors
- DoD funding by year, FY2012-FY2015

In addition, the nine regions are compared against each other in a variety of ways. The following sections present these comparisons and individual regional reports.

Data Sources

Data were drawn from several sources for the analysis of Kentucky's regions. These include federal data sources, as well as specialized databases.

Gross Regional Products

Information on the gross regional products was sourced from Emsi, which draws on national data sets. This data set was specifically drawn from 2016 4th Quarter Quarterly Census of Employment and Wages counting Employees, Non-QCEW Employees, and Self-Employed.

Workforce

Emsi employment in the NAICS code for "Federal Government, Military" for 2015 excludes civilians and contractors; therefore, the extrapolated impact numbers provide a better understanding of jobs impacted by defense spending.

Bowling Green Federal employment military numbers reduced from 30,448 to 3,806 to adjust for the fact that most of the employees of Fort Campbell, a military installation in the Bowling Green-Hopkinsville region, live in TN. Approximation was done by using the distribution of residence of employees in the Fort Campbell area from the "OnTheMap" Census tool.

DoD Contract Spending

Data about the amount of DoD contracts was taken from USASpending. This data was classified by place of performance and averaged for fiscal years 2012 – 2015.

Regional Comparisons

Regional Profiles

Table 1 illustrates the nine regions and the counties included in each, as defined by the Kentucky Cabinet for Economic Development. Figure 1 segments Kentucky's regions by how dependent they are on defense (measured by the location quotient[1] for defense employment and the total economic impact in jobs from DoD funding), and whether their economies, in general, are growing or constricting.

Those regions with a growing economy that are not defense dependent are in the strongest position when it comes to fluctuations in defense funding sources. Regions with a growing economy that are defense dependent may have more options to diversify into other growing sectors already in the region. Regions that have experienced declines in employment, but are not currently defense dependent may not face a significant risk from defense cuts or shifts in spending priorities, but any loss of jobs or economic activity can strain a weakened economy. Kentucky does not have any regions that would be considered high risk – that is, regions that are both losing jobs overall and dependent on defense spending.

The lowest risk regions include Owensboro-Henderson, Northern Kentucky, Paducah-Purchase, Ashland, and Mountain. Lexington has a significant amount of defense spending and is approaching defense dependence in terms of employment. The Lexington Region is home to the Blue Grass Army Depot and Blue Grass Station, an Army installation. Northern Kentucky enjoys strong employment growth and it has very little employment that is defense dependent. Paducah-Purchase and Owensboro-Henderson are very similar in their low levels of defense dependence; however, the regional economies are generating very low growth, so any potential shifts in defense spending could reverse their job growth.

1 The defense employment location quotient is calculated as the (Regional defense employment/ State defense employment) / (Regional total employment / State total employment). Where values above one indicate a higher concentration of defense employment.

Table 1: Kentucky's Nine Economic Regions[2]

Economic Regions					
Ashland		**Bowling Green-Hopkinsville**		**Cumberland**	
Boyd	Lawrence	Allen	Metcalfe	Adair	McCreary
Carter	Lewis	Barren	Monroe	Casey	Pulaski
Elliott	Rowan	Butler	Simpson	Clinton	Rockcastle
Greenup		Christian	Taylor	Cumberland	Russell
		Edmonson	Todd	Knox	Wayne
		Green	Trigg	Laurel	Whitley
		Hart	Warren		
		Logan			
Lexington		**Louisville**		**Mountain**	
Anderson	Lincoln	Breckinridge	Marion	Bell	Letcher
Bath	Madison	Bullitt	Meade	Breathitt	Magoffin
Bourbon	Mercer	Carroll	Nelson	Clay	Martin
Boyle	Montgomery	Grayson	Oldham	Estill	Menifree
Clark	Nicholas	Hardin	Shelby	Floyd	Morgan
Fayette	Owen	Henry	Spencer	Harlan	Owsley
Franklin	Robertson	Jefferson	Trimble	Jackson	Perry Pike
Garrard	Scott	Larue	Washington	Johnson	Powell
Harrison	Woodford			Knott	Wolfe
Jessamine				Lee	
				Leslie	
Northern Kentucky		**Owensboro-Henderson**		**Paducah-Purchase**	
Boone	Grant	Crittenden	McLean	Ballard	Hickman
Bracken	Kenton	Daviess	Muhlenberg	Caldwell	Livingston
Campbell	Mason	Hancock	Ohio	Calloway	Lyon
Fleming	Pendleton	Henderson	Union	Carlisle	Marshall
Gallatin		Hopkins	Webster	Fulton	McCracken
				Graves	

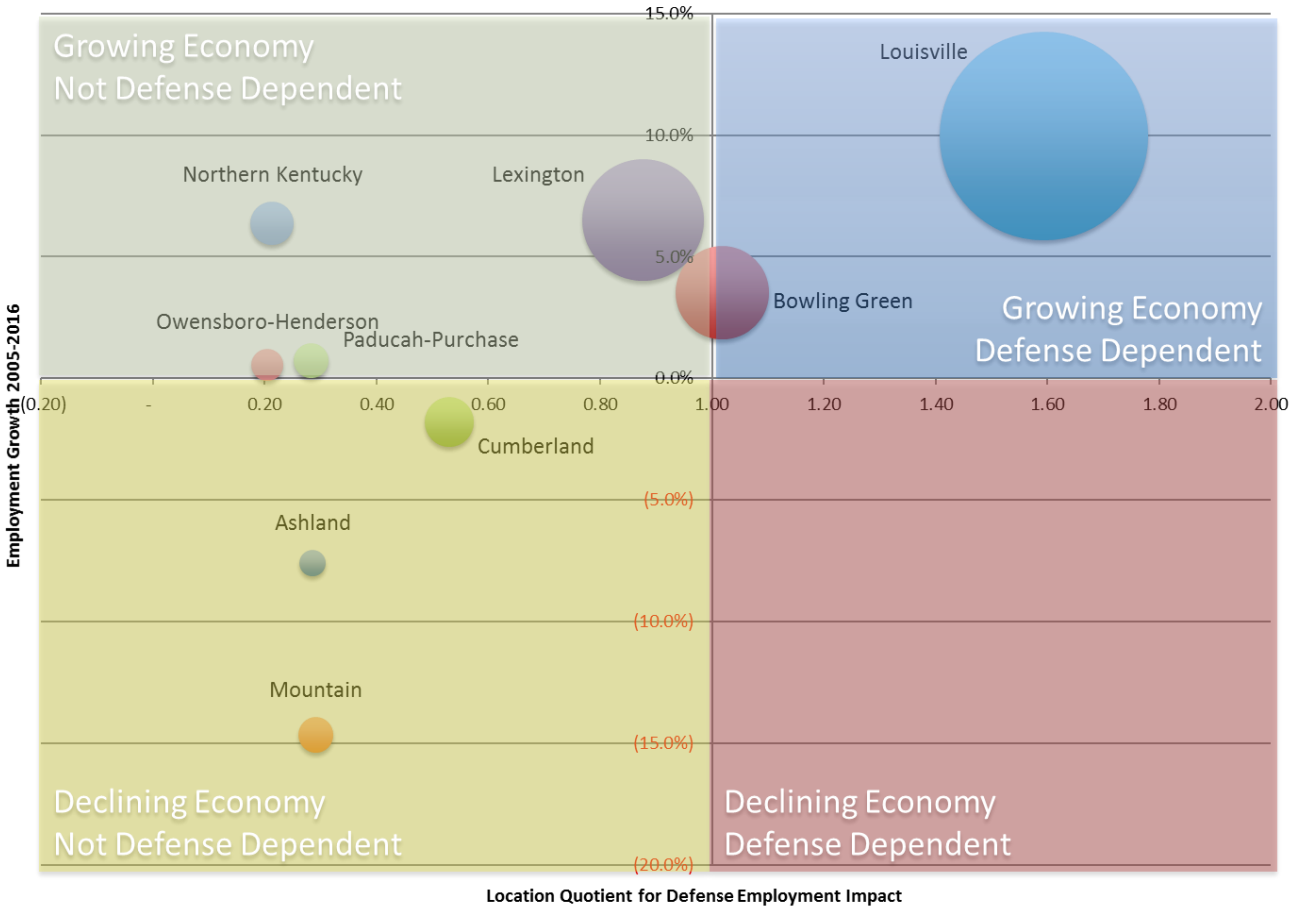
Louisville, Lexington, and Bowling Green-Hopkinsville are the three regions that are defense dependent, but which are buffered by overall job growth in their regional economies. These regions face a moderate level of risk since defense spending can fluctuate with national security priorities and federal budgets. However, the Louisville region is home to Fort Knox, one of the largest military installations in the U.S., which should provide some stability for the defense-related activities in the region. Similarly, Bowling Green-Hopkinsville benefits from the presence of Fort Campbell.

Three regions have declining economies but are not dependent on defense. The Mountain Region, in the eastern part of the state has the most declining economy among all regions in the state. The Ashland Region is the smallest in terms of employment size, but is performing slightly better than the Mountain Region in terms of percentage job growth. The Cumberland Region has seen the least job loss of regions in the lower left quadrant of Figure 1. The Cumberland Region could conceivably progress to cross the line

2 Kornstein, et. al. (2015). The Economic Impact of the Automotive Industry in Kentucky. Retrieved from https://louisville.edu/upa/research-centers-1/AutomotiveIndustryt.pdf

from declining into growing, it is also on the verge of being defense dependent as 2.6% of jobs in the region can be traced back to DoD installations or contracts.

Figure 1: Employment Growth Compared to Location Quotient for Defense Employment[3]



3 Note: Size of the bubble represents the total economic impact of DoD funding in the region. Source data from Emsi 2016.4 and Business Development Zone.

Ranking the Regions

Table 2 compares Kentucky's regions by Gross Regional Product (GRP). It highlights some trends across the data. The regions of Louisville and Lexington are the top performers for GRP and Defense Spending, with Northern Kentucky and Bowling Green-Hopkinsville not far behind. Though the economy of Cumberland is not as strong as other parts of the state, it does rank fourth in Defense Spending, exceeding areas with stronger overall economies such as Northern Kentucky and Owensboro-Henderson.

Table 2: Gross Regional Product Rank[4]

Region	Gross Regional Product	Rank GRP	FY '12-'15 Defense Contract Perf-ormance	Defense Contract Performance Rank
Ashland	$5,421,684,470	9	$60,162,136	8
Bowling Green	$18,512,009,764	4	$2,607,232,296	3
Cumberland	$7,832,672,375	8	$339,376,849	4
Lexington	$35,131,901,797	2	$3,754,857,017	2
Louisville	$69,534,590,161	1	$17,041,109,334	1
Mountain	$9,303,145,659	6	$73,122,415	7
Northern Kentucky	$18,869,082,994	3	$260,615,448	5
Owensboro-Henderson	$11,412,284,500	5	$52,351,550	9
Paducah-Purchase	$8,308,536,118	7	$146,154,847	6

Table 3 shows how the defense spending is clustered in different regions. Louisville has the largest share of all defense spending in Kentucky, with 70%. The large degree of defense spending accounts for more than 6% of Louisville's economy. Lexington is more diversified, as the region receives 15% of the state's DoD spending, accounting for roughly 3% of GRP. Bowling Green-Hopkinsville is also fairly balanced, with 11% of DoD spending, representing 2.5% of GRP.

Table 3: Defense Spending as a Percentage of GRP[5]

Region	Share of Kentucky Defense Spending FY 12-15	Defense Spending Share of GRP FY 15	Defense Spending Share of GRP Rank
Louisville	70%	6.2%	1
Bowling Green	11%	3.3%	2
Lexington	15%	2.5%	3
Paducah-Purchase	1%	0.4%	4
Mountain	<1%	0.4%	5
Northern Kentucky	1%	0.3%	6
Cumberland	1%	0.3%	7
Ashland	<1%	0.2%	8
Ownesboro-Henderson	<1%	0.1%	9

4 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.
5 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

The employment change shown below is what occurred between 2005 and 2016 in sectors funded by defense spending. The change in the Louisville Region was the most drastic; it grew by 10%. This resulted in a location quotient of 1.59, which means that the number of jobs related to defense in this region is more concentrated than throughout the state. A location quotient that is higher than one signifies dependence on a certain industry—in this case, defense. As was shown in Figure 1, the Bowling Green region is also somewhat dependent on this industry. The Ashland and Mountain regions are experiencing significant job losses.

Table 4: Location Quotient and Employment Change[6]

Region	DOD LQ	Employment Change
Louisville	1.59	10%
Bowling Green-Hopkinsville	1.02	3.5%
Lexington	0.88	6.5%
Cumberland	0.53	-1.8%
Ashland	0.29	-7.6%
Mountain	0.29	-14.7%
Paducah-Purchase	0.28	0.7%
Northern Kentucky	0.21	6.4%
Owensboro-Henderson	0.21	0.6%

The jobs created by DoD investment are also significant. The total economic impact is a measure of how many jobs were created total, including DoD contracts and installation presence, and those jobs created by DoD employee and contractor spending. In 2015, in Kentucky as a whole, 21,395 people were employed by funds from DoD contracts, while 102,349 people were employed due to the impact of the contracts.

Table 5: DoD Employment, Contracts, and Impact[7]

Region	DOD Employment	Total Economic Impact	Total Impact Rank
Louisville	9,134	53,570	1
Lexington	2,606	18,132	2
Bowling Green-Hopkinsville	3,806	10,701	3
Cumberland	961	2,978	4
Northern Kentucky	1,492	2,301	5
Mountain	1,213	1,555	6
Paducah-Purchase	725	1,439	7
Owensboro-Henderson	939	1,301	8
Ashland	520	854	9

Regional Strategies

Comparative trends provide a lens for linking specific strategies to each region. Table 6 outlines the sub-state strategies that apply to each of the nine regions. The regions are grouped according to the trends identified in Figure 1: Growing – Not Defense Dependent, Declining – Not Defense Dependent, and Growing – Defense Dependent. The strategies referenced in this matrix come from both The Kentucky Aerospace & Aviation Study, prepared in tandem with this report, and recommendations found in Chapter

6 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.
7 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates.

5 of this report. The references in the table refer to the chapters and the full narrative of the recommendations.

Table 6: Matrix of Sub-State Strategies Applicable to Each Region[8]

Region	Priority		
	Short Term (< 1 year)	Medium Term (1-2 Years)	Long Term (3-5 Years)
Growing – Not Defense Dependent			
Lexington (I)	A8.1, A8.3, A8.4, A8.5	D5.2, D5.7, A7.3, A7.6, A8.7, A8.8, A8.9, A8.12	D5.6, D5.8, D5.9, A7.1, A7.2, A7.4, A7.7, A7.8, A8.10
Northern Kentucky (I)	A8.1, A8.3, A8.4, A8.5	D5.2, A8.7, A8.8, A8.9, A8.12	D5.8, A8.10
Owensboro-Henderson	A8.1, A8.4, A8.5	D5.2, A8.9, A8.12	D5.8,
Paducah-Purchase	A8.1, A8.4, A8.5	D5.2, A8.9, A8.12	D5.8, A7.7
Declining – Not Defense Dependent			
Ashland (I)	A8.1, A8.3, A8.5	D5.2, A8.7, A8.8, A8.12	D5.6, A7.2, A8.13, A8.10
Cumberland	A8.1, A8.5	D5.2, A8.12	A8.13
Mountain	A8.1, A8.5	D5.2, A8.12	A8.13
Growing – Defense Dependent			
Bowling Green (I)	A8.1, A8.3, A8.6	D5.2, D5.3, D5.5, D5.6, A7.6, A8.7, A8.8, A8.9	D5.8, A7.2, A8.10
Louisville (I)	A8.1, A8.3, A8.6	D5.3, D5.2, D5.6, A7.3, A7.6, A8.7, A8.8, A8.9	D5.8, D5.9, A7.1, A7.2, A7.4, A7.5, A7.7, A7.8 A8.10

Strategy Descriptions

Each strategy referenced in Table 6 is listed below. The title and reference number are provided, as well as the document and chapter from which each description has been obtained. A brief description outlining the key premise and element of each is also provided.

Kentucky's Defense Industry Study, Chapter 5

(D5.1) Develop a Kentucky Defense Industry Consortium to Further the Defense Industry in Kentucky

The Kentucky Defense Industry Consortium would be an industry-led consortium recruited from Kentucky's more than 1,000 defense contractors to address the following needs:

- Addressing out-of-state supply chain leakage;
- Building business relationships between defense companies in Kentucky;
- Collaborating with the Aerospace & Aviation Consortium; and
- Assisting with DoD contracting, where appropriate.

8 Note: (I) Contains a university and related Aerospace and Aviation research assets. Note: Strategy A8.1 refers to Chapter 8, Recommendation 1 of the Aerospace & Aviation Industry Study; Strategy D5.2 refers to Chapter 5, Recommendation 2 of the Defense Industry Study.

One possibility for proactive economic development would be building upon regional industry clusters that are strongly defense-related. For example, there may be opportunities to augment the presence of Humana Military Healthcare Services in the Louisville region (see Chapter 2). An additional recruitment strategy could be based on attracting other DoD insurance and banking providers to open or expand branch locations in Kentucky, to utilize the talent available in the region in this field.

Within Kentucky, 16 general aviation airports were identified as capable of handling air cargo or have additional air cargo capacity (see Chapter 5 of the Kentucky Aerospace and Aviation Industry Study). For defense contractors in rural areas, this presents an opportunity to utilize airports closer to their places of business for transporting raw materials for production or finished goods to customers.

(D5.2) Plug Supply-Chain Gaps by Connecting In-State Businesses or Attracting Out-of-State Businesses

Major supply-chain gaps for defense-dependent industries create a leakage of $2.1 billion in revenue out of state each year (see Chapter 3). Two economic development strategies to address supply chain leakage should be employed:

- Foster business to business introductions to fill supply chain gaps; and
- Target companies to fill supply chain gaps in business recruitment efforts.

Opportunities for reducing supply-chain leakage do not stop with reducing out-of-state purchases by DoD contractors. Kentucky's seven DoD contracting offices are also hiring out significant amounts of work to out-of-state firms. The largest contracting offices based on total contract value include those at Fort Knox, Louisville, and Lexington. During FY 2015 these seven offices awarded over $582 million to organizations in Kentucky and $3.8 billion to organizations located outside of the state. This indicates a significant opportunity to involve more Kentucky-based organizations in the bidding process.

(D5.3) Build Partnerships with Defense Dependent Companies and Create Opportunities for Diversification

The current political environment indicates the potential for increasing defense spending for FY 2018 and beyond. However, the specific priorities of defense funding will determine what types of contractors will see increased revenue. If certain defense systems and products are phased out in favor of new ones, existing DoD contractors could still be at risk. The Cabinet for Economic Development (CED) needs to begin a pilot program to help regional partners conduct outreach to Kentucky defense contractors, assess their specific needs and connect them with appropriate service providers to identify new markets and develop business and operating plans to enter those commercial markets.

(D5.4) Create a Committee to Help the State Attract Additional Research, Missions, and Veterans

State marketing efforts should market Kentucky as a military-friendly state by promoting all military installations and assets collectively instead of individually. The Governor should lead biannual assessments of military capacities to attract additional missions. Utilize all military assets, not just large installations, as workforce access points that include Career Centers and related workforce services. Assist in the coordination of public-private partnerships between industry and the military.

(D5.5) Improve Military-Related Tax Issues

From the retention of military veterans as they retire to the overall economic impact of an installation, Kentucky should address tax issues affecting the military and surrounding communities.

Establish a special taxing district for Fort Campbell

While the majority of Fort Campbell's footprint is in Kentucky, the majority of the economic impact occurs across the border, in Tennessee, stemming directly from the favorable tax environment (see Chapter 4, specifically the report related to the Bowling Green region). As indicated in Chapter 2 of the Kentucky Aerospace and Aviation Industry Study, Kentucky ranked 34th in the nation in state business tax climate, according to the Tax Foundation's 2017 report. In contrast, Tennessee ranked 13th. Kentucky compares particularly poorly in property tax, where the state ranks 36th in the nation, while Tennessee ranks 29th.[9] According to key stakeholder interviews and focus groups, soldiers and installation personnel purchase personal items, homes, cars, and other assets in Tennessee due to differences in sales, property and payroll taxes. Other states with installations on state borders have addressed this issue with special taxing districts.

Adjust military pension taxes

According to a key stakeholder interviewed for this study, Kentucky taxes all retired military pensions after the first 25%. Garrison Commanders and others cite this tax policy as a reason Kentucky loses well-trained, experienced personnel whose skills transfer well to private sector jobs.

(D5.6) Explore Creating an Innovation Hub to Act as an Incubator for Creative Technology and Manufactured Goods

Significant and varied research is being conducted at multiple research and development hubs across the state, including the University of Kentucky, University of Louisville, and Morehead State. If connected as part of a greater initiative, Kentucky and the military could capitalize on these developments. Additionally, each of these programs could achieve greater visibility and attract more talent in graduate and Ph.D. students.

Though much aerospace research being conducted has more commercial application than being directly defense related, these programs should seek out opportunities for defense R&D projects, which might also develop into commercialized applications in the future. Specifically, thermal coating work and UAV/drone research at the **University of Kentucky** have received worldwide recognition and have attracted leading researchers to the university. Additionally, work at **Morehead State University** with satellites and constellation theory is gaining attention as cutting-edge and easily has military and commercial ramifications.

(D5.7) Develop Programs Designed to Attract Spouses to the State

In many cases, a military spouse is the deciding factor for veterans in relocating to a state. Additionally, these spouses have careers and skills that are highly sought after in the medical, legal, manufacturing, and

9 The Tax Foundation. (2017). 2017 State Business Tax Climate Index. Retrieved from https://files.taxfoundation.org/20170302120920/TF-SBTCI-2017-Final1.pdf

other fields. Kentucky's local workforce boards should be encouraged to develop specific recruiting programs focused on spouses, ensuring the needs of these decision-makers are recognized.

(D5.8) Develop Military Focused Apprenticeships

With military veterans highly sought after by business and industry stemming from their training and soft skills, Kentucky should target those leaving the service for apprenticeship programs. These apprenticeships should focus on individual skill sets and optimally matching those skills to private sector workforce needs. Additionally, these apprenticeship programs should specialize in transitioning veterans to the private sector.

(D5.9) Explore Becoming a National/Regional Training Hub

With Fort Campbell and Fort Knox both located in Kentucky, representing a significant presence in both land and capabilities, these installations could become a national/regional training center for police, emergency response, and other regional/local emergency personnel. Given today's new focus on larger, mass casualty, terrorism, natural disaster, and other enhanced emergency responses, the existence of these well-known installations could be capitalized on by the state.

The Kentucky Aerospace & Aviation Industry Study, Chapter 7[10]

(A7.1) Utilize Airspace for Public-Private Partnerships

Numerous public and private installations offer access to public airspace, however, Fort Knox and Fort Campbell offer additional benefits to Aerospace & Aviation companies wanting to test new products. These benefits include tightly controlled facilities from a security standpoint, as well as access to unpopulated acreage, making them ideal for testing, research, and development. Additionally, with both installations owning and controlling their own airspace, ideal-testing conditions can be safely monitored and controlled. With the development of an Aerospace & Aviation consortium, companies can ascertain demand for access. Once demand has been determined, the consortium should approach the corresponding leadership of both installations to explore the establishment of a public-private partnership for the utilization of each installation's airspace. While Fort Campbell's airspace currently is more populated, Fort Knox's airspace capacity represents a tremendous opportunity.

(A7.2) Develop Mission Tracking Capabilities

The State of Kentucky has been on the leading edge of the recent trend to commercialize space. Acting in concert with the previous recommendation (A7.1), a consortium of Aerospace providers should be established to ascertain the demand for additional mission control services. Once fully vetted, consortium leadership should approach the appropriate personnel at both installations to explore public-private partnerships for mission tracking and control of space vehicles. While launch services are beginning to fall into the private sector after historically being in the public/governmental realm, Kentucky's geographic location and the fact of not being on the coast makes launch control aspirations obsolete.

From private companies such as Space Tango in Lexington, KY to satellite technologies being developed at Morehead State University, Kentucky researchers, engineers, and scientists have been well represented

10 The Kentucky Aerospace & Aviation Study was prepared in tandem with The Kentucky Defense Industry Study by Thomas. P. Miller & Associates in 2017 and can be found on the Kentucky Cabinet for Economic Development website.

in the growing industry. Ten years ago, only federal governments possessed the ambition, fiscal resources, and available assets to launch, track, and control space vehicles. Today, with the commercialization of space, private companies are entering this realm with launch and retrieval capabilities, as well as mission control. Given Kentucky's Fort Knox and Fort Campbell military installations, as well as its geographic location and weather, the state would be well suited for mission tracking and control services.

The considerations for creating or expanding launch locations are more complex and restrictive than expanding mission control activities. Mission control activities require access to radar facilities, a robust communications infrastructure, and the talent with the expertise to staff such a facility.

Developing locations for space launches involves additional criteria related to the specific technical needs for launching rockets and others involving safety and security. For safety concerns, launch facilities are relegated to coastal communities to ensure any aborted or terminal launches occur over water and non-populated areas.

(A7.3) Include Military Human Resources and Recruiting Personnel in the Aerospace & Aviation Sector Consortium

With the creation of a specific Aerospace & Aviation sector consortium to evaluate numerous issues surrounding the cluster, leadership must ensure human resources and recruiting personnel are included in conversations on workforce issues pertaining to the cluster. With the number one issue of concern for Aerospace & Aviation companies revolving around the availability of qualified talent, these individuals will ensure the military and its deep pool of well-trained and educated talent is represented. Military human resources and recruiting personnel members of the Aerospace & Aviation consortium can help connect consortium members to retiring members of the military. Veterans represent enormous potential for available workforce for Aerospace & Aviation companies in Kentucky. Veterans may possess specific, high-tech skills and experience needed for occupations such as aviation mechanics, air traffic controllers, pilots, and aviation meteorologists.

(A7.4) Create and Promote Apprenticeships and Related Programs, Focusing on Military Installations in the State

Similar to Recommendation A7.3, Kentucky should create and promote apprenticeships and other earn and learn opportunities to companies in the Aerospace & Aviation industry, with efficient access and entry points emanating from military installations within the state. Apprenticeship training has been demonstrated to be an effective answer for business and industry looking for a well-trained and secure workforce. Utilizing military installations across the state as feeder programs into apprenticeships and similar opportunities will enhance these programs, ultimately providing a higher quality workforce for Aerospace & Aviation companies across Kentucky.

(A7.5) Explore the Creation of a Research and Technological Hub at Fort Knox

With additional land available at Fort Knox, Kentucky should explore the creation of a technological hub to act as an incubator for creative technology and manufactured goods and services. Similar to the Polytechnic Campus at Arizona State University, this technological hub could facilitate the commercialization of several regional university research and developments. With one in five Aerospace & Aviation industry companies located in Louisville/Jefferson County, Kentucky, Fort Knox would

represent an ideal location for this research and technological hub. An innovation center would necessarily be connected to the research consortium recommended in Chapter 8 of this study.

(A7.6) Explore a Communications and Contracting Framework to Facilitate Defense Contracting

Given Kentucky's significant military presence within the state, consisting of installations such as Fort Knox, Fort Campbell, the Bluegrass Army Depot, and others, state leadership should facilitate more efficient lines of communication and contracting between the state's Aerospace & Aviation companies and these military assets. The Kentucky Aerospace & Aviation consortium should ensure representatives from these installations are included in the eventual consortium and emphasize training for contracting.

(A7.7) Explore Becoming a Leader in Crash Investigation and Search and Rescue

Given Kentucky's Aerospace & Aviation assets, the state should explore becoming a world leader in crash investigation and search and rescue. With the airspace associated with Fort Knox, Eastern Kentucky University's focus on commercial pilot training, Fort Campbell's renowned special operations pilots, and Murray State University's focus on flight simulators, components are in place for Kentucky to excel in this field. While traditionally a National Transportation Safety Board (NTSB) mission, given the fact that Fort Campbell possesses the greatest population of rotary wing aircraft in the world as well as the associated manpower, Kentucky would be well suited to develop a Center of Excellence for crash investigation, search and rescue. Technologies emanating from this field could potentially be commercialized and capitalized upon.

(A7.8) Explore Becoming a National/Regional Maintenance Hub for Military Fixed and Rotary Wing Aircraft

Capitalizing on Kentucky's Aerospace, Aviation, and Military assets, the state should explore becoming a national and/or regional maintenance hub for military fixed wing and rotary aircraft. With military assets such as Fort Campbell, Fort Knox, and others, Kentucky has a critical mass of aircraft in the state, especially rotary winged helicopters. No other location on the planet has more helicopters than Fort Campbell, Kentucky. In addition, along with the total number of helicopters at the base, Fort Campbell has the highly-skilled maintenance personnel needed to maintain and operate these aircraft. Kentucky should capitalize on these facts and explore the creation and/or recruitment of an aircraft maintenance hub for the military.

The Kentucky Aerospace & Aviation Industry Study, Chapter 8[11]

(A8.1) Create an Aerospace and Aviation Consortium

One way to ensure more collaboration and communication is to start a consortium to bring the key players in Aerospace in Kentucky together on a quarterly or bi-monthly basis to share the progress they have made and future plans. The research on Aerospace that is taking place in the higher education institutions of Kentucky is diverse. At Morehead State, the Space Science program is focused on constellation satellites, while at University of Kentucky there is work being done on drones and thermal re-entry

11 The Kentucky Aerospace & Aviation Study was prepared in tandem with The Kentucky Defense Industry Study by Thomas. P. Miller & Associates in 2017 and can be found on the Kentucky Cabinet for Economic Development website.

protection systems and the Unmanned Systems Research Consortium launched in 2013 and spearheaded by the University of Kentucky. Researchers at the University of Louisville are focusing on microgravity materials and human exposure to radiation in space. Meanwhile, there are other entities emerging such as Space Tango, an accelerator for companies interested in medical endeavors in space. However, according to interviews, leaders in the Aerospace sector do not have a good way of communicating all that is happening on a regular basis.

(A8.2) Establish a "Blue Ribbon Panel" for UAS

Explored further in Chapter 4 of this study, another chief recommendation for Kentucky's Aerospace & Aviation industry is to establish a Blue Ribbon Panel to create a centralized forum for relevant stakeholders of the UAS industry in Kentucky. As presented and discussed in Alaris' 2016 Unmanned Aircraft Systems (UAS) Industry Study, this Panel's charter should enable it to lead comprehensive planning around the industry in Kentucky.

(A8.3) Invest in University R&D

High functioning universities generating a large amount of research and development are essential for the development of a successful cluster. As a first step, funding should concentrate on research units that focus on groundbreaking technology, as well as attracting high-quality professors and graduate level students. While Kentucky can boast being home to several national leading researchers at the University of Kentucky, University of Louisville, Morehead State, and others, attracting more leading scientists and engineers will create a critical mass of R&D activity.

(A8.4) Stimulate Connections with the Private Sector

In order to retain the high-performing graduates in Aerospace programs such as those proposed in the previous recommendation, it is imperative to grow and encourage occupations and careers that are exciting and well paying. A first step in creating connections between the private sector and higher education could be something as simple as a panel event, hosting members of both higher education institutions and industry, or it could include sponsoring student teams focused on Aerospace in an Innovation Boot Camp (see Creating a Culture of Innovation).

(A8.5) Conduct Efficiency Audits and Training

The Advantage Kentucky Alliance Manufacturing Extension Partnership (AKA MEP) and the Kentucky Association of Manufacturers are key stakeholders in moving Kentucky towards advanced manufacturing. AKA MEP's focus areas include business growth services, supplier development services, and continuous improvement services. An audit of Aerospace manufacturers in Kentucky to understand their overall stresses and, as individual companies, where their specific challenges lie, could help AKA MEP recommend new sector-wide programs and trainings as well as offer manufacturers training in one of their focus areas.

(A8.6) Explore Preferred Vendor Certifications

Kentucky should work with the defense and Aerospace suppliers to address sector-wide, sector-specific challenges that Aerospace manufacturers are facing with regard to procurement. Specific initiatives could then be crafted to get Kentucky suppliers certified or up to speed.

(A8.7) Create an Innovation Center

The next logical step for a consortium would be to establish a support system to move R&D into commercialization. This facilitates startups spinning out of university R&D and creating the jobs that will keep talented graduates in Kentucky. An innovation center solely focused on Aerospace innovations would necessarily be connected to the research consortium recommended above.

(A8.8) Build a Culture of Commercialization

Another aspect of transitioning research to the market is to shift researchers' paradigms to include commercialization. These programs engage students who are interested in commercializing research. Their work can feed into the local and state business plan competitions. Programming such as this could be greatly expanded.

(A8.9) Extend the Manufacturing Region Designation

The Southwestern Ohio Aerospace Region, which encompasses part of Northern Kentucky, was awarded IMCP designation in 2014. That designation will expire in late 2018. Either expanding the geographic footprint of designation in the future or pursuing an independent designation to include other manufacturing hubs could continue to help grow capital investment in Aerospace manufacturing in Kentucky.

(A8.10) Create an Embedded Lab

A long-term goal that would solidify the Aerospace industry in Kentucky would be to have an embedded lab funded primarily by private interests and staffed by graduate students in Aerospace programs. An embedded lab is a satellite research location of a company or companies located on or near a university campus with the primary objective of facilitating a collaborative industry-university relationship.

(A8.11) Establish Sector Partnerships

The public workforce system has long focused on jobseekers as the primary customer of the system, with poor to mixed results, due primarily to a lack of understanding of the needs of businesses and industry. The new federal Workforce Innovation and Opportunity Act calls attention to business and industry as primary customers of the system, as well as promoting the formation of sector partnerships.

(A8.12) Expand Apprenticeships

Chapters 2 and 3 of this report study made the case for investing in apprenticeships related to Aerospace & Aviation. Many apprenticeships (including existing apprenticeship programs in Kentucky in carpentry and electrical construction) provide on-the-job experience along with associate degrees in applied sciences or related fields from community colleges.

(A8.13) Partner with Community Colleges

Over the longer term, if apprenticeships are created to support key A&A occupations, the curricula offered by community colleges should also be examined to see if there are opportunities to create programs in Aerospace & Aviation. These curricula and programs could both accompany apprenticeships and be an attractor to students interested in Aerospace & Aviation. Meetings should be convened with stakeholders from community colleges in Kentucky to better understand workforce training gaps in A&A on a community college level.

Key Regional Assets

Almost all of Kentucky's nine regions boast at least one key asset that could play a critical role in the linkage and implementation of the identified sub-state strategies. These assets span focus between aerospace, aviation, and defense, and have been identified in the following pages.

Lexington

Key Assets

University of Kentucky

The Engineering School at the University of Kentucky offers an undergraduate Aerospace Certificate option that provides multidisciplinary experience in aerospace systems and specializations and has a partnership with Embry-Riddle University for graduate education in aerospace. The University of Kentucky is conducting research on a number of aerospace related topics:

- Autonomous Multi-Vehicle Control and Human-Assistive Control
- Interpreting Dynamic Information in Videos
- Smart Materials and Structures with Environmental Response
- International Space Station and Small Satellite Experiments
- Multi-Physics Modeling and Experiments for Atmospheric Entry Spacecraft
- Unmanned Aircraft Systems for Atmospheric Physics and Precision Agriculture

Bluegrass Army Depot

The Blue Grass Army Depot is a storage facility for conventional munitions and chemical weapons for the U.S. Army. They store and safeguard munitions, chemical defense equipment, and the National Chemical Weapons Stockpile. It is located southeast of Richmond and Louisville. The Depot covers 14,494 acres of open fields, wooded areas as well as facilities for storage, repair, and disposal of munitions. Both conventional explosive munitions and assembled chemical weapons are maintained at the depot.

Northern Kentucky

Key Assets

Northern Kentucky University

Northern Kentucky University (NKU) is a public, co-educational university in northern Kentucky located in Highland Heights, seven miles southeast of downtown Cincinnati, Ohio. NKU became a university in in 1976 growing from 8,000 students in 1980 to 10,000 in 1990 and nearly 15,000 students today.

Cincinnati/Northern Kentucky International Airport

Amazon is making a $1.49 investment in a new hub at Cincinnati/Northern Kentucky International Airport (CVG), the largest-ever investment at CVG, which may bring up to 3,000 new jobs to the region. Amazon has signed a 50-year lease at CVG and has promised to bring 2,700 new jobs to the region, 600 of which will be full-time. In return, Amazon will receive $45 million in combined state and local tax incentives.[12] This news increases the standing of CVG as a major player in cargo aviation — before the Amazon news,

12 Williams et. al. (2017). Amazon plans worldwide cargo hub, 2,700 jobs at CVG. Retrieved from http://www.cincinnati.com/story/money/2017/01/31/amazon-plans-2700-jobs-15b-investment-cvg/97283034/

CVG was ranked eighth in the nation for cargo traffic. Analysts say that more cargo traffic can make CVG more attractive to commercial aviation. According to one analyst, "CVG's landing fees are based on landed weight. So the more costs a cargo carrier can cover, the more appealing the airport can be to passenger carriers."

Owensboro-Henderson

Key Assets

Clarke Power Services

Clarke Power Services has provided commercial vehicle maintenance with an outstanding track record of delivering value to the transportation and service industries since 1964. Customers are served with a comprehensive portfolio of service offerings, or Clarke can provide solutions designed to meet the unique needs of a business.

Paducah-Purchase

Key Assets

Murray State University

Murray State University (MSU) is a four-year public university located in Murray, Kentucky. It also has campuses in Paducah, Hopkinsville, Madisonville, and Henderson that offer upper level and graduate courses.

Ashland

Key Assets

Post-Secondary Education

The Ashland region includes Ashland Community and Technical College, which has multiple campuses throughout the region, and Morehead State University, which has a satellite campus located in Ashland.

Airports

The Ashland region includes the Ashland Regional Airport, which is used for local charter and private aircraft, and the Tri-State Airport, which also provides commercial aviation with flights on Allegiant and American Eagle airlines.

Cumberland

Key Assets

Without a military installation or university, and with a relatively small population, the strategies for supporting and building the Aerospace & Aviation sector within the Cumberland region hinge on its manufacturers.

Mountain

Key Assets

The Mountain Region does not have a university or defense installation; its largest city is Pike, with a population of 61,792. The region's key assets are its businesses.

Bowling Green-Hopkinsville

Key Assets

Western Kentucky University

Western Kentucky University (WKU) is a public university in Bowling Green Ohio, with an enrollment of 20,171. WKU was founded by the Commonwealth of Kentucky in 1906. It has a graduate school that grants both Masters and PhDs. There is an undergraduate college, the Ogden College of Science and Engineering, which offers a Bachelor of Engineering, and a Bachelor of Sciences.

Fort Campbell

Located between Hopkinsville, Kentucky, and Clarksville, Tennessee, Fort Campbell is home to the only Air Assault Division in the world.

Louisville

Key Assets

Fort Knox

Fort Knox is a United States Army base located south of Louisville, KY. The base covers 170 square miles in Bullitt, Hardin, and Meade counties. The Army Human Resources Command, United States Army Cadet Command, and the United States Army Accessions Command are located on the base. It is most popularly known as the site of the United States Bullion Depository.

University of Louisville

The University of Louisville is a public university in Louisville, Kentucky, and was founded in 1798. Total enrollment is 22,640. The University has 12 schools and colleges, including the renowned University of Louisville School of Medicine and the J.B. Speed School of Engineering that offers programs in:

- Chemical Engineering (CE)
- Computer Engineering and Computer Science (CECS)
- Industrial Engineering (IE)
- Mechanical Engineering (ME)
- Biomedical Engineering (BE)
- Civil and Environmental Engineering (CEE)
- Electrical and Computer Engineering (ECE)

Regional Reports

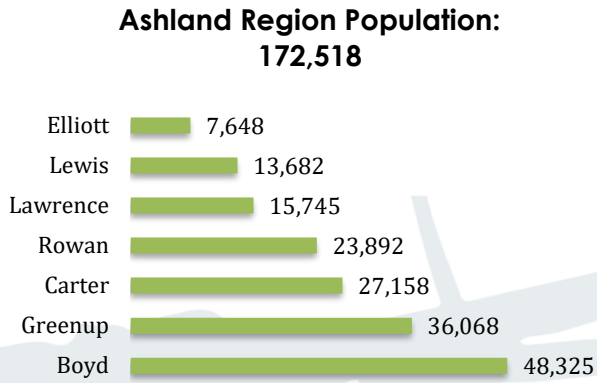
Regional data profiles for Kentucky's nine economic development regions are provided in the following pages. Each profile includes the following key information specific to the region:

- A comparative visualization of defense spending as a % of GRP
- Regional outlook and population information
- Top industries by job
- A heat map of DoD funding by County
- Total economic impact of DoD funding, including multipliers
- Top contractors
- DoD funding by year, FY2012-FY201

ASHLAND REGIONAL REPORT

Defense Spending & Gross Regional Product

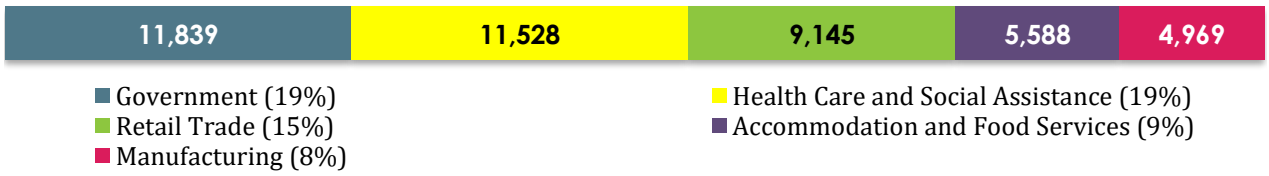
Population by County



- **Regional Outlook:** The Ashland Region has the lowest Gross Regional Product of the regions in Kentucky, as well as the second lowest amount of defense spending as a percentage of Gross Regional Product. The GRP of the region is $5,421,684,470 and the amount of DoD contracts performed in the region in FY 2015 is $12,421,092, which is 0.2% percent of GRP.
- **Population**: The population of the Ashland Region is 172,518, which is 3.9% of the population of the state.

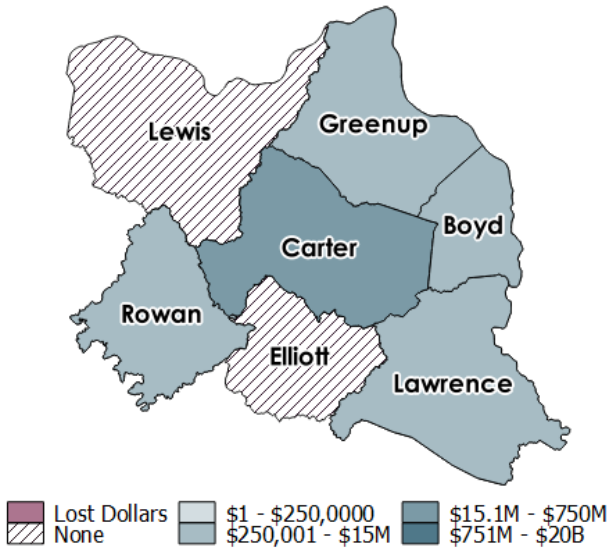
Top 5 Industries by Job in Region

The numbers shown in the bar chart below represent the top five industries' share of all jobs held in the Ashland Region. The region is experiencing negative job growth, with a negative 7.6% change from 66,132 jobs in 2005 to 61,099 jobs in 2016.



ASHLAND REGIONAL REPORT

DoD Funding Performed in Region



Economic Impact of DoD Funding

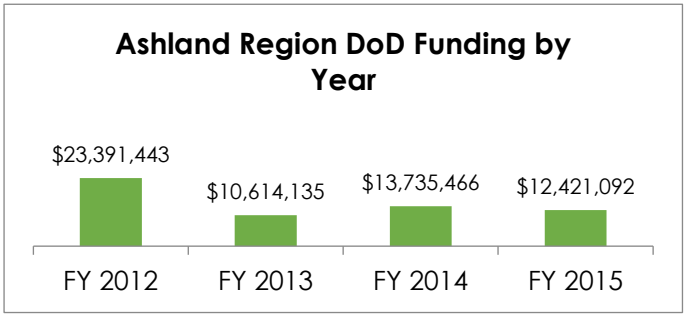
Total Economic Impact		
Total Economic Output (Sales)	Total Jobs	Total Earnings
$96,934,694	854	$21,890,236
---------- Multipliers ----------		
Sales Multiplier	Jobs Multiplier	Earnings Multiplier
1.19	1.35	1.70

Ashland DOD Employment: 520

When considering the overall impact of DoD funding, the multiplier effect causes the importance of DoD funding to increase. With a sales multiplier of 1.19, the total economic output is 1.7% of GRP. Similarly, the earnings multiplier of 1.7 means that the total economic impact of DoD funded earnings nearly doubled.

Top Contractors in the Ashland Region

Company	City	FY 2015 Total	FY12-15 Total
Carter Industries, Inc.	Olive Hill	$7,529,896	$33,756,009
Ashland Sales and Service Company, Inc.	Olive Hill	$3,128,578	$19,821,633
Robinson Contracting, Inc.	Greenup	$37,788	$2,115,568
Massillon Construction and Supply, LLC	Greenup	$1,019,951	$1,019,951
Lyndco, Inc.	Greenup	$0	$480,031
LKJ Crabbe, Inc.	Grayson	$0	$470,793
Prus Contracting, LLC	Greenup	$27,024	$446,436
Stantec Tetra Tech Jv	Greenup	$292,412	$292,412
Louderback Family Investments, Inc.	Morehead	($1,835)	$174,182
Solar Energy Solutions LLC	Louisa	$12,397	$157,787

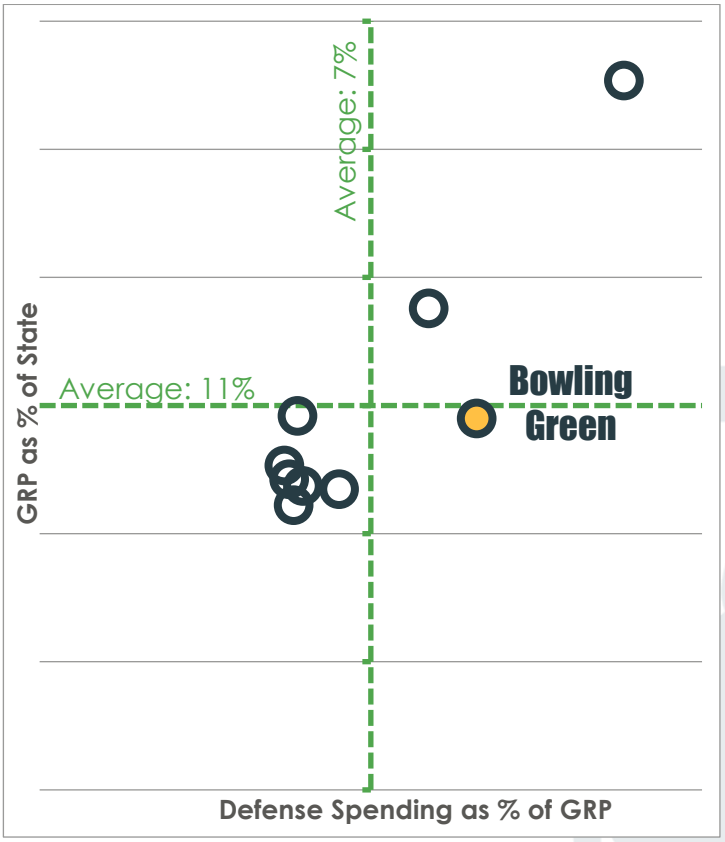


The top contractor in the Ashland region is Carter Industries with $33.8 million in total funding from fiscal year 2012 to 2015. Only two contractors received more than $5 million in total funding, while the fifth largest contractor received less than $500,000 total.

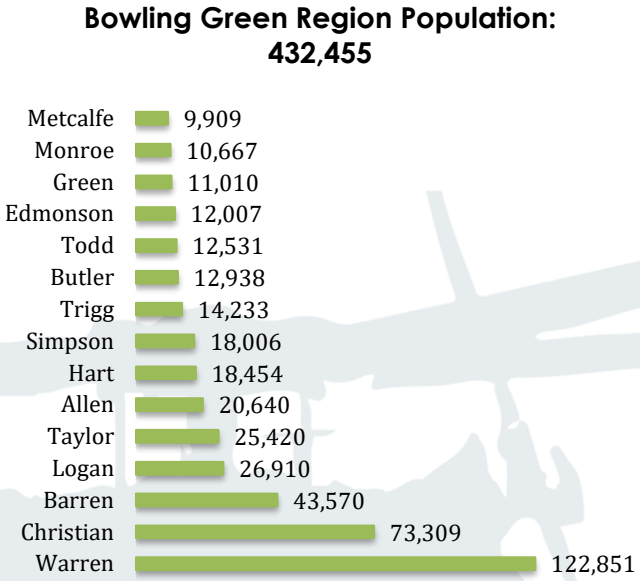
DoD Funding in the Ashland region has ranged from a high of more than $23 million in 2012 to a low of $10.6 million in 2013. It is not clear if there is a trend in the region, or if the annual levels reflect the ebb and flow of multi-year contracts.

BOWLING GREEN REGIONAL REPORT

Defense Spending & Gross Regional Product



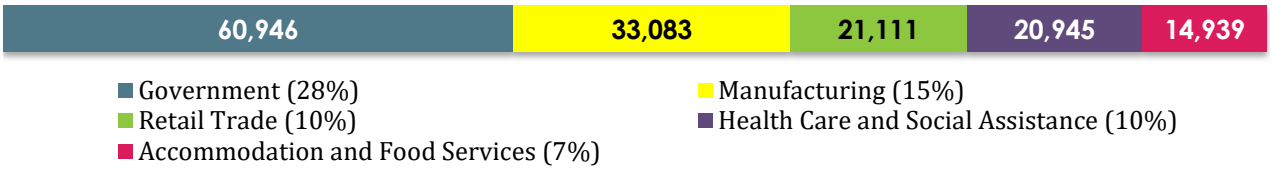
Population by County



- **Regional Outlook:** The Bowling Green Region has the fourth highest Gross Regional Product of the regions in Kentucky and ranks second in the amount of defense spending as a percentage of Gross Regional Product. The GRP of the region is $18,512,009,764 and the amount of defense contracts performed in the region in FY 2015 is $611,007,253, which is 3.3% percent of GRP.
- **Population**: The population of the Bowling Green Region is 432,455, which is 10% of the population of the state.

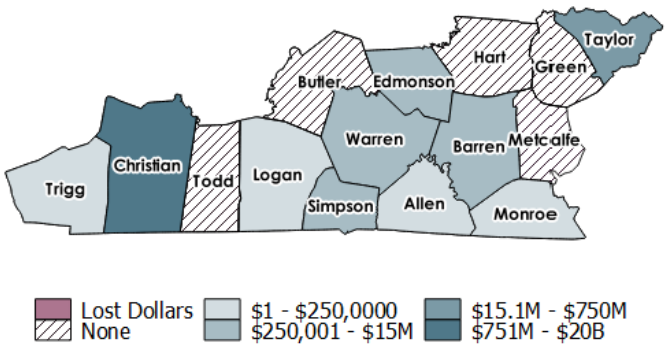
Top 5 Industries by Job in Region

The numbers shown in the bar chart below represent the top five industries' share of all jobs held in the Bowling Green Region. The region is experiencing positive job growth, with a 3.5% change from 207,844 jobs in 2005 to 215,192 jobs in 2016.



BOWLING GREEN REGIONAL REPORT

DoD Funding Performed in the Region



Lost Dollars
None
$1 - $250,0000
$250,001 - $15M
$15.1M - $750M
$751M - $20B

Economic Impact of DoD Funding

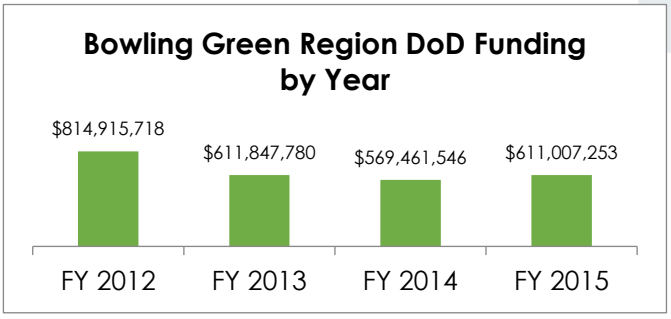
Total Economic Impact[13]		
Total Economic Output (Sales)	Total Jobs	Total Earnings
$2,274,433,455	10,701	$536,158,450
---------- Multipliers ----------		
Sales Multiplier	Jobs Multiplier	Earnings Multiplier
1.14	1.36	1.24

Bowling Green DOD Employment: 3,806

When considering the overall impact of DoD funding, the multiplier effect causes the importance of DoD funding to increase. Therefore, the impact of sales (1.14), jobs (1.36), and earnings (1.24) were all magnified through DoD funding

Top Contractors in the Bowling Green Region

Company	City	FY 2015 Total	FY12-15 Total
Boeing Sikorsky Aircraft Support	Fort Campbell	$111,514,269	$390,621,417
Dyncorp International LLC	Fort Campbell	$1,629,442	$158,529,293
Lockheed Martin Corporation	Fort Campbell	$39,798,486	$120,699,751
International Development & Resources, Inc.	Fort Campbell	$20,293,469	$73,528,919
Whitehead Electric Company, Inc.	Fort Campbell	$17,287,829	$66,408,813
Archer Western Federal Jv	Fort Campbell	$167,570	$57,978,360
GCCS, Inc.	Fort Campbell	$14,282,258	$55,989,953
Dyncorp International LLC	Fort Campbell	$21,623,768	$55,466,784
Sundt Construction, Inc.	Fort Campbell	$61,798	$47,285,806
M. A. Mortenson Company	Fort Campbell	$0	$45,702,907



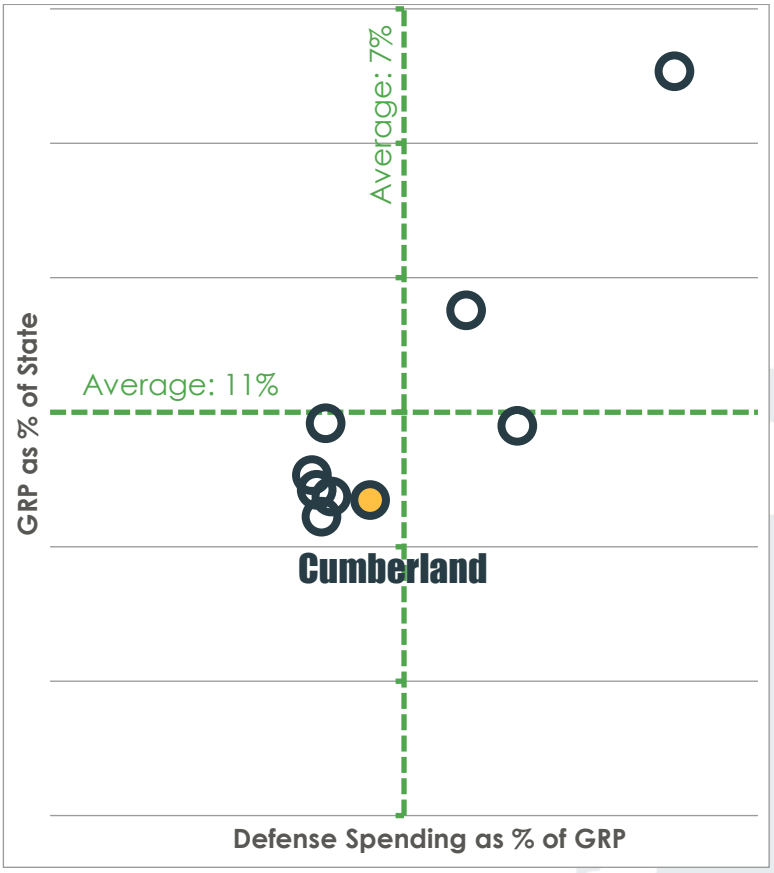
All of the top contractors in the Bowling Greeen region performed their work at Fort Campbell. The top contractor is Boeing Sikorsky Aircraft Support with $390.6 million in total funding from fiscal year 2012 to 2015. Several divisions of Dyncorp appear on the list including second and eighth, with $158.6 million and $55.5 million, respectivley.

DoD Funding in the Bowling Green region has ranged from a high of $814.9 million in 2012 to a low of $569.5 in 2014. There appears to be a downward trend in defense spending, notwithstanding an uptick in FY2015.

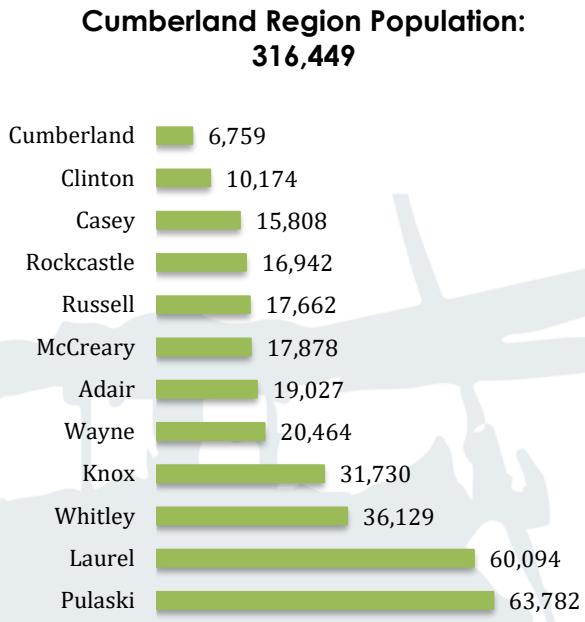
13 To calculate these figures, TPMA estimated the number of Fort Campbell military workers who actually reside in Kentucky, based on multiple sources.

CUMBERLAND REGIONAL REPORT

Defense Spending & Gross Regional Product



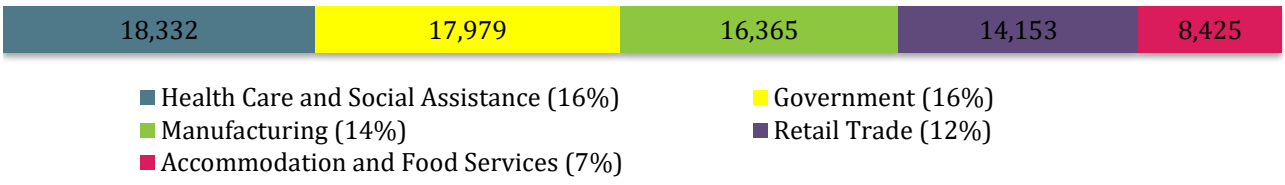
Population by County



- **Regional Outlook:** The Cumberland Region has the second lowest Gross Regional Product of the regions in Kentucky and ranks seventh in the amount of defense spending as a percentage of Gross Regional Product. The GRP of the region is $7,832,672,375 and the amount of defense contracts performed in the region in FY 2015 is $23,677,233, which is less than one percent of GRP.
- **Population**: The population of the Cumberland Region is 316,449, which is 7.2% of the population of the state.

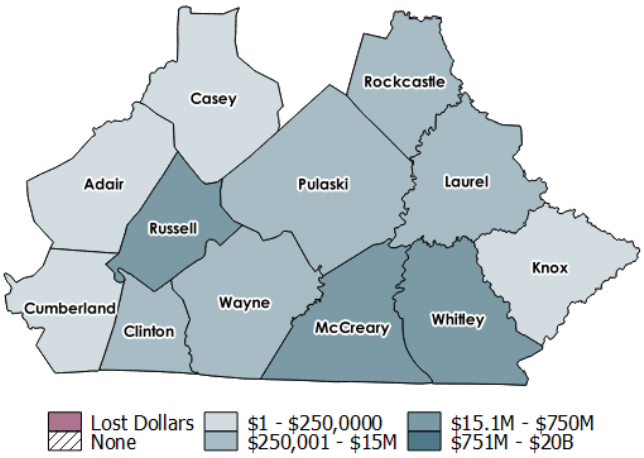
Top 5 Industries by Job in Region

The numbers shown in the bar chart below represent the top five industries' share of all jobs held in the Cumberland Region. The region is experiencing negative job growth, with a negative 1.8% change from 117,205 jobs in 2005 to 115,104 jobs in 2016.



CUMBERLAND REGIONAL REPORT

DoD Funding Performed in the Region



Economic Impact of DoD Funding

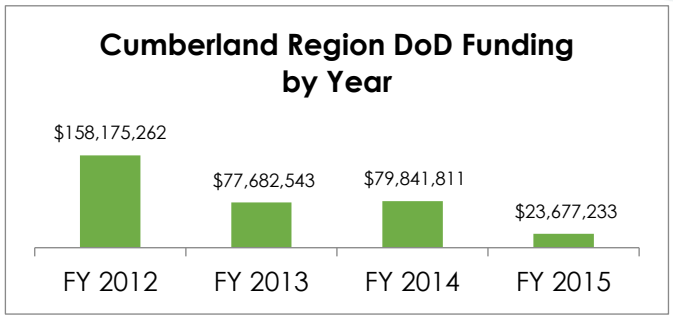
Total Economic Impact		
Total Economic Output (Sales)	Total Jobs	Total Earnings
$249,995,127	2,978	$66,203,327
---------- Multipliers ----------		
Sales Multiplier	Jobs Multiplier	Earnings Multiplier
1.21	1.20	1.32

Cumberland DOD Employment: 961

When considering the overall impact of DoD funding, the multiplier effect causes the importance of DoD funding to increase. Therefore, the impact of sales (1.21), jobs (1.2), and earnings (1.32) were all magnified through DoD funding.

Top Contractors in the Cumberland Region

Company	City	FY 2015 Total	FY12-15 Total
Treviicos Soletanche Jv	Jamestown	$0	$165,840,141
Southeastern Kentucky Rehabilitation Industries, Inc.	Corbin	$11,992,730	$102,683,683
Outdoor Venture Corporation	Stearns	$2,697,890	$38,752,306
Wright & Wright Machinery Co., Inc.	Monticello	$1,708,740	$8,613,699
Judy Company, Inc., The	Jamestown	$0	$3,474,779
Tarter Contracting, Inc.	Somerset	$267,615	$2,862,052
Bluegrass Contracting Corporation	Jamestown	$2,757,036	$2,757,036
Patriot Industries, Inc.	Monticello	$979,018	$2,319,518
Aspen Construction Company	Jamestown	$545,095	$2,197,900
Lacrosse Enclosures, Inc.	Albany	$568,041	$1,933,311

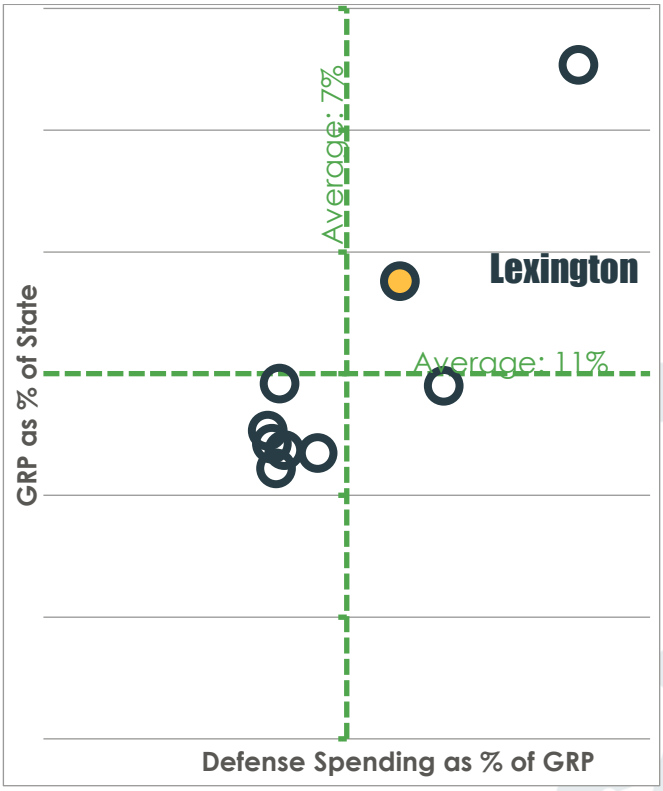


The top contractors in the Cumberland Region are Treviicos Soletanche JV and Southeastern Kentucky Rehabilitation Industries, Inc. with $165.8 and $102.7 million in spending, respectively. Only one other contractor, Outdoor Venture Corporation, received more than $20 million, and the rest of the contractors received $8.6 million to $1.9 million.

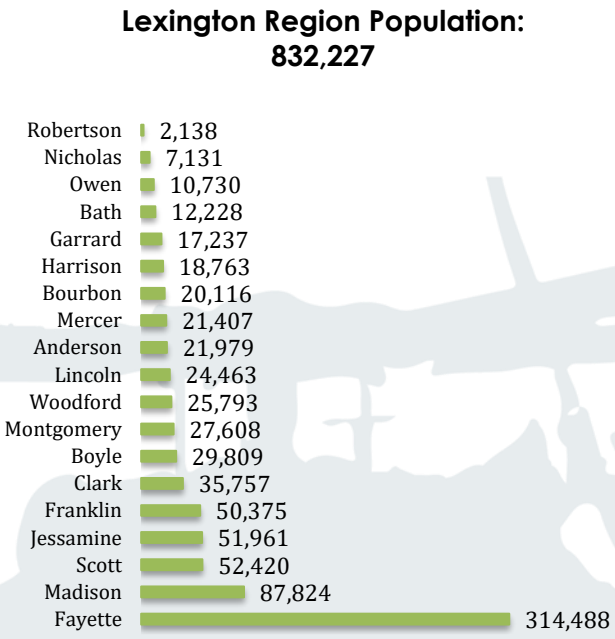
DoD Funding in the Cumberland Region has ranged from $158.2 million in 2012 to a low of $23.7 million in 2015. Over the given fiscal years there has been a clear downward trending in DoD spending in the region.

LEXINGTON REGIONAL REPORT

Defense Spending & Gross Regional Product



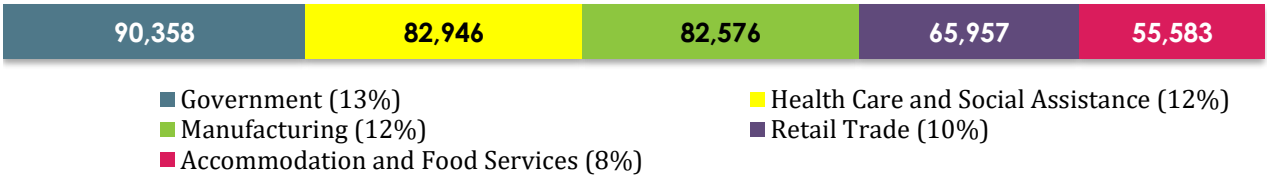
Population by County



- **Regional Outlook:** The Lexington Region has the second highest Gross Regional Product of the regions in Kentucky, and the third highest amount of defense spending as a percentage of Gross Regional Product. The GRP of the region is $35,131,901,797, which is 19% of the state's total GRP, making it the second best performing region in the state. The amount of defense contracts performed in the region is $885,917,104, which is 14.8% percent of all defense spending in Kentucky in FY 2015.
- **Population**: The population of the Lexington Region is 832,227, which is 19% of the population of the state.

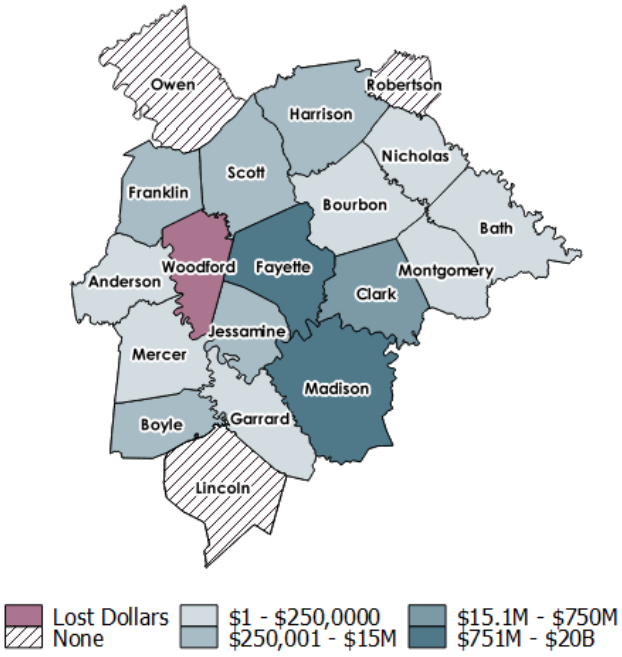
Top 5 Industries by Job in Region

The numbers shown in the bar chart below represent the top five industries' share of all jobs held in the Lexington Region. The region is experiencing positive job growth, with a 6.5% change from 397,725 jobs in 2005 to 423,589 jobs in 2016.



LEXINGTON REGIONAL REPORT

DoD Funding Performed in the Region



Economic Impact of DoD Funding

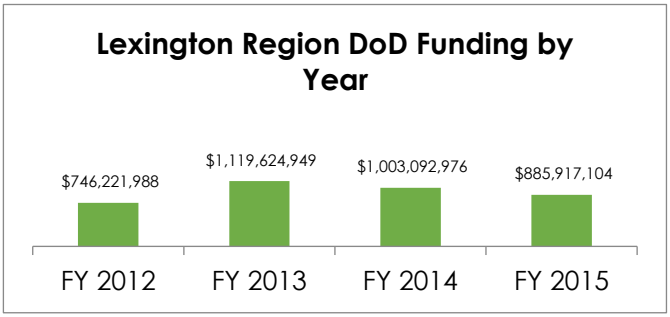
Total Economic Impact		
Total Economic Output (Sales)	Total Jobs	Total Earnings
$2,028,657,251	18,132	$699,243,213
---------- Multipliers ----------		
Sales Multiplier	Jobs Multiplier	Earnings Multiplier
1.54	1.60	1.64

Lexington DOD Employment: 2,606

When considering the overall impact of DoD funding, the multiplier effect causes the importance of DoD funding to increase. With a sales multiplier of 1.54, the total economic output is 5.7% of GRP. Similarly, the earnings multiplier of 1.64 means that the total economic impact of DoD funded earnings nearly doubled.

Top Contractors in the Lexington Region

Company	City	FY 2015 Total	FY12-15 Total
Lockheed Martin Corporation	Lexington	$508,384,787	$1,800,118,150
Bechtel Parsons Blue Grass, a Joint Venture	Richmond	$218,138,789	$1,294,732,426
Kentucky Logistics Center	Lexington	$17,054,521	$65,349,984
Spiral Solutions and Technologies	Lexington	$29,531,761	$59,274,425
Bering Straits Logistics Services LLC	Winchester	$15,718,906	$50,399,271
Spiral Solutions & Technologies, Inc.	Lexington	$0	$39,486,791
Federal Prison Industries, Inc.	Lexington	$4,459,697	$38,376,360
Raytheon Digital Force Technologies, LLC	Lexington	$8,610,605	$35,633,856
The Mason & Hanger Group, Inc.	Lexington	$4,688,970	$21,493,501
Link-Belt Construction Equipment Company, L.P., LLLP	Lexington	$9,781,674	$20,258,315

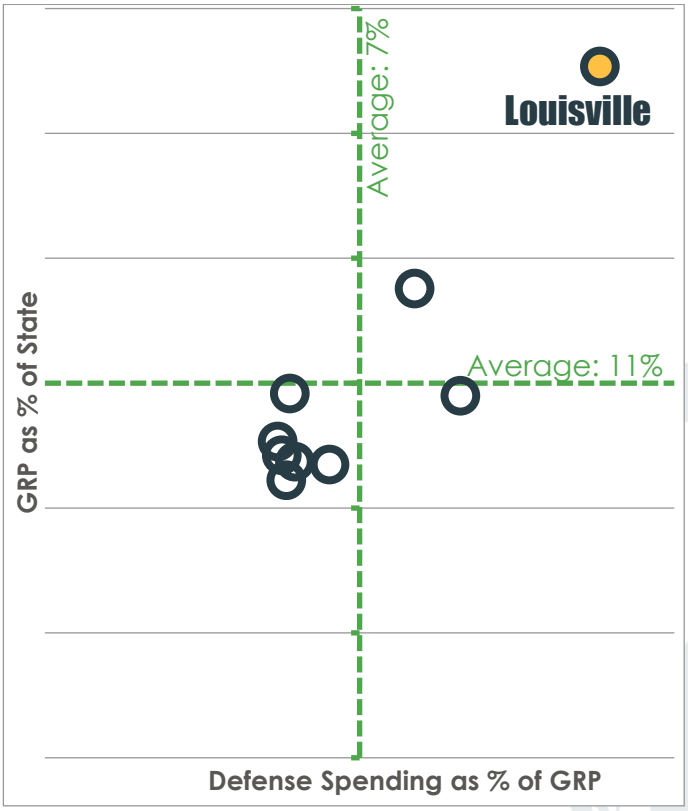


The top contractor in the Lexington region is Lockheed Martin Corporation with $1.8 billion in total funding from fiscal year 2012 to 2015. All of the top ten contractors in the region were funded at over $20 million. Notably, the sixth ranking company, Spiral Solutions & Technologies, Inc. performed no DoD work in the region in FY2015.

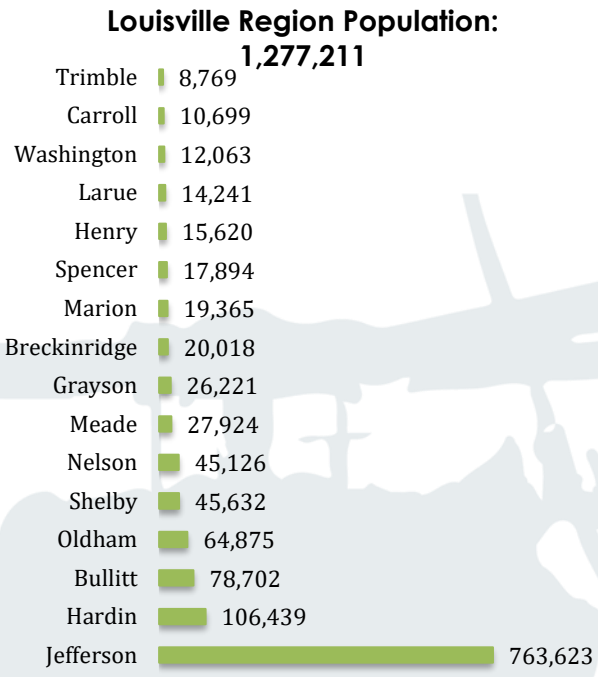
DoD Funding in the Lexington region has ranged from $746 million in FY 2012 to $1.12 billion in FY 2013. It is not clear if there is a clear trend in the region, or if the trend reflects the ebb and flow of multi-year contracts.

LOUISVILLE REGIONAL REPORT

Defense Spending & Gross Regional Product



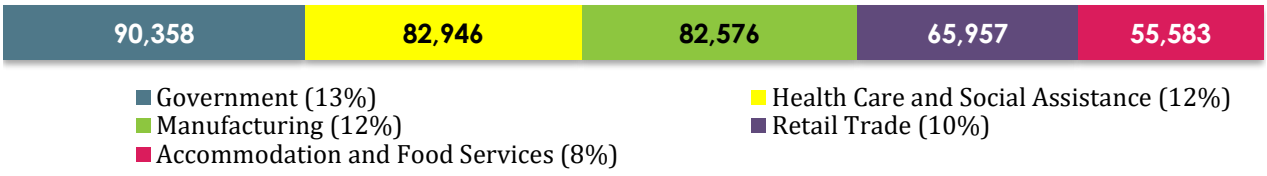
Population by County



- **Regional Outlook:** The Louisville Region has the second highest Gross Regional Product of the regions in Kentucky, but by far the highest amount of defense spending as a percentage of Gross Regional Product. The GRP of the region is $69,534,590, which is 37.7% of the state's total GRP, making it the best performing region in the state. The amount of DoD contracts performed in the region is $4,296,257,019, which is 72% percent of all defense spending in Kentucky in FY 2015.
- **Population**: The population of the Louisville Region is 1,277,211, which is 29% of the population of the state.

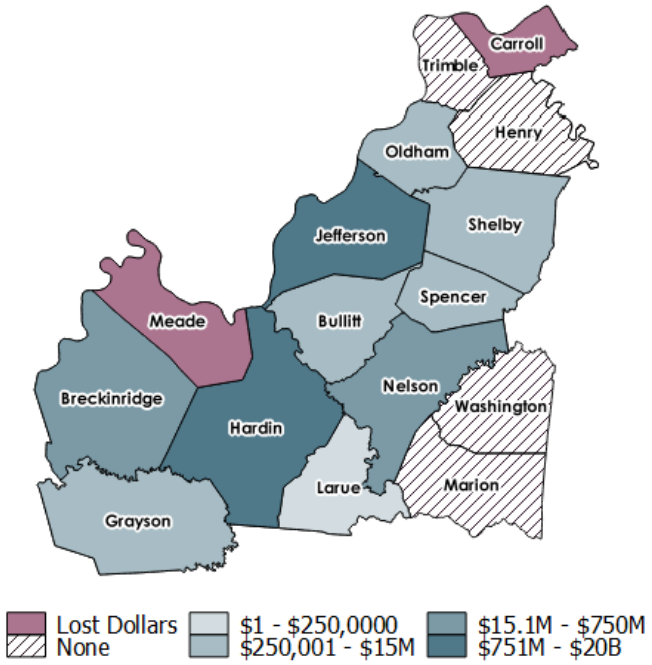
Top 5 Industries by Job in Region

The numbers shown in the bar chart below represent the top five industries' share of all jobs held in the Louisville Region. The region is experiencing positive job growth, with a 10% change from 625,943 jobs in 2005 to 688,319 jobs in 2016, an increase of more than 62,000 jobs.



LOUISVILLE REGIONAL REPORT

DoD Funding Performed in the Region



Economic Impact of DoD Funding

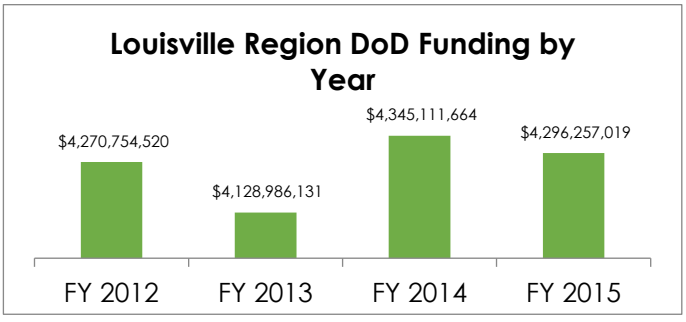
Total Economic Impact		
Total Economic Output (Sales)	Total Jobs	Total Earnings
$11,440,291,401	53,570	$3,159,932,733
---------- Multipliers ----------		
Sales Multiplier	Jobs Multiplier	Earnings Multiplier
1.55	2.36	1.93

Louisville DOD Employment: 9,134

When considering the overall impact of DoD funding, the multiplier effect causes the importance of DoD funding to increase. With a job multiplier of 2.36, the total economic output is 21% of GRP, making the DoD a major factor in the regional economy. Similarly, the earnings multiplier of 1.93 means that the total economic impact of DoD funded earnings nearly doubled.

Top Contractors in the Louisville Region

Company	City	FY 2015 Total	FY12-15 Total
Humana Military Healthcare Services, Inc.	Louisville	$3,542,159,270	$13,973,123,206
Raytheon Company	Fairdale	$167,153,027	$436,966,783
BAE Systems Land & Armaments, Inc.	Louisville	$28,449,743	$180,910,230
Sourceamerica	Fort Knox	$54,809,466	$165,509,165
Serco, Inc.	Fort Knox	($33,381)	$153,340,838
Strategic Communications, LLC	Louisville	$7,214,498	$148,799,130
L-3 Services, Inc.	Fort Knox	$0	$133,687,153
Raytheon Technical Services Company LLC	Fairdale	$8,823,569	$118,563,196
BAE Systems Land & Armaments, Inc.	Louisville	$31,048,423	$71,608,513
Lusk Mechanical Contractors, Inc.	Fort Knox	$991,237	$69,622,256

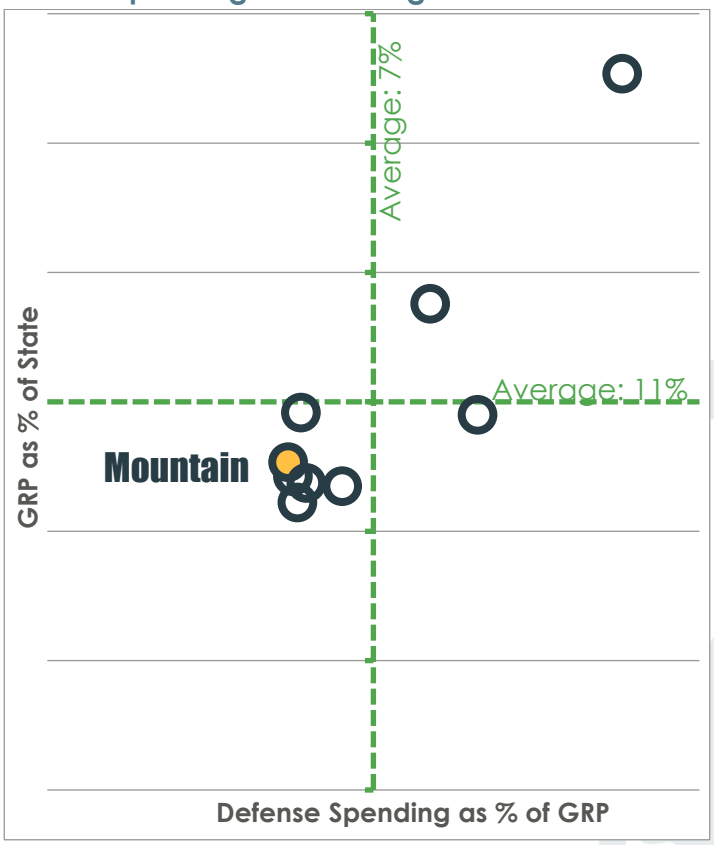


The top contractor in the Louisville region is Humana Military Healthcare Services with more than $14 billion in total DoD funding. All of the top eight contractors received more than $100 million in total funding. Even the tenth largest contractor received more than $69.6 million. Notably, the seventh ranked contractor, L-3 Services, Inc. performed no DoD related work in the region in FY 2015.

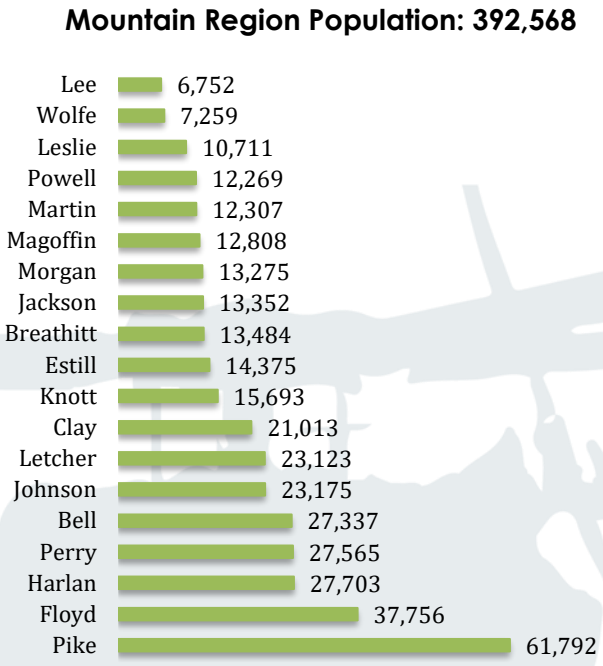
Annual DoD funding peaked at $4.35 billion in FY 2014 and dropped slightly to $4.30 in FY 2015.

MOUNTAIN REGIONAL REPORT

Defense Spending & Gross Regional Product



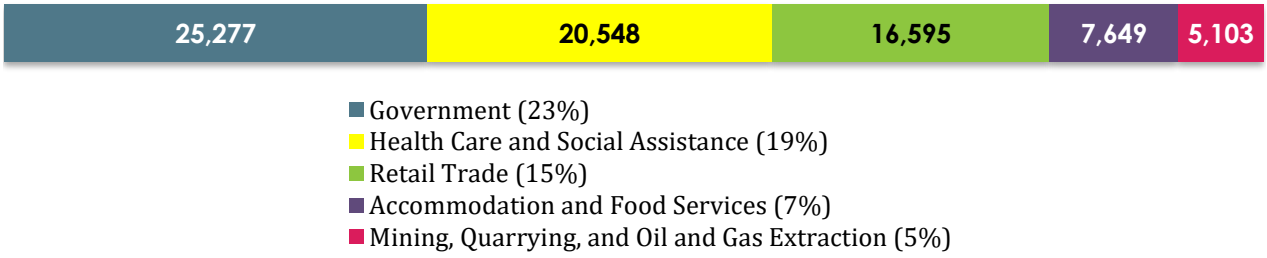
Population by County



- **Regional Outlook:** The Mountain Region ranks sixth out of the nine regions in terms of GRP, and is seventh in defense spending. The GRP of the region is $ $9,303,145,659, which is 5% of the state's total GRP. The amount of DoD contracts performed in the region in FY 2015 is $38,003,491, which is less than one percent of all defense spending in Kentucky.
- **Population**: The population of the Mountain Region is 392,568, which is 9% of the population of the state.

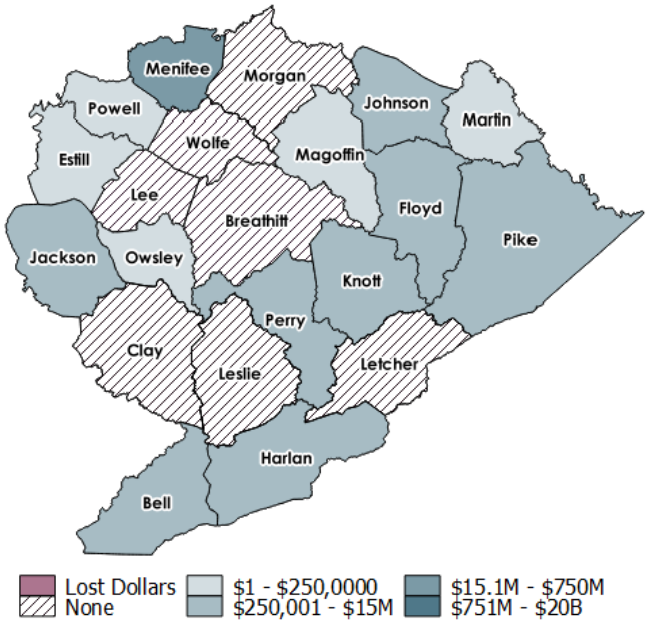
Top 5 Industries by Job in Region

The numbers shown in the bar chart below represent the top five industries' share of all jobs held in the Mountain Region. The region is experiencing negative job growth, with a 14.7% change from 127,985 jobs in 2005 to 109,218 jobs in 2016.



MOUNTAIN REGIONAL REPORT

DoD Funding Performed in the Region



Economic Impact of DoD Funding

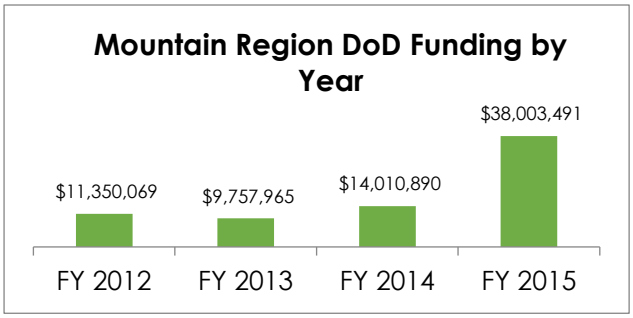
Total Economic Impact		
Total Economic Output (Sales)	Total Jobs	Total Earnings
$190,244,195	1,555	$37,288,034
---------- Multipliers ----------		
Sales Multiplier	Jobs Multiplier	Earnings Multipliers
1.14	1.22	1.33

Mountain Region DOD Employment: 1,213

When considering the overall impact of DoD funding, the multiplier effect causes the importance of DoD funding to increase. With a sales multiplier of 1.14, the total economic output is 2% of GRP. Similarly, the earnings multiplier of 1.33 means that each dollar of earnings generated by DoD funding generated another one third of a dollar.

Top Contractors in the Mountain Region

Company	City	FY 2015 Total	FY12-15 Total
Boneal, Inc.	Means	$16,521,655	$35,930,731
Phoenix Products, Inc.	Mckee	$4,224,915	$11,023,930
Rising Sun Developing Company	Martin	$9,877,000	$9,877,000
Worldwide Equipment, Inc.	Prestonsburg	$1,464,226	$2,906,177
Mary Helen Parkey	Middlesboro	$1,565,416	$2,376,420
LKJ Crabbe, Inc.	Staffordsville	$582,645	$1,652,756
Massillon Construction and Supply, LLC	Martin	$1,560,968	$1,560,968
Noble Landscapping	Buckhorn	$283,290	$964,589
Sandy Valley Fasteners, LLC	Paintsville	$416,627	$646,123
Coleman, Donald	Shelbiana	$93,677	$631,673

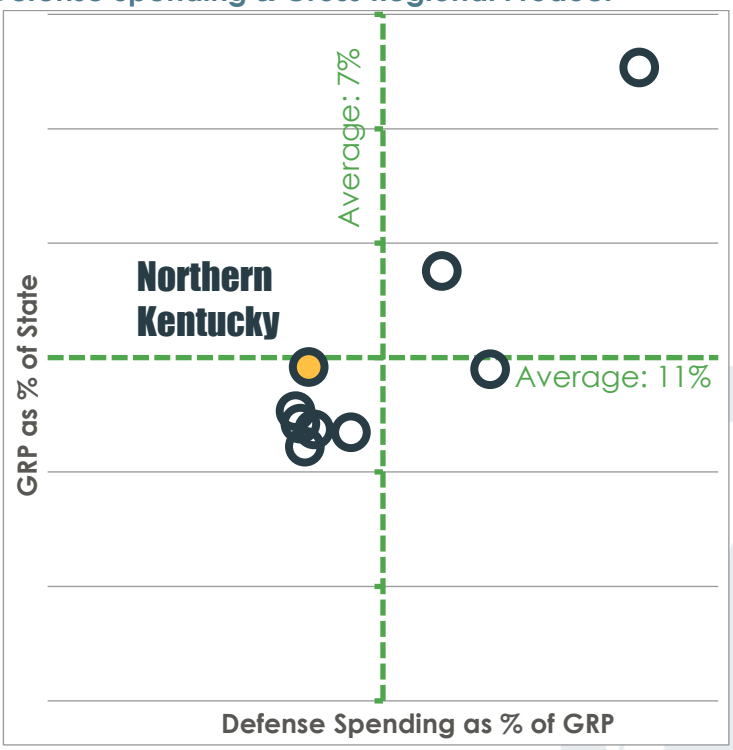


The top contractor in the Mountain Region is Boneal Incorporated with $35.9 million in total funding from fiscal year 2012 to 2015. Seven of the top ten contractors in the region were funded at over $1 million. Notably, Rising Sun Developing Company of Martin was awarded all $9.9 million in funds over the four fiscal years in FY 2015.

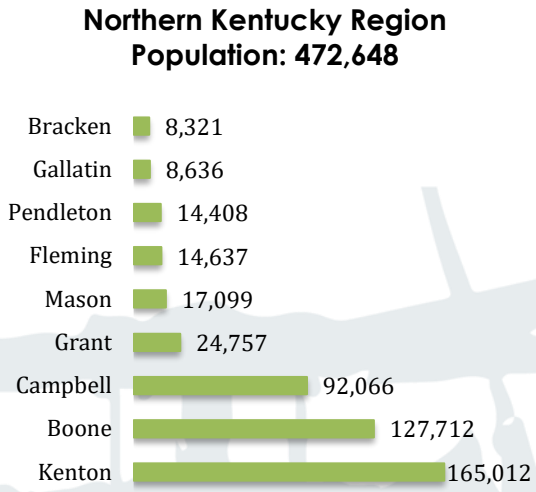
DoD Funding in the Mountain region has ranged from $11 million in 2012 to a high of more than $38 million in 2015. This increase is more than triple the amount of 2012 funding with the largest increase occurring between 2014 and 2015.

NORTHERN KENTUCKY REGIONAL REPORT

Defense Spending & Gross Regional Product



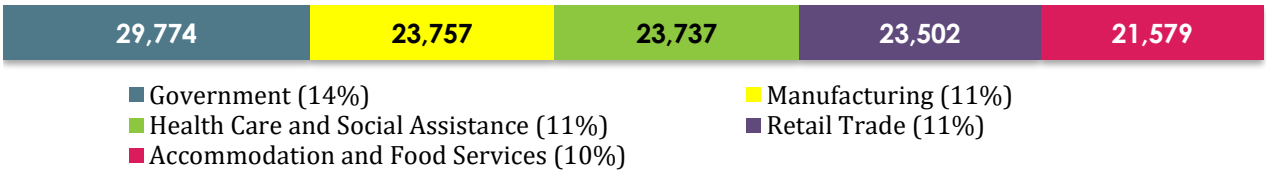
Population by County



- **Regional Outlook:** The Northern Kentucky Region has the third highest Gross Regional Product of the regions in Kentucky, and ranks sixth for defense spending as a percentage of Gross Regional Product. The GRP of the region is $18,869,082,994 and the amount of DoD contracts performed in the region in FY 2015 is $62,482,500, which is less than one percent of the region's GRP.
- **Population**: The population of the Northern Kentucky is 472,648, which is 11% of the population of the state.

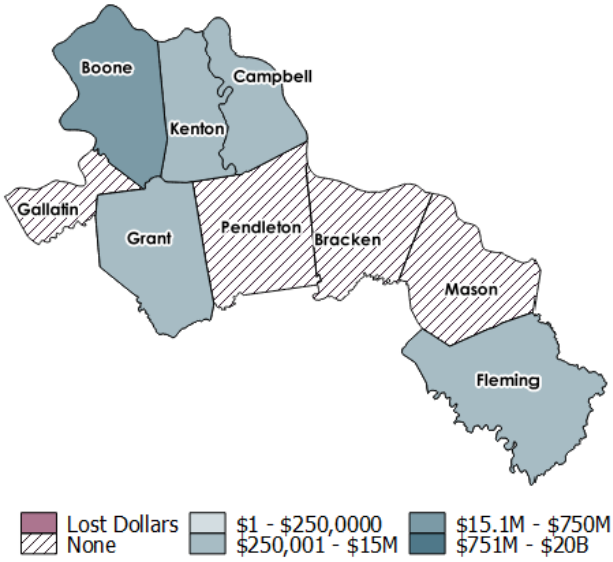
Top 5 Industries by Job in Region

The numbers shown in the bar chart below represent the top five industries' share of all jobs held in the Northern Kentucky Region. The region has added 13,225 jobs from 2005 to 2016, a 6.4% increase from 207,189 jobs in 2005 to 220,414 jobs in 2016.



NORTHERN KENTUCKY REGIONAL REPORT

DoD Funding Performed in the Region



Economic Impact of DoD Funding

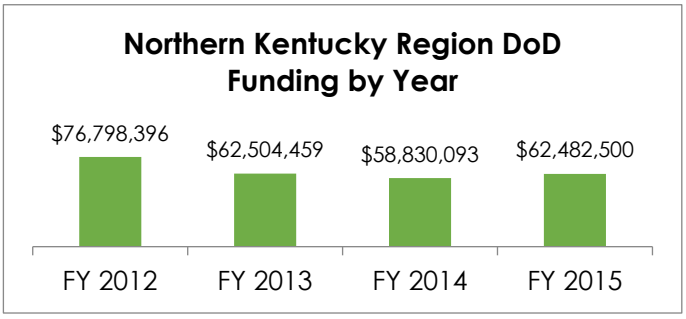
Total Economic Impact		
Total Economic Output (Sales)	Total Jobs	Total Earnings
$337,900,256	2,301	$74,546,215
---------- Multipliers ----------		
Sales Multiplier	Jobs Multiplier	Earnings Multipliers
1.28	1.35	1.57

Northern Kentucky DOD Employment: 1,492

When considering the overall impact of DoD funding, the multiplier effect causes the importance of DoD funding to increase. With a sales multiplier of 1.28, the total economic output is nearly $338 million. Similarly, the earnings multiplier of 1.57 means a return of $1.57 on earnings for DoD related work.

Top Contractors in the Northern Kentucky Region

Company	City	FY 2015 Total	FY12-15 Total
DRS Environmental Systems, Inc.	Florence	$32,153,714	$187,905,583
Messier-Bugatti-Dowty	Walton	$14,257,567	$32,347,372
General Cable Technologies Corporation	Highland Heights	$159,731	$5,173,627
Schwarz Roofing LLC/K Hayes Limited Jv	Florence	$3,999,516	$3,999,516
Pciroads, LLC	Warsaw	$2,817,350	$2,817,350
Q.B.S., Inc.	Warsaw	$2,782,476	$2,782,476
Tier 1 Performance Solutions, LLC	Covington	$524,827	$2,549,122
A Q W, Inc.	Walton	$478,443	$2,394,930
Rotek, Inc.	Florence	$0	$2,142,298
Metal Solutions Design & Fabrication, LLC	Dayton	$281,967	$2,009,699

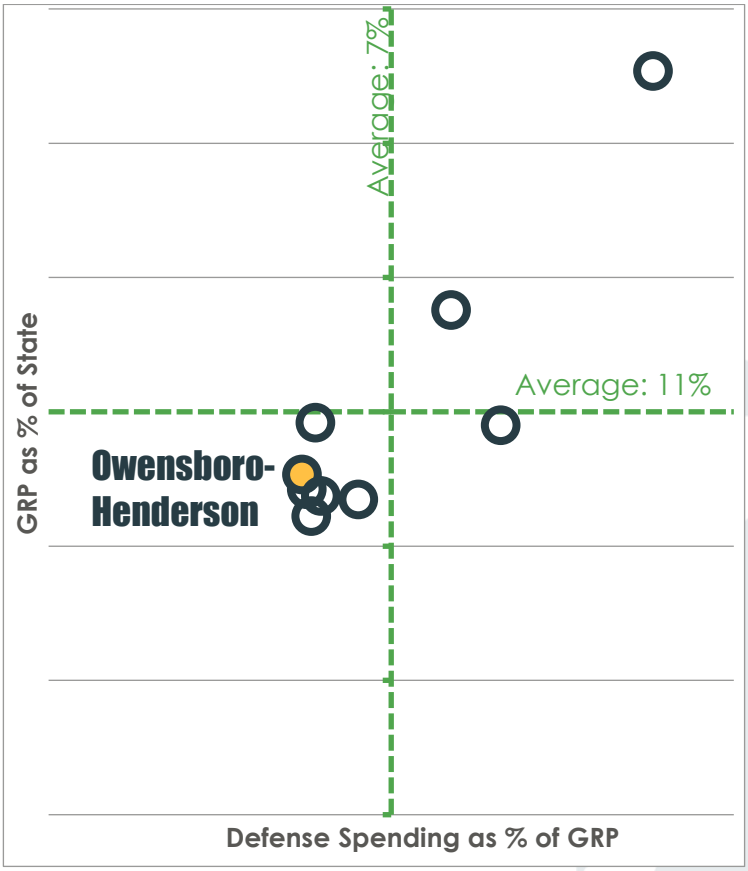


The top contractor in the Northern Kentucky region is DRS Environmental with $187.9 million in total funding from fiscal year 2012 to 2015. Messier-Bugatti-Dowty (Safran Landing Systems) also performed $32.4 million in contracts over the same period. None of the remaining top eight contractors receive more than $6 million in total funding

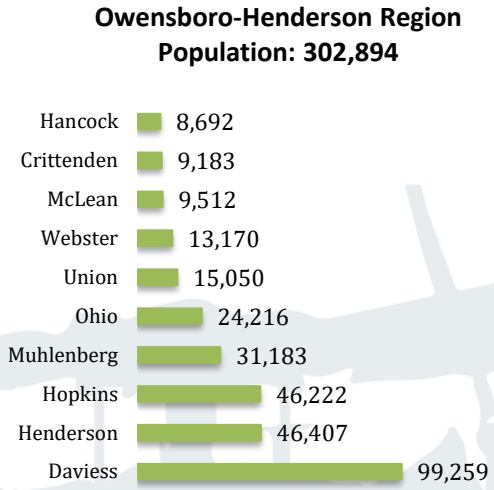
DoD Funding in the Northern Kentucky region has ranged from a high of $77 million in 2012 to a low of $58 million 2015. This decline is a potential cause for concern, but it may also reflect the end of large multi-year contracts.

OWENSBORO-HENDERSON REGIONAL REPORT

Defense Spending & Gross Regional Product



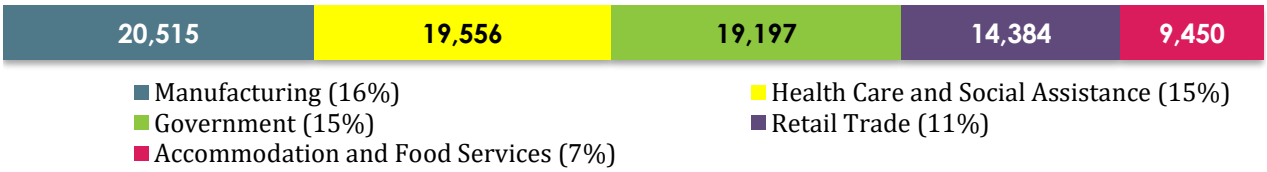
Population by County



- **Regional Outlook:** The Owensboro-Henderson Region ranks fifth in Gross Regional Product for the regions in Kentucky, and ranks ninth in the amount of defense spending as a percentage of GRP. The GRP of the region is $11,412,284,500 and the amount of DoD contracts performed in the region in FY 2015 is $11,445,690, which is less than 1% of regional GRP. .
- **Population**: The population of the Owensboro-Henderson Region is 302,894, which is 7% of the population of the state.

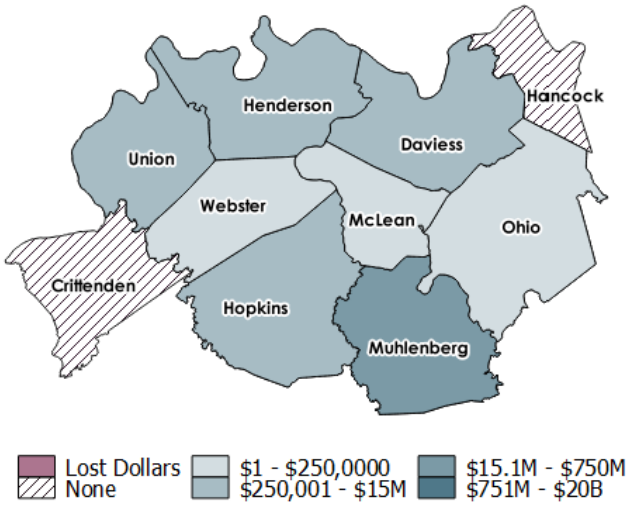
Top 5 Industries by Job in Region

The numbers shown in the bar chart below represent the top five industries' share of all jobs held in the Owensboro-Henderson Region. The region is experiencing very slow job growth, with a positive 0.6% change from 129,195 jobs in 2005 to 129,926 jobs in 2016, an increase of 720 jobs.



OWENSBORO-HENDERSON REGIONAL REPORT

DoD Funding Performed in the Region



Economic Impact of DoD Funding

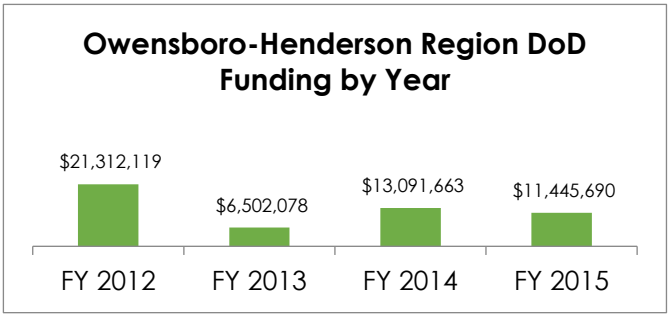
Total Economic Impact		
Total Economic Output (Sales)	Total Jobs	Total Earnings
$164,972,432	1,301	$35,145,545
---------- Multipliers ----------		
Sales Multiplier	Jobs Multiplier	Earnings Multipliers
1.19	1.28	1.46

Owensboro-Henderson DOD Employment: 939

When considering the overall impact of DoD funding, the multiplier effect causes the importance of DoD funding to increase. DoD funding has a sales multiplier of 1.19 in the region and a jobs multiplier of 1.28 with 1,301 jobs attributed to DoD funding. The Total Economic Output is nearly $165 million in the region from DoD funding.

Top Contractors in the Owensboro-Henderson Region

Company	City	FY 2015 Total	FY 12 – FY15
Ensign-Bickford Aerospace & Defense Company	Graham	$2,374,123	$19,563,744
Clarke Power Services, Inc.	Henderson	$2,643,525	$8,021,238
Kentucky Bioprocessing, Inc.	Owensboro	$2,510,263	$6,666,154
MPD, Inc.	Owensboro	$1,101,871	$5,642,655
Donovan Commercial Industries, Inc.	Nortonville	$1,237,197	$4,221,180
Western Kentucky Food Services	Greenville	$644,000	$1,378,540
Scott Heavy Equipment, Inc.	Madisonville	$400,963	$1,255,256
Field Packing Company LLC	Owensboro	$0	$895,980
URS Group, Inc.	Morganfield	$0	$848,144
Midamerica Jet, Inc.	Owensboro	$47,494	$696,453

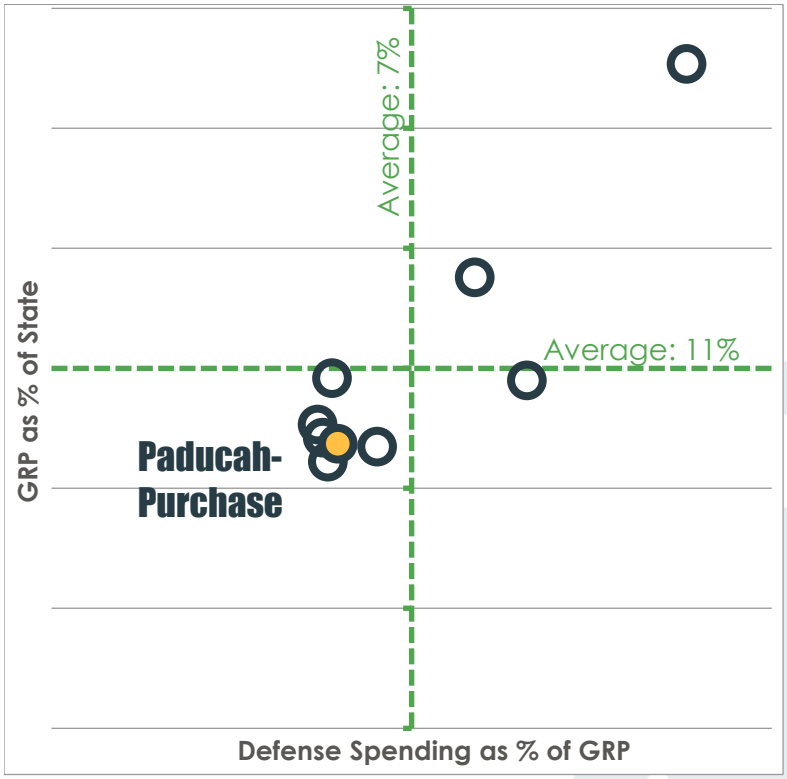


The top contractor in the Owensboro-Henderson region is Ensign-Bickford Aerospace & Defense Company fiscal year 2012 to 2015, with $19.6 million in contracts. Only three other contractors received more than $5 million in total funding.

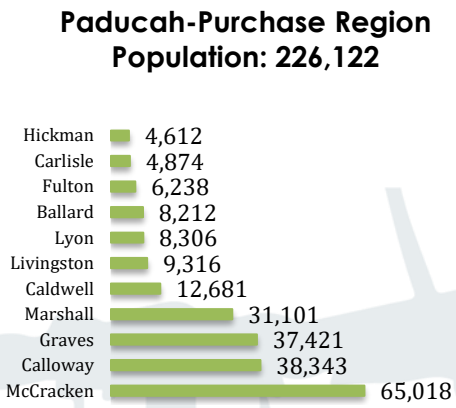
DoD Funding in the Owensboro-Henderson region has ranged from just over $6 million in 2013 to a high of more than $21 million in 2012. Other than a strong year in 2012, there has been relatively little defense activity in the region.

PADUCAH-PURCHASE REGIONAL REPORT

Defense Spending & Gross Regional Product



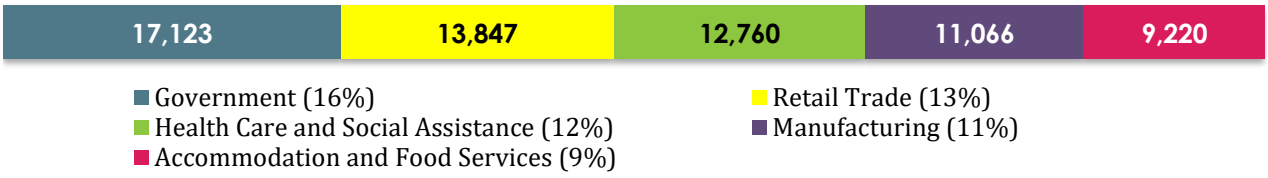
Population by County



- **Regional Outlook:** The Paducah-Purchase Region ranks seventh for Gross Regional Product of the regions in Kentucky, and ranks fourth for defense spending as a percentage of Gross Regional Product. The GRP of the region is $8,308,536,118 and the amount of DoD contracts performed in the region in FY 2015 is $35,683,612, which is 0.4% of Gross Regional Product.
- **Population**: The population of the Paducah-Purchase Region is 226,122, which is 5% of the population of the state.

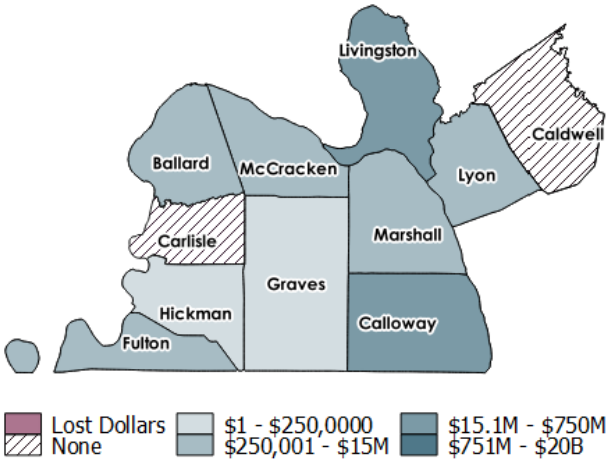
Top 5 Industries by Job in Region

The numbers shown in the bar chart below represent the top five industries' share of all jobs held in the Paducah-Purchase Region. The region is experiencing slow job growth, with a positive 0.7% change from 103,305 jobs in 2005 to 104,058 jobs in 2016, a change of 753 jobs.



PADUCAH PURCHASE REGIONAL REPORT

DoD Funding Performed in the Region



Economic Impact of DoD Funding

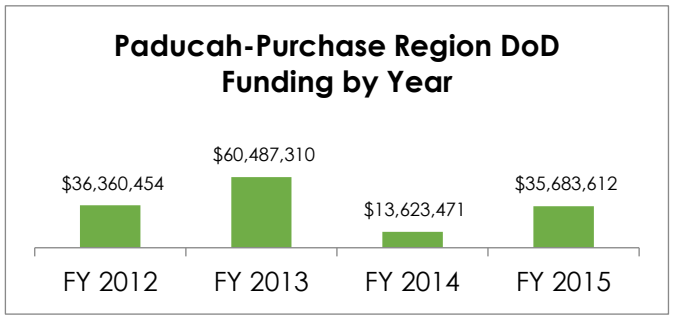
Total Economic Impact		
Total Economic Output (Sales)	Total Jobs	Total Earnings
$178,095,338	1,439	$46,911,489
---------- Multipliers ----------		
Sales Multiplier	Jobs Multiplier	Earnings Multiplier
1.29	1.4	1.49

Paducah-Purchase DOD Employment: 725

When considering the overall impact of DoD funding, the multiplier effect causes the importance of DoD funding to increase. With a sales multiplier of 1.29, the total economic output is $178 million. The earnings multiplier is 1.49 and 1,439 jobs in the region are attributed to DoD funding.

Top Contractors in the Paducah-Purchase Region

Company	City	FY 2015 Total	FY 12 – FY 15
Thalle Construction Co., Inc.	Grand Rivers	$11,489,915	$50,054,183
Taylor Motors, Inc.	Murray	$6,751,712	$23,707,692
Lbl Contracting Company	Fulton	($11,696)	$6,640,225
Steward Machine Co., Inc.	Grand Rivers	$468,482	$6,451,538
Ostrom Painting & Sandblasting, Inc.	Grand Rivers	$133,471	$5,632,103
Geo Consultants, L.L.C.	Kevil	$600,901	$5,220,781
Luhr Bros., Inc.	Smithland	$0	$4,991,105
Jerry B. Young Construction, Inc.	Fulton	$0	$4,530,319
Campbell Services LLC Graham Services LLC, a Joint Venture	Kuttawa	$759,262	$3,185,340
Bci Construction Usa, Inc.	Eddyville	$2,896,413	$2,896,413



The top contractor in the Paducah-Purchase region is Thalle Construction Co. Inc. with $50 million in work performed in fiscal year 2012 to 2015. Taylor Motors, Inc. is also a large player with $23 million over the same period of time. No other contractor exceeded $10 million between FY 2012 and 2015.

DoD Funding in the Paducah-Purchase region ranged from a low of around $13 million in FY 2014 to a high of $60 million in FY 2013. It is not clear if there is an evident trend in the region, or if the trend reflects the ebb and flow of multi-year contracts.

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Kentucky Commission on Military Affairs &
the Commonwealth of Kentucky

Chapter 5: Strategic Analysis & Recommendations for Growth

Introduction

This chapter provides specific recommendations on next steps for the Kentucky Commission on Military Affairs and its partners, based on the research and analysis collected and explained in Chapters 1 through 4 of the Kentucky Defense Industry Study. The chapter structure consists of six themes that are supported by one or more recommendations.

Due to commonalities between the Aerospace & Aviation cluster and the Defense industry, there is some overlap in the recommendations provided in this chapter and those provided in chapters in another report, namely Chapters 7 and 8 of the Kentucky Aerospace & Aviation Industry Study. However, the information provided here is unique in that it focuses exclusively on how to promote growth and diversification for DoD contracting businesses within the state, regardless of their unique industry sectors.

Recommendations

Enhancing Business Opportunities for Defense Companies

Recommendation 1: Develop a Kentucky Defense Industry Consortium to Further the Defense Industry in Kentucky

The consortium would focus specifically on the following goals:

- Addressing out-of-state supply chain leakage;
- Building business relationships between defense companies in Kentucky;
- Collaborating with the Aerospace & Aviation Consortium; and
- Assisting with DoD contracting, where appropriate.

TPMA's research revealed over 1,300 businesses that received DoD contract funding in recent years (see Chapter 1). These companies are scattered across the state and across an array of industry sectors. Though convening such a diverse group of businesses from such a wide geographic area sounds challenging, this should be seen more as a sign of the ample number of target firms available for invitation. Not all companies need to participate, and over time, as strong networks develop, the group may sub-divide according to geographic area, industry sector, or both. The consulting team's effort to produce regional summary reports for nine sub-regions in Kentucky could help galvanize regional conventions (see Chapter 4).

Convening some number of these contractors in order to learn about each other's businesses would foster new interpersonal networks that could benefit the state in a variety of ways. To name a few possibilities:

- Creation of new product innovations due to connecting business people, engineers, and scientists across multiple organizations by connecting businesses, research universities, engineering and scientific firms;
- Enhancement of existing product offerings to more value-added products by connecting multiple tiers of providers. As indicated in Chapter 8 of the Kentucky Aerospace and Aviation Industry Study, in industries such as Aerospace, where a small number of companies exert significant market authority, an emphasis on reduced inventory could force subcontractors to work together to produce more finished products;

- Connect university, private, and public partners that have not previously worked together and can link and leverage resources to develop new facilities and training programs; or
- Improve business practices that make the entire state more competitive.

Provide best-practices and data tool options for the roughly 5,000 businesses in Kentucky with registered CAGE codes but which are not currently winning any defense contracts though the opportunities for economic development through such meetings are abundant, a few ideas are mentioned here based on TPMA's findings from data, research, and conversations.

One possibility for proactive economic development would be building upon regional industry clusters that are strongly defense-related. For example, there may be opportunities to augment the presence of Humana Military Healthcare Services in the Louisville region (see Chapter 2). This business services the Tricare Program (a medical insurance program for active duty members' families and DoD retirees). There were over $3 billion in contracts obligated to this program each year between FY12 and FY15. The corporate parent of Humana Military Services, Humana Health, is one of the largest insurance companies in the United States and is headquartered in Louisville. It may be feasible to build on the success of the insurance cluster in northern Kentucky to bring ancillary services executed by Humana into the state; for example, actuarial researchers, claims investigations, etc. An additional recruitment strategy could be based on attracting other DoD insurance and banking providers to open or expand branch locations in Kentucky, to utilize the talent available in the region in this field. Additionally, Kentucky should explore utilizing Humana Health to offer best practices solutions to the Veterans Administration to assist the VA in the delivery of services. Humana could potentially provide feedback and offer strategies to better the service delivery of VA Centers across the nation. Given the VA's current negative findings recently, this could potentially provide an enormous economic impact and improve service delivery nationwide to veterans.

Within Kentucky, 16 general aviation airports were identified as capable of handling air cargo or which have additional air cargo capacity (see Chapter 5 of the Kentucky Aerospace and Aviation Industry Study). For defense contractors in rural areas, this presents an opportunity to utilize airports closer to their places of business for transporting raw materials for production or finished goods to customers.

Recommendation 2: Plug Supply-Chain Gaps by Connecting In-State Businesses or Attracting Out-of-State Businesses

Major supply-chain gaps for defense industries create a leakage of $1.4 billion in defense-related revenue out of state each year (see Chapter 3). Two economic development strategies to address supply chain leakage should be employed:

- Foster business to business introductions to fill supply chain gaps; and
- Target companies to fill supply chain gaps in business recruitment efforts.

If Kentucky businesses can be identified that can fill some of the supply chain gaps, introductions between business could be facilitated that could lead to new business partnerships that reduce transportation costs and mutually benefit those businesses. Industries where facilitating relationships with existing companies

may pay off include the following:

- Other Heavy and Civil Engineering Construction;
- Temporary Help Services; and
- Other Communications Equipment Manufacturing.

If such suppliers do not exist in-state, targeted business recruitment could potentially bring businesses into Kentucky to plug the existing gaps. Industries that most commonly import goods and services to defense contractors in the state include:

- Iron and Steel Mills & Ferroalloy Manufacturing;
- Wholesale Trade Agents & Brokers;
- Asphalt Shingle and Coating Materials Manufacturing;
- Petroleum Refineries; and
- Other Commercial & Industrial Machinery & Equipment Rental & Leasing.

Opportunities for reducing supply-chain leakage do not stop with reducing out-of-state purchases by DoD contractors. Kentucky's seven DoD contracting offices are also hiring out significant amounts of work to out-of-state firms. The largest contracting offices based on total contract value include those at Fort Knox, Louisville, and Lexington. From FY12 to FY15, these seven offices awarded over $2.7 billion to organizations in Kentucky and $6.3 billion to organizations located outside of the state. This indicates a significant opportunity to involve more Kentucky-based organizations in the bidding process. It would be worthwhile to analyze the contracts awarded, as well as the types of companies in these states winning the awards, to determine potential gaps that could be filled with Kentucky-based companies.

Recommendation 3: Build Partnerships with Defense Dependent Companies and Create Opportunities for Diversification

The current political environment seems favorable to DoD contractors due to President Trump's commitment to increasing defense spending by nearly 10% in FY2018.[1] However, the specific priorities of defense funding will determine what types of contractors will see increased revenue. If certain defense systems and products are phased out in favor of new ones, existing DoD contractors could still be at risk.

Now that certainly heavily defense-dependent industries have been identified (see Chapter 1), the Cabinet for Economic Development (CED) can meet with businesses from these sectors and monitor their activities over time. If indeed these businesses are affected by reprioritization of defense spending, the CED or regional economic development offices may be able to collaborate with them to assist with identification of new product lines, new markets for existing products, and open opportunities with other businesses in Kentucky, as well as export opportunities outside the United States.

TPMA identified a list of the most vulnerable defense industries in Kentucky according to level of revenue dependence on the defense industry and general employment declines in the given industry category. According to TPMA's analysis, there are at least 75 defense firms located in various regions across the state involved in these lines of business (see Chapter 1).

1 The White House Press Briefings. (2017, Feb. 28). President Trump is Rebuilding America's National Security. https://www.whitehouse.gov/the-press-office/2017/02/28/president-trump-rebuilding-americas-national-security

These industries are:

- All Other Support Services;
- Commercial and Institutional Building Construction;
- Other Support Activities for Air Transportation;
- Facilities Support Services;
- Office Furniture (except Wood) Manufacturing; and
- Apparel Accessories and Other Apparel Manufacturing.

Outside of defense dependent companies, there may be further opportunities to connect with a short-list of businesses that are deeply ingrained in the defense industry. Though there is a good deal of defense activity in the state, the list of companies that actually support defense systems that are used by DoD in overseas peacemaking operations is relatively small. In fact, there are only nine companies that contracted for over $1 million in defense systems in the fiscal years 2012-2015 (see Chapter 3). TPMA recommends reaching out directly to these companies to better understand their supply chains. This exercise may yield information about their input needs that could allow CED to link these companies with in-state suppliers of the same or similar products.

Diversification Partnership Pilot

TPMA recommends the state of Kentucky explore a pilot program built around this recommendation. Below, are detailed examples from other states, as well as expected priorities for this pilot program and funding expectations.

Several other states have developed pilot programs for diversification through their OEA initiatives.

> **Washington Military Alliance and Washington State Department of Commerce**: Washington provides an individualized company assessment process that identifies the key barriers, challenges, and opportunities for the defense firms and then links them to appropriate services offered by state partners.[2]
>
> **Maryland Department of Commerce**: Maryland links the technologies developed on military bases as a catalyst for new commercial innovation. They evaluate the defense technology and patent portfolios for potential commercial applications. Developing these commercial products can help diversify the economic strength of the region and shield businesses from the adverse impacts of defense spending cuts.[3]
>
> **STEAM ENGINE USA (Rhode Island):** Rhode Island developed a pilot program to spur manufacturing innovation by leveraging its unique assets in design, reflecting the reputation and expertise of the Rhode Island School of Design (RISD). The program developed a Design Readiness Assessment (DRA) that lays the groundwork for innovation by analyzing a manufacturer's opportunity to enhance existing products and launch new efforts. Manufacturers that go through

2Washington Military Alliance. Defense Industry Adjustment Program Deliverables. Retrieved from http://wamilitaryalliance.org/oea-grant-deliverables/

3 Maryland.gov. Economic Diversification of Defense Industries. http://commerce.maryland.gov/about/economic-diversification-of-defense-industries

the DRA get access to a service provider network that can assist with the recommendations for new product development and diversification.[4]

Priorities for the Pilot

A diversification initiative should at a minimum include the following elements:

Phase 1: Company Assessment

- Assess the company's current market position
- Assess the company's current growth strategy
- Assess the specific challenges/risks of reduced DOD spending
- Assess the company's technical capabilities
- Assess the company's preparedness for competitive commercial markets

Phase 2: Services

- Development of Commercial Business/Operating Plans – Leverage Kentucky's existing business development services, such as the SBDC network and the MEP network (Advantage Kentucky Alliance) to assist firms with the development of new business plans.
- Identification of New Markets – leverage Kentucky's international outreach to educate defense dependent companies on international markets and protocols for engaging with international partners to diversify their markets and customer base. Both one-on-one and seminar/workshop formats may be appropriate.

Funding for the Pilot

Initial funding of $300,000 would support the planning and development of a statewide diversification initiative and provide for staffing, coordination, marketing, and service delivery. Of the initial funding, $175,000 would be for staffing, coordination and marketing and $175,000 for technical assistance and services to the 25 defense dependent firms. All 25 firms would receive the Phase 1 assessment and then five (5) firms would be selected for more intensive Phase 2 services.

Leveraging Military Partnerships

Recommendation 4: Create a Committee to Help the State Attract Additional Research, Missions, and Veterans

Subactivities of this recommendation include the following:

- Market Kentucky as a military-friendly state by promoting all military installations and assets collectively instead of individually;
- Establish Governor-led biannual assessments of military capacities to attract additional missions and to better position assets relative to future BRAC activities;
- Utilize all military assets as workforce access points; and
- Assist in the coordination of public-private partnerships between industry and the military.

4 Steam Engine USA. (2015). Design Readiness Assessment. Retrieved from http://steamengineusa.com/the-pilot-defense/design-readiness-assessment/

Promote all military installations and assets collectively instead of individually

Kentucky currently does not promote the state's military assets and installations collectively, which ultimately pits assets against each other for funding, capacity, and other decisions. States such as Georgia, South Carolina, and others promote a more inclusive military message at the state level, creating a more attractive package for federal investment. As opposed to having Fort Campbell and Fort Knox compete over an additional mission, soldiers, assets, or other investments, the state should promote the collective strengths of its military. Whether through the development of a new commission or the refinement of the state's Commission on Military Affairs, Kentucky should continuously identify and establish the overall strengths of its assets and areas of need.

Establish Governor-led biannual assessments of military capacities to attract additional missions

To enable a more statewide, collective approach, TPMA recommends either a state-level governing commission be developed and led by the Governor, or these responsibilities be added to the mission of the Kentucky Commission on Military Affairs (KCMA). The Governor's term, a minimum of four years, will outlast individual Garrison Commanders and Commanding Generals who normally only stay at one post for a period of two years. This commission should assess the collective needs, priorities, and additional capacities of all military installations in the state. After the needs and capacities have been determined, the state can collectively market them to decision makers in Washington, DC. The commission should look at the installations as a multi-site economic development project and fully vet all needs from additional missions. For example, infrastructure and community needs should be evaluated if an additional mission is provided to one of the bases. These additional capacities and needs can then be conveyed to DC leadership, in essence marketing them for the recruitment of additional missions. If the United States Army develops a new mission that is a good fit for Kentucky's strengths, Kentucky's leadership should ensure the state's installations are at the top of the list.

Utilize all military assets as workforce access points into public, private, and nonprofit sectors

The KCMA should assess and enable all military assets as workforce access points. In today's economy, many businesses make location decisions based on the availability of a skilled workforce more than any other factor. Given this, Kentucky should assess all military access and exit points, represented in military recruiting stations, ROTC and Jr. ROTC programs, installations, and other assets to enable and empower them as access points for workforce across the state.

Currently, Kentucky's Career Centers market only to larger installations to assist veterans and transitioning personnel with finding private employment when transitioning out of the military. However, this process is cumbersome. Given veterans' and transitioning soldiers' attractiveness as possible employees, the process should be refined to become more efficient with bridge training and targeting recruitment.

Veterans as a group are prized by Kentucky's industry and businesses as highly skilled and well trained, with exemplary soft skills. The high standards of the military are also borne out in recruiting statistics. According to an interview conducted with an individual familiar with recruiting, only approximately one in three candidates are being accepted at local military recruiting stations. By partnering with local workforce development boards and creating sector partnerships to identify business and industry workforce needs, these military access and exits points can become gold mines of talent for regional businesses and industries eager to hire skilled workers. One example that could serve as a best practice for other regions is the *Workforce Essentials* program at the Montgomery County (Tennessee) Career

Center, which employs a veterans' representative who focuses on connecting veterans with businesses in the market for skilled workers.

Assist in the coordination of public-private partnerships between industry and the military
In addition to the airspace above Fort Campbell and Fort Knox (see Chapter 2), Kentucky's military installations have a wealth of assets that could be utilized more effectively for business and industry in the state. Fort Knox's immense training complexes, airspace, firing range, mock cities, and energy independence and generating capacity are several examples. The state should help facilitate public-private partnerships with business and industry to explore the demand to utilize these assets for commercial use.

Throughout the course of this study, numerous stakeholders who participated in interviews and focus groups suggested that a critical missed opportunity in the Kentucky is the development of public-private partnerships to more effectively harness military assets for commercial use (see Chapter 7 of the Kentucky Aerospace and Aviation Industry Study). Many stated a general lack of knowledge and lack of access points were hindrances to these partnerships. Those business and industry leaders who could potentially utilize these assets, lacked the knowledge of whom to ask and where to start the conversation. Additionally, leadership at both Fort Knox and Fort Campbell stated their willingness and openness to exploring public-private partnerships, but that miscommunication and misunderstandings have hindered the process. The KCMA and CED should assist in the coordination and promotion of public private partnerships between business and industry and the military.

Managing the Cost of Doing Business

Kentucky is bordered by seven states, with several cities on or near borders with these states. This makes it easy for residents to locate their businesses on the other side of the state line when it is advantageous for taxation or regulatory reasons. It is also possible that the state is missing out on potential veteran residents living across state borders, simply due to neighboring states having more variable taxation structure for veterans.

Therefore, it is critical that Kentucky examines tax structures in surrounding states to ensure the state is postured to be competitive and understand the taxation environment on businesses in surrounding states, particularly those that share a border with cities such as Louisville, Covington, Newport, Hopkinsville, Henderson, Ashland, Paducah, and others.

Recommendation 5: Improve Military-Related Tax Issues

From the retention of military talent, both veterans and retirees, and the overall economic impact of military installations in the state, Kentucky has several outstanding tax policies and issues that hinder economic development within the state. Given these negative consequences from tax policy, Kentucky should address tax issues affecting the military and surrounding communities. Specific sub activities related to this recommendation include the following:

- **Establish a special taxing district for Fort Campbell;**
- **Adjust military pension taxes; and**
- **Ensure military perspective is captured in re-examining statewide tax policies.**

Establish a special taxing district for Fort Campbell

While the majority of Fort Campbell's footprint is in Kentucky, the majority of the economic impact occurs across the border, in Tennessee, stemming directly from the favorable tax environment (see Chapter 4, specifically the report related to the Bowling Green region). As indicated in Chapter 2 of the Kentucky Aerospace and Aviation Industry Study, Kentucky ranked 34th in the nation in state business tax climate, according to the Tax Foundation's 2017 report. In contrast, Tennessee ranked 13th. Kentucky compares particularly poorly in property tax, where the state ranks 36th in the nation, while Tennessee ranks 29th.[5] According to key stakeholder interviews and focus groups, soldiers and installation personnel purchase items such as homes, cars, and other assets in Tennessee due to differences in sales, property and payroll taxes. Other states with installations on state borders have addressed this issue with special taxing districts.

Adjust military pension taxes

According to a key stakeholder interviewed for this study, Kentucky taxes all retired military pensions after the first 25%. Garrison Commanders and others cite this tax policy as a reason Kentucky loses well-trained, experienced personnel whose skills transfer well to private sector jobs. Retired military veterans potentially bring a substantial economic impact. Many military retirees are at an age where they will purchase homes, contribute to the workforce, and even start their own businesses.[6] Kentucky provides partial exemptions on retired military benefits. In particular, Veteran Disability Dependency & Indemnity Compensation Benefits are exempt; however, Military Retirement Pay is not. As of 2017, 25 states provide full exemption of Military Retirement Pay and Survivor Benefit Plan payments.[7] To level the playing field with competing states, Kentucky should examine the potential of reducing or eliminating the tax on Military Retirement Pay. In recent years, multiple states have produced economic impact analyses of exemptions to military pay and survivor benefits, which could provide significant guidance on this issue.[8]

Ensure military perspective is captured in re-examining statewide tax policies

While the previous two activities address individual tax policy concerns related to the military, Kentucky should ensure the military perspective is captured and addressed in any future examination of statewide tax policies. The goal of this activity would be to ensure the Commonwealth is as military tax friendly as possible to ensure an adequate supply of personnel for the workforce and a focused effort to maximize the overall economic impact from the military within the state. Qualitative inputs in the form of interviews and focus groups with military personnel underscored the fact that military friendly tax policies are key

5 The Tax Foundation. (2017). 2017 State Business Tax Climate Index. Retrieved from https://files.taxfoundation.org/20170302120920/TF-SBTCI-2017-Final1.pdf

6 Historic data indicate that entrepreneurship rates are typically higher than among non-entrepreneurs, but a shift seems to have occurred in the period from 2009 to 2013 that reverse that pattern. Fairlie, R. (2014). Kaufman Index of Entrepreneurial Activity, 1996-2013. Retrieved from http://www.kauffman.org/~/media/kauffman_org/research%20reports%20and%20covers/2014/04/kiea_2014_report.pdf

7 Military Officers Association of America. (2017). 2017 Military State Report Card and Tax Guide. Retrieved from http://www.moaa.org/statereport/

8 States completing analyses in the past five years include North Carolina, Utah, South Carolina and New Mexico, to name a few.

attributes attracting peroneal to states such as Florida and Texas. Ensuring the military perspective is examined in any future tax policy debates within the state will underscore Kentucky's military-friendly status and ensure top talent from the military is not lost to competing states. By just examining the consequences of individual tax policies from a military perspective, the state could potentially avoid any negative externalities of poor tax policy.

Developing Innovations

Recommendation 6: Explore Creating an Innovation Hub to Act as an Incubator for Creative Technology and Manufactured Goods

Significant and varied research is being conducted at multiple research and development hubs across the state, including the University of Kentucky, University of Louisville, and Morehead State. If connected as part of a greater initiative, Kentucky and the military could capitalize on these developments. Additionally, each of these programs could achieve greater visibility and attract more talent in graduate and Ph.D. students. To further emphasize the opportunity to advance on this front, Kentucky ranks 38th among all states in awards of DoD Research contracts. Of the more than 20 Kentucky-based companies that received awards in recent years, most obligation amounts were small (less than $100,000) (see Chapter 2).

Though much aerospace research being conducted has more commercial application than being directly defense related, these programs should seek out opportunities for defense R&D projects, which might also develop into commercialized applications in the future. Specifically, thermal coating work and UAV/drone research at the University of Kentucky have received worldwide recognition and have attracted leading researchers to the university. Additionally, work at Morehead State University with satellites and constellation theory is gaining attention as cutting-edge and easily has military and commercial ramifications.

By centralizing these concepts, or at a minimum entrusting an entity to bridge the communications gap between the military, research and development, and private sectors, Kentucky could further the progress of each, resulting in a potentially significant economic impact. Not only serving as an incubator, this hub could lead the promotion and communication of these technologies across Kentucky and to the world. While Fort Knox, with its immense additional land capacity, seems the logical choice, the creation of this technological hub could occur at any installation or university.

More precise market analysis would be required in each of these fields, but due to ongoing research within the state, some potential areas of opportunity and collaboration include:

- Nano satellites;
- Remote sensing/sensors;
- Distributed Space Systems (swarming);
- Biomedical research in space;
- Autonomous Operations (UAV – but not leader here); and
- Thermal Re-entry Systems.

Small Business Innovation Research (SBIR) program spending can be an important gateway for building a long and sustained partnership with the DoD. Small, innovative firms that develop specialized capabilities or innovative new systems or equipment can form the core of new supply chains that can last for decades.

As shown in Chapter 2, while Kentucky leads the nation in SBIR matching funds, the state trails all neighboring states, except West Virginia, in total investment. The state could build upon existing awards with the Air Force, Marine Corps, Coast Guard, and Navy by developing contracts with the Army (which has a significant presence in-state), perhaps building upon the relocation of the Army's Defense Information Systems Agency (DISA) headquarters to Fort Knox. Creating a platform where the state's 15 small- to medium-sized businesses that have successfully obtained SBIR grants can communicate their advice and lessons learned could increase the number of such grants. TPMA also recommends that funding of the state match through the Kentucky Innovation Network be restored to its original amount prior to recent budget cuts or increased to encourage new and larger investments.

With the announcement that Fort Knox will be designated as one of four data centers for the DOD moving forward, stemming, in no small part to their geographic location away from the East Coast and their energy self-sufficiency, the state should examine the opportunity of expanding this service. With Kentucky residing equidistant between data dependent regions such as New York, Washing DC, Charlotte NC and others, Kentucky could capitalize on Fort Knox's ambitious DOD Data Center program and explore opportunities of increasing this sector. The Commonwealth would be well served to evaluate its potential as a regional data center for numerous industries.

Finally, Kentucky should examine emerging DOD requirements of all services to better posture the state for the future. The state should examine and understand the future needs of all services and position assets, both public and private, to ensure the state is the leader in providing for these future and emerging needs of the military. By proactively providing for the future and emerging needs of all branches of the military, the Commonwealth will truly become a military friendly state, ultimately increasing economic impact.

Innovation Hub Pilot

TPMA recommends the state of Kentucky explore a pilot program built around this recommendation. Below are expected priorities for this pilot program and funding expectations.

Priorities for the Pilot

1. Convene the researchers from the University of Kentucky, University of Louisville, and Morehead State, along with the researchers from the approximately twenty Kentucky-based companies conducting aerospace R&D.
2. Develop consensus on a lead institution, a network model of innovation hubs, or a hybrid model.
3. Validate (or refute) the opportunity areas; this may require independent, objective benchmarking completed by a third party
4. Identify funding sources for the Innovation Hub
5. Develop a portal/platform to facilitate communication and collaboration across the hub, coordinated by the Defense Consortium and KCMA.

Funding for the Pilot

Initial funding of $150,000 would support the planning and development of a strategic plan and operating model for the Innovation Hub model, including the development of memoranda of agreement for the partner institutions. Assuming that the Defense Consortium is able to provide the coordination and

communication function on their portal, then that function would be integrated with the consortium providing more efficient use of resources.

Enhancing Workforce

In addition to the workforce ramifications of harnessing all military assets across the state to bolster the workforce talent pool, several additional workforce recommendations stem from military issues.

Recommendation 7: Develop Programs Designed to Attract Spouses to the State

In many cases, a military spouse is the deciding factor for veterans or retirees in relocating to a state. Additionally, these spouses have careers and skills that are highly sought after in the medical, legal, manufacturing, and other fields. Kentucky's local workforce boards should be encouraged to develop specific recruiting programs focused on spouses, ensuring the needs of these decision-makers are recognized.

Kentucky cannot focus only on career needs of the retiree and veteran, but must also develop approaches to understanding and addressing the needs of the spouse in order to compete for talent attraction and relocation after soldiers, sailors, civil servants, and airmen leave the service.

Recommendation 8: Develop Military Focused Apprenticeships

With military veterans highly sought after by business and industry stemming from their training and soft skills, Kentucky should target those leaving the service for apprenticeship programs. These apprenticeships should focus on individual skill sets and optimally matching those skills to private sector workforce needs. Additionally, these apprenticeship programs should specialize in transitioning veterans to the private sector. Veterans and military personnel have their own syntax and concepts. By focusing on veterans, these apprenticeship programs can more effectively and efficiently bridge communication gaps and skill matrices to transition veterans into the private sector.

To more effectively facilitate this career ladder into apprenticeships, Kentucky should consider aligning its programs with the Department of Defense SkillBridge concept. SkillBridge focuses on transitioning service members into civilian jobs utilizing skills and abilities that translate well from a soldiers MOS to a given civilian job. By easing the transition, apprenticeship recruitment has been streamlined by more easily identifying talent and the subsequent civilian career field. Additionally, by aligning with the DoD SkillBridge and companies like Cisco, Morgan Stanley and others who are proactively utilizing these services, Kentucky will be presented as much more military-friendly than those states that do not.

Capitalizing on Current Assets and Missions

Recommendation 9: Explore Becoming a National/Regional Training Hub

With Fort Campbell and Fort Knox both located in Kentucky, representing a significant presence in airspace and land resources, these installations could become a national/regional training center for police, emergency response, and other federal, state, regional, and local emergency management personnel. Given today's new focus on larger, mass-casualty, terrorism, natural disaster, and other enhanced

emergency responses, the existence of these well-known installations could be capitalized on by the federal government and the state.

With Fort Knox's immense land mass, airspace, river, diversified geography, mock cities, firing ranges, and abundance of facilities, the installation is well suited for a simulated combat or emergency "theatre." Additionally, with the presence of Fort Campbell and its airstrip and other facilities, it could serve as a staging area. When troops or emergency responders are activated, they are always directed to a staging area to prepare for deployment to their ultimate combat theatre or emergency. Enhancing the realism of any training, the capability of providing both a staging area and theatre is an asset for Kentucky. Between the two installations, Fort Knox has the additional land and airspace capacity to better serve as the training area.

Given the facts above, Kentucky should explore becoming a national and regional training hub for both military assets and emergency responders. By promoting the dual assets of Fort Campbell and Fort Knox for military training, Kentucky could potentially attract additional missions and military-related economic impacts. Brigades to platoons all have some form of economic impact when stationed outside of their normal home bases. Kentucky could capitalize on these soldiers and other personnel training in the state while also providing them with the optimal conditions for training.

In addition to military training, the state and installations of Fort Campbell and Fort Knox could serve as perfect training areas for civilian emergency responders as well. With some investment, these installations could provide the optimal training environment for mass casualty/mass response training. Kentucky's climate, geography, and natural assets such as rivers and streams could easily replicate any environment.

In addition to the central location, Kentucky's geography and climate make the state an ideal location for a national training center for both military and civilian entities. Kentucky could create and promote a series of training programs with a permanent national and/or regional training site, multiple scenarios and environments, proven training programs, and a full-time professional training staff. Cost savings for military and civilian organizations could be realized versus developing original programs in individual communities or installations. These trainings could bring together state, local, and national agencies, acting in concert, to ensure as real a training environment as possible.

Regional Training Hub Pilot Program

TPMA recommends the state of Kentucky explore a pilot program built around this recommendation. Below are expected priorities for this pilot and funding expectations.

Priorities for the Pilot

1. Benchmark/research multi-purpose rapid emergency response facilities in the U.S.
2. Convene leadership of Fort Campbell and Fort Knox to determine the viability of hosting a training hub or activities at one of these bases.
3. If on-base hosting is not feasible, identify sites near these bases that could serve these purposes.
4. Convene leadership of police, emergency response, and other regional/local emergency services to identify high priority needs for a training facility.

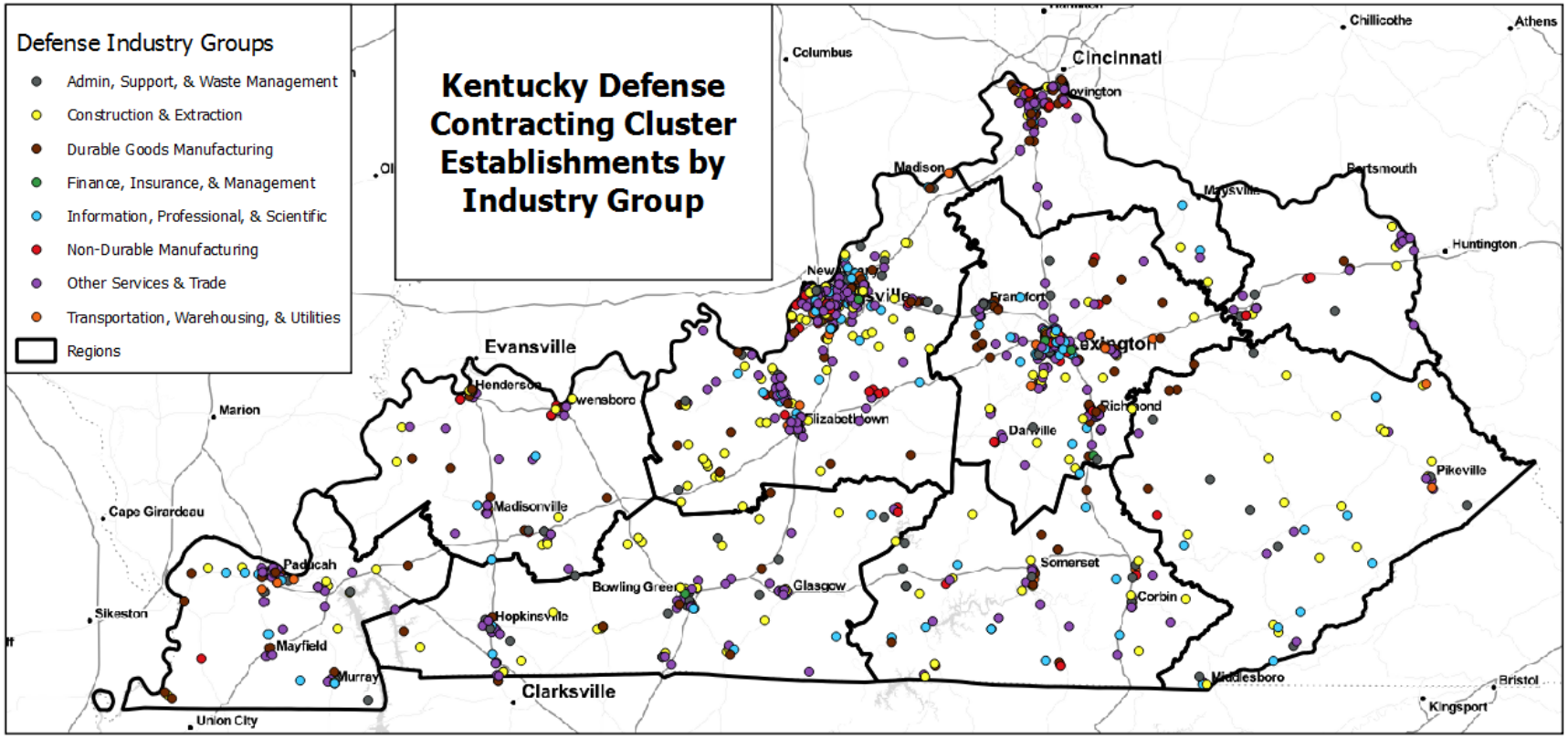
Funding for the Pilot Program

Initial funding of $50,000 would support a feasibility assessment and site selection support for the training hub. Kentucky should explore grant opportunities with the Department of Defense and/or Homeland Security.

Kentucky Commission on Military Affairs &
the Commonwealth of Kentucky

Appendices

Appendix A: Full-Page Maps and Tables



Sources: BDZ, USASpending.gov, NETS, Hoovers, and Thomas P. Miller & Associates

Chapter 1 - Table 1: FY12-FY15 Contracting Industries with Less than 1% Defense Dependency[1]

NAICS	Description	NAICS	Description	NAICS	Description
221122	Electric Power Distribution	332999	All Other Miscellaneous Fabricated Metal Product Manufacturing	541511	Custom Computer Programming Services
221210	Natural Gas Distribution	333618	Other Engine Equipment Manufacturing	541512	Computer Systems Design Services
236118	Residential Remodelers	333911	Pump and Pumping Equipment Manufacturing	541611	Administrative Management and General Management Consulting Services
237110	Water and Sewer Line and Related Structures Construction	334290	Other Communications Equipment Manufacturing	541690	Other Scientific and Technical Consulting Services
237130	Power and Communication Line and Related Structures Construction	336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	541990	All Other Professional, Scientific, and Technical Services
237310	Highway, Street, and Bridge Construction	336390	Other Motor Vehicle Parts Manufacturing	561320	Temporary Help Services
238210	Electrical Contractors and Other Wiring Installation Contractors	423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers	561720	Janitorial Services
238220	Plumbing, Heating, and Air-Conditioning Contractors	423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers	561730	Landscaping Services
238290	Other Building Equipment Contractors	423830	Industrial Machinery and Equipment Merchant Wholesalers	562910	Remediation Services
238320	Painting and Wall Covering Contractors	442110	Furniture Stores	611310	Colleges, Universities, and Professional Schools
324110	Petroleum Refineries	492110	Couriers and Express Delivery Services	621111	Offices of Physicians (except Mental Health Specialists)
332312	Fabricated Structural Metal Manufacturing	517210	Wireless Telecommunications Carriers (except Satellite)	721110	Hotels (except Casino Hotels) and Motels
332710	Machine Shops	532120	Truck, Utility Trailer, and RV (Recreational Vehicle) Rental and Leasing	811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance

1 Emsi 2016.4. This data was analyzed by Business Development Zone and Thomas P. Miller & Associates with additional information from USASpending.gov.

Appendix B: List of DoD Claimant Codes

DoD Claimant Codes	
Airframes and Related Assemblies and Spares	Separately Procured Containers and Handling Equipment
Aircraft Engines and Related Spares and Spare Parts	Textiles, Clothing and Equipage
Other Aircraft Equipment and Supplies	Building Supplies
Missile and Space Systems	Subsistence
Ships	Transportation Equipment (Railway)
Combat Vehicles	Production Equipment
Non-Combat Vehicles	Construction
Weapons	Construction Equipment
Ammunition	Medical and Dental Supplies and Equipment
Electronics and Communication Equipment	Photographic Equipment and Supplies
Petroleum	Materials Handling Equipment
Other Fuels and Lubricants	All Others Not Identifiable to Any Other Procurement Program
Separately Procured Containers and Handling Equipment	Services