



## **AEROSPACE**

### ***Metro Denver and Northern Colorado Industry Cluster Profile***

The aerospace industry cluster includes companies that develop products and systems for commercial, military, and space applications. The companies have a wide variety of focus areas, from research and development to design and manufacture of guided missiles and space vehicles, satellites and other communications equipment, and navigation and detection instruments. The companies in the aerospace industry cluster also produce planetary spacecraft and launch systems and provide mission support.

Colorado's aerospace industry has critical mass. Colorado is home to four military commands, seven major space contractors, and several universities involved in leading space research. There are over 120 businesses classified as aerospace companies. With an additional 200 companies across the state that have either some aerospace operations or serve as suppliers to the aerospace industry, Colorado boasts more than 300 companies in the space industry. Direct employment in the aerospace industry totals 26,650 private workers and approximately 29,200 military personnel. These 55,850 workers in the aerospace industry support an additional 115,400 workers in all industries throughout Colorado, bringing direct and indirect employment supported by the aerospace industry to 171,250 workers.

The nine-county Metro Denver and Northern Colorado region<sup>1</sup> employs 20,500 private workers in the aerospace industry, representing 77 percent of all aerospace workers in Colorado. The region has almost 90 aerospace companies or 71 percent of the state's total companies in the cluster.

Recent developments in the aerospace cluster include the formation of the United Launch Alliance (ULA), a new company born when the rocketry divisions of Lockheed Martin and Boeing Corporation merged. The ULA began operations in December 2006 and currently employs about 1,600 workers in the Metro Denver area. In other aerospace developments, Lockheed Martin has begun work on an \$8.2 billion NASA contract for the Orion Spacecraft. Almost 500 of Lockheed Martin's Colorado employees are currently working on the project, and an additional 600 Orion-related jobs could be added in Colorado by 2009.

The Colorado Space Coalition, a group of industry stakeholders, works to make Colorado a center of excellence for space. The coalition – including aerospace companies, military leaders, academic groups, and economic development organizations – promotes the state's significant aerospace assets nationally, as well as advancing legislation vital to industry growth and success.

The National Space Symposium is held annually in Colorado Springs. At the spring 2007 conference, military officers stressed the need to modernize military satellite systems and discussed new fast-response satellites. Indeed, the Aerospace Industries Association forecasts U.S. aerospace sales will reach more than \$195 billion in 2007, representing an increase of \$11 billion over the prior year. The trade group added that civilian aircraft sales have largely supported recent industry expansion while sales to the commercial sector and the Pentagon will likely rise in 2007.

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<sup>1</sup> The nine-county Metro Denver and Northern Colorado region includes Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Larimer, and Weld Counties.

## Private Aerospace Snapshot\*

**The nine-county region ranks second out of the 50 largest metro areas for private aerospace employment concentration in 2007.** With direct employment of about 20,500 aerospace workers, the region ranks first out of the 50 largest metro areas in absolute employment.

	<u>Nine-County Region</u>	<u>U.S.</u>
Direct Employment, 2007	20,500	375,040
One-Year Direct Employment Growth, 2006-2007	12.6%	0.8%
Five-Year Direct Employment Growth, 2002-2007	32.7%	2.7%
Avg. Annual Direct Employment Growth, 2002-2007	5.8%	0.5%
Number of Direct Industry Cluster Companies, 2007	90	4,500
Direct Employment Concentration	1.5%	0.3%

\*Data reflects only private aerospace employment in the region and excludes military employment.

### Major Colorado Aerospace Contractors

Seven of the country's major space contractors have a significant presence in Colorado. These companies assist the Department of Defense in procuring, placing, and managing national space assets for military purposes. They also provide manned and unmanned spacecraft, instrumentation, and ground control services for NASA and other agencies.

- **Ball Corporation** employs about 3,700 people in Colorado of which about 2,600 are employed by **Ball Aerospace and Technologies Corporation** located in the nine-county region. The company provides imaging and communications equipment, software, and services to its government and commercial aerospace customers.
- **Boeing Company** employs more than 2,300 workers in Colorado with 1,890 in the nine-county region. Boeing has several major defense units around the state including Boeing Missile Defense Systems, Integrated Defense Systems, Homeland Security and Services and Support Operations, and Space and Intelligence Systems.
- **ITT Corporation** has two divisions in Colorado. The **Systems Division** in Colorado Springs employs about 700 people and provides government, commercial, and international customers solutions for air and missile defense, communications, command and control, as well as full logistics support services. The **Space Systems Division, Visual Information Solutions** group employs 110 people in Boulder. The company provides software solutions for data visualization and analysis and image processing, consulting services, and training for commercial, research, and government markets.
- **Lockheed Martin** employs about 11,300 people in Colorado, more than half of which work at the Space Systems unit headquartered in Jefferson County. Space Systems designs, develops, tests, and manufactures a variety of advanced technology systems for space and defense. About 8,150 of Lockheed Martin's employees are located in the nine-county region.
- **Northrop Grumman** provides a diverse portfolio of products and services related to systems integration, defense electronics, information technology, and battle management. In addition, the company works with advanced aircraft, unmanned aerial vehicles, missile systems, naval vessels, and space technology. Northrop Grumman employs about 2,700 people throughout the state with 1,500 located in the nine-county region.
- **Raytheon Company** manages spacecraft missions and analyzes post-launch data. The company employs more than 2,700 people at eight worksites around the state. Most employees are spread across five locations in Aurora.

- **United Launch Alliance (ULA)** is a 50-50 joint venture between Lockheed Martin's Atlas and Boeing's Delta launch teams. ULA is headquartered in Metro Denver, and about 1,600 members of its 3,800-person workforce are located in the nine-county region. Most of the ULA's engineering and administrative activity is concentrated locally at Lockheed Martin's Space Systems unit, and most assembly and integration operations are concentrated at a Boeing facility in Alabama.

### Major Private Aerospace Companies

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| <ul style="list-style-type: none"> <li>• Ball Aerospace and Technologies Corp.<br/><a href="http://www.ballaerospace.com">www.ballaerospace.com</a></li> <li>• Boeing Company<br/><a href="http://www.boeing.com">www.boeing.com</a></li> <li>• DigitalGlobe, Inc.<br/><a href="http://www.digitalglobe.com">www.digitalglobe.com</a></li> <li>• GeoEye<br/><a href="http://www.geoeye.com">www.geoeye.com</a></li> <li>• ITT Corporation<br/><a href="http://www.itt.com">www.itt.com</a></li> </ul> | <ul style="list-style-type: none"> <li>• Lockheed Martin Corp.<br/><a href="http://www.lockheedmartin.com">www.lockheedmartin.com</a></li> <li>• Merrick and Company<br/><a href="http://www.merrick.com">www.merrick.com</a></li> <li>• Northrop Grumman Corp<br/><a href="http://www.northropgrumman.com">www.northropgrumman.com</a></li> <li>• Raytheon<br/><a href="http://www.raytheon.com">www.raytheon.com</a></li> <li>• United Launch Alliance<br/><a href="http://www.ulalaunch.com">www.ulalaunch.com</a></li> </ul> |
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### Military Bases

Colorado is home to a diverse mix of Department of Defense (DoD) military installations, fostering important synergies between private aerospace companies and governmental entities.

- **Buckley Air Force Base**, located in Aurora, is home to the 460th Space Wing and supports 38 tenant organizations, representing all branches of the military, located on and off base.
- **The Peterson Complex** in Colorado Springs includes Peterson Air Force Base, Cheyenne Mountain Air Force Station, and Schriever Air Force Base.
  - **Peterson Air Force Base** is the home of the 21st Space Wing, as well as the North American Aerospace Defense Command (NORAD), the United States Northern Command (USNORTHCOM), Air Force Space Command (AFSPC), US Army Space and Missile Defense Command/US Army Strategic Command (SMDC/ARSTRAT), and the 302nd Airlift Wing (AFRES). The 21st Space Wing is responsible for worldwide missile warning and space control.
  - **Cheyenne Mountain Air Force Station** is the host for Operation Center activities of NORAD, USNORTHCOM, US Strategic Command, and AFSPC. These centers continuously act as the central collection and coordination centers for a worldwide system of satellites, radars, and sensors that provide early warning of any missile, air, or space threat to North America.
  - **Schriever Air Force Base** is the home of the 50th Space Wing, as well as the Space Innovation and Development Center (SIDC), 310th Space Wing (AFRES), Missile Defense Integrated Operations Center (MDIOC), and the Joint Functional Command Component – Integrated Missile Defense (JFCC-IMD). The 50th Space Wing provides space combat capability through command, control, operations, and support of communication, navigation, warning, surveillance, and weather satellite weapons systems.
- The **United States Air Force Academy** in Colorado Springs was established in 1954, graduating more than 38,000 cadets since its inception. The Academy conducts a vast amount of research in the areas of aeronautics and astronautics.

## Military Aerospace Profile

Government Installation	Personnel
Buckley Air Force Base	10,100
Peterson Complex*	8,400
U.S. Air Force Academy	8,100
Schriever Air Force Base	2,600
<b>Total Employment</b>	<b>29,200</b>

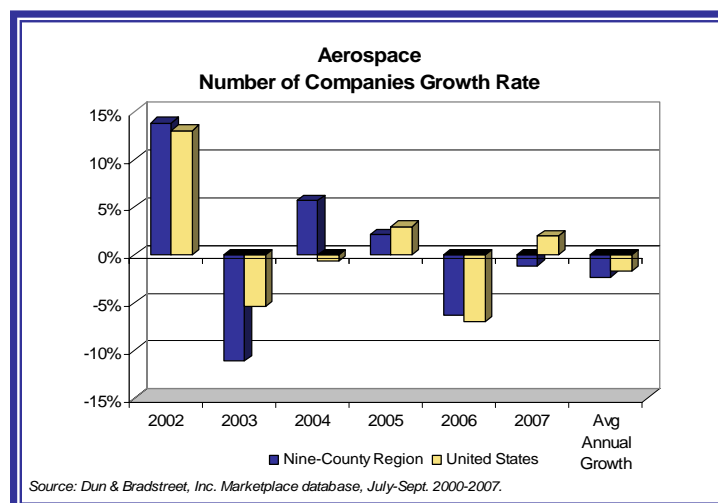
\*Peterson Complex personnel includes Peterson Air Force Base and Cheyenne Mountain Air Force Station (including NORAD, USNORTHCOM, AFSPC and SMDC/ARSTRAT).

## Aerospace Economic Profile

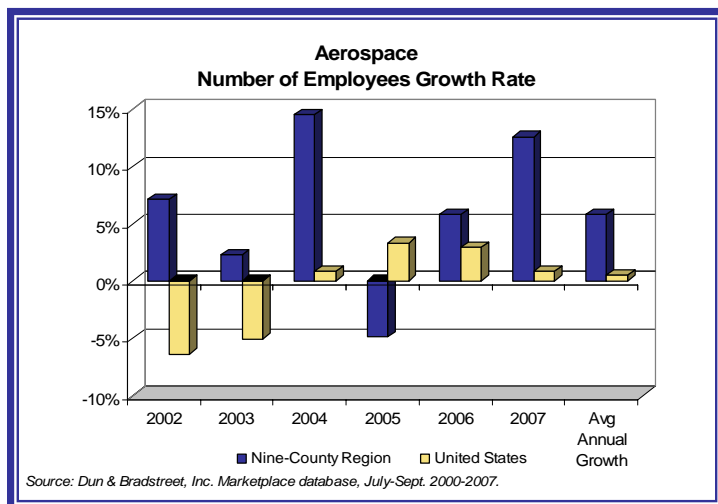
The aerospace industry cluster is defined by 19, six-digit North American Industry Classification System (NAICS) codes including search, detection, and navigation instrument manufacturing; guided missile and space vehicle manufacturing; satellite telecommunications; and research and development.

### Private Companies

- About 90 aerospace companies were located in the nine-county region in 2007.
- About 44 percent of the companies employ fewer than 10 people while 16 percent employ more than 250 workers.
- The number of aerospace companies in the region decreased 11 percent from 2002 to 2007, dropping from approximately 100 to 90. The number of aerospace companies nationwide declined about eight percent over the same period.
- About 58 percent of the region's aerospace companies are involved in manufacturing optical instruments and lenses (33 percent) or search and navigation equipment (25 percent).
- The highest percentages of aerospace businesses are in Boulder (30 percent), Arapahoe (18 percent), and Jefferson (16 percent) Counties. About 71 percent of Colorado aerospace companies are located in the Metro Denver and Northern Colorado region.



### Private Employment



- Aerospace companies employ about 1.5 percent of the region's total employment base, compared to a 0.3 percent concentration nationally.
- Aerospace companies directly employ about 20,500 people in the nine-county region.
- Total aerospace employment increased 33 percent between 2002 and 2007, compared to a 2.7 percent increase nationally. Aerospace employment growth in the region averaged 5.8 percent per year over the past five years.
- Most aerospace employees are involved in manufacturing search and navigation equipment (80 percent) or guided missiles and space vehicles (12 percent).

- About 93 percent of regional aerospace employees work in Jefferson (42 percent), Arapahoe (31 percent), and Boulder (20 percent) Counties. More than three-quarters of Colorado aerospace employees work in the nine-county region.

### **Wages**

The 2006 average annual salary for an aerospace worker in Colorado was \$98,140 compared to the national average of \$81,400. Given this average salary, total payroll in the aerospace industry cluster in the region reached an estimated \$1.8 billion in 2006.

#### **Denver-Aurora MSA Occupational Salaries, 2006\***

Aerospace Engineers	\$84,990
Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	\$49,500
Computer Software Engineers, Systems Software	\$85,530

\*Mean annual salary data is for the ten-county Denver-Aurora Metropolitan Statistical Area (MSA), including Adams, Arapahoe, Broomfield, Clear Creek, Denver, Douglas, Elbert, Gilpin, Jefferson, and Park Counties.

Source: U.S. Bureau of Labor Statistics, Metropolitan Area Occupational Employment and Wage Estimates, May 2006, [www.bls.gov](http://www.bls.gov).

## ***Key Reasons for Aerospace Companies to Locate in the Nine-County Region***

**The region is a top aerospace location offering:**

### **1. The ability to recruit and retain technical and scientific employees**

- Of Colorado's adult population, 34 percent have completed at least a bachelor's degree. That makes Colorado the third most educated state in the country, behind Massachusetts and Maryland. (American Community Survey, 2006)
- Colorado ranks 11th in the number of PhD scientists and engineers per 1,000 workers. A high rank points to a large pool of innovators in the state. (Corporation for Enterprise Development, 2007)
- Colorado Springs, Fort Collins-Loveland, and Boulder-Longmont rank among the top 20 metropolitan statistical areas in terms of scientists and engineers as a percent of the workforce. The Boulder-Longmont area ranks first in the United States. (National Science Board, 2006)
- The Metro Denver WIRED Initiative, a four-year, \$15 million regional workforce development grant housed at the Metro Denver Economic Development Corporation, is working to develop a labor force skilled in STEM (science, technology, engineering, and math) for the nine-county region's fastest-growing industries, including aerospace, bioscience, energy, and information technology-software. (Metro Denver WIRED Initiative)
- Colorado ranks second behind Washington in the percentage of total wage and salary jobs in high technology industries. A high proportion of advanced technology industries is an indicator of economic dynamism. (Corporation for Enterprise Development, 2007)
- Colorado ranks fourth in computer specialists as a share of the workforce. (National Science Board, 2006)
- Colorado ranks fifth in the number of science and engineering graduate students enrolled in doctorate-granting institutions. (Corporation for Enterprise Development, 2007)

### **2. Proximity to vendors and customers**

- The aerospace industry in Colorado is anchored by seven large prime contractors (Lockheed Martin, Ball Aerospace, Boeing, Raytheon, Northrop Grumman, ITT Corporation, and United Launch Alliance).
- Major military operations in the state include Buckley AFB, Peterson AFB, Schriever AFB, and Cheyenne Mountain Air Force Station. In addition, the U.S. Air Force Academy is located outside of Colorado Springs.

- Cheyenne Mountain Air Force Station hosts four military commands - North American Aerospace Defense Command (NORAD), U.S. Northern Command (USNORTHCOM), Air Force Space Command (AFSPC), and U.S. Army Space and Missile Defense Command/U.S. Army Forces Strategic Command (SMDC/ARSTRAT).
- Prime contractors and military installations support more than 300 Colorado aerospace businesses and suppliers. (Colorado Space Coalition, August 2007)
- In 2006, Colorado recipients were awarded more than \$767 million in NASA prime contracts. This included \$689 million in business contracts and \$78 million in educational and non-profit contracts. Colorado ranked fifth out of all states in NASA funding. (National Aeronautics and Space Administration, 2006)
- Colorado ranked first in 2006 in NASA contract awards among states without a NASA facility. (National Aeronautics and Space Administration, 2006)

### **3. Low to moderate costs of doing business**

- Colorado has the 14th most business-friendly tax climate in the nation, according to the State Business Tax Climate Index. Colorado ranks 15th in the corporate tax index, a sub-index of the overall tax climate index. Colorado has one of the lowest corporate income tax rates in the nation with a rate of 4.63 percent. (The Tax Foundation, 2007)
- Metro Denver average office occupancy costs of \$19.92 per square foot are lower than most cities worldwide. (CoStar Group, Mid-Year 2007)

### **4. Pro-business and flexible state and local governments**

- Colorado ranked eighth on *Forbes'* 2007 "Best States for Business" list. The magazine ranks the business climate in all 50 states based on criteria including costs of living and doing business, job growth, and quality of the local labor pool. The rankings also account for future growth potential in employment, income, and gross state product. (*Forbes*, 2007)
- Colorado placed second in the U.S. Economic Freedom Index. The Index also shows Colorado has the fewest regulatory barriers and ranks high in the fiscal sector. (Pacific Research Institute for Public Policy, 2004)
- Based on competitiveness of existing businesses and entrepreneurial energy, Colorado ranks first in business vitality and was one of only 10 states to receive an "A" grade in business vitality. (Corporation for Enterprise Development, 2007)
- Representative Mark Udall currently represents Colorado on the U.S. House of Representatives Science and Technology Committee. The Committee has jurisdiction over all non-defense federal scientific research and development. (U.S. House of Representatives House Committee on Science, 2007)

### **5. Proximity to Colleges/Universities**

- Two academic institutions in Colorado offer nationally ranked aerospace programs or degrees. (*U.S. News & World Report*, 2007)
  - The number two aerospace engineering undergraduate program in the country is at the U.S. Air Force Academy, located in Colorado Springs
  - The University of Colorado at Boulder (CU-Boulder) offers the #16 ranked aerospace engineering doctorate program. CU-Boulder is a member of the recently appointed U.S. Air Force Space Education Consortium
- The U.S. Air Force designated the University of Colorado at Colorado Springs as the lead university in the Space Education Consortium, which provides courses and curriculum throughout the country to help educate the future space workforce
- In 2005, Colorado's academic institutions spent more than \$124 million on aerospace and atmospheric science research and development. That amount was 15 percent of total spending on academic research and development. (National Science Foundation, 2005)

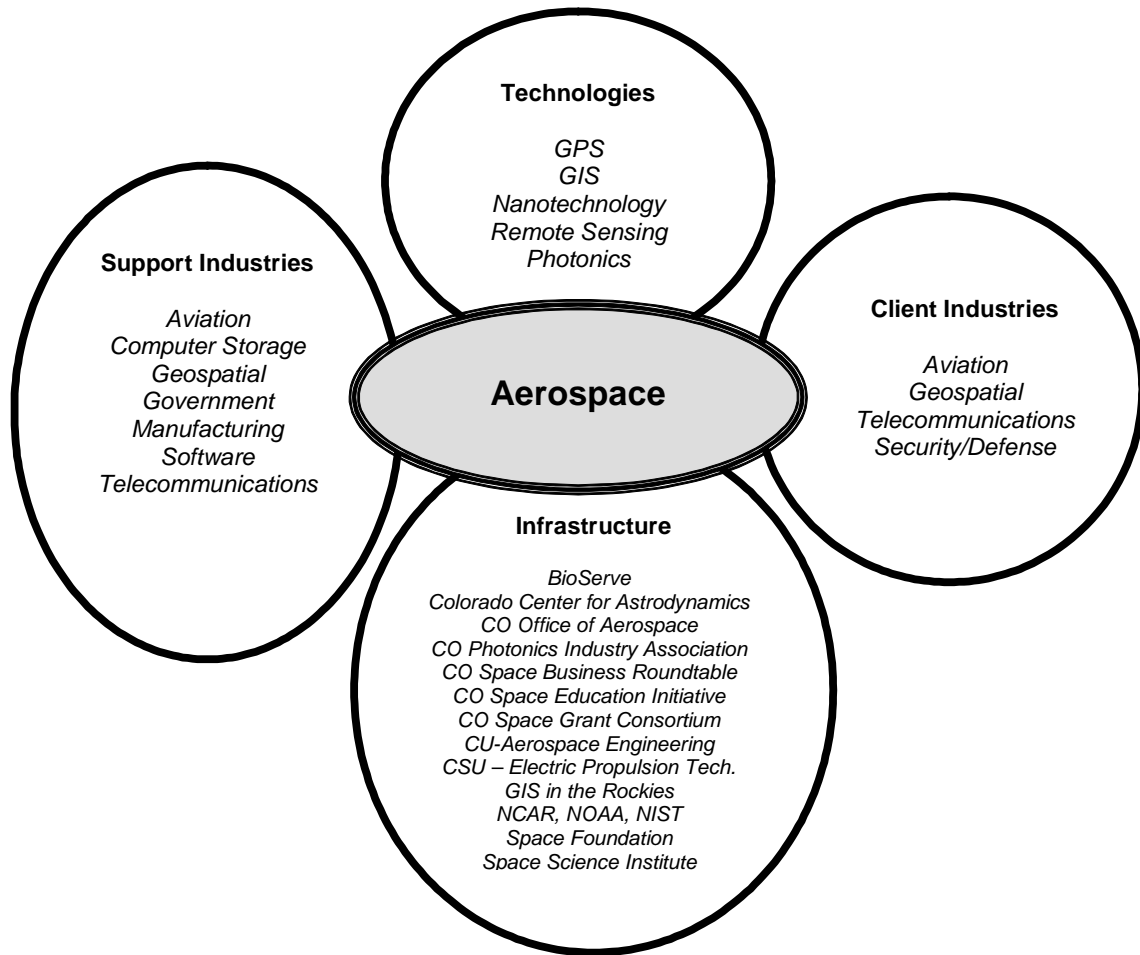
- The University of Colorado at Boulder received the most NASA research money of any other U.S. public university in fiscal year 2006. That amount was also the most received by any single public entity. (National Aeronautics and Space Administration, 2006; Colorado Space Coalition, August 2007)
- Colorado ranks 10th in the number of patents issued per one million people. A high number of patents points to a high rate of innovation in a state. (United States Patent and Trademark Office, 2006)
- Colorado has three institutions that are members of the Universities Space Research Association. The three schools – the University of Colorado at Boulder, the Colorado School of Mines, and the University of Denver – all have graduate programs in space sciences or engineering

### **Aerospace Industry Cluster Definition**

<b>NAICS*</b>	<b>NAICS Description</b>	<b>SIC</b>	<b>SIC Description</b>
331512 (P)	Steel Investment Foundries	3324-9901	Aerospace investment castings, ferrous mfg
331524 (P)	Aluminum Foundries (except Die-Casting)	3365-0201	Aerospace castings, aluminum mfg
331528 (P)	Other Nonferrous Foundries (except Die-Casting)	3369-9901	Aerospace castings, nonferrous: except aluminum mfg
332111 (P)	Iron and Steel Forging	3462-05	Missile and ordnance forgings mfg
332111 (P)	Iron and Steel Forging	3463-02	Nonferrous Missile and ordnance forgings mfg
332313 (P)	Plate Work Manufacturing	3443-1104	Space simulation chambers, metal plate mfg
332813 (P)	Electroplating, Plating, Polishing, Anodizing and Coloring (part)	3471-0204	Decontaminating and cleaning of missile or satellite parts mfg
332993	Ammunition (except Small Arms) Manufacturing	3483-0101	Arming & fusing devices for missiles mfg
332993	Ammunition (except Small Arms) Manufacturing	3483-9910	Missile warheads mfg
333314	Optical Instrument & Lens Mfg	3827	Optical Instruments & Lenses
334220 (P)	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing (part)	3663-9910	Space satellite communications equipment mfg
334511	Search, Detection & Navigation Instrument Mfg	3812	Search, Detection, Navigation, Guidance
336414	Guided Missile & Space Vehicle Mfg	3761	Guided Missiles & Space Vehicles
336415	Guided Missile & Space Vehicle Propulsion Unit & Parts Mfg	3764	Space Propulsion Units & Parts
336419	Other Guided Missile & Space Vehicle parts & Aux. Equipment Mfg	3769	Space vehicle equipment NEC
339113 (P)	Surgical Appliance and Supplies Manufacturing (part)	3842-0113	Space suits mfg
423860 (P)	Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers	5088-0300	Aircraft and space vehicle supplies and parts - Wholesale trade
423860 (P)	Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers	5088-0305	Guided missiles and space vehicles - Wholesale trade
423860 (P)	Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers	5088-0307	Space propulsion units and parts - Wholesale trade
517410 (P)	Satellite Telecommunications	4899-9902	Satellite earth stations
517510 (P)	Cable and Other Program Distribution	4841-9905	Satellite master antenna systems services (SMATV)
517910 (P)	Other Telecommunications	4899-9905	Missile tracking by telemetry or photography
927110	Space Research & Technology	4789-9902	Space flight operations, except government
927110	Space Research & Technology	9661	Space Research & Technology

*\*(P) indicates that only part of the NAICS industry category is represented in the aerospace industry cluster definition.*

## Aerospace Industry Cluster Relationships



For additional information, contact us:



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