



## **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 region's aerospace companies focus on a wide variety of areas, from research and development to the 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 achieved critical mass. The state is home to four military commands, seven major space contractors, and several universities involved in leading space research. Colorado has more than 300 companies in the space industry. Over 130 businesses are 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. Direct employment in the aerospace industry totals 26,860 private workers and approximately 31,050 military personnel. These 57,910 workers in the aerospace industry support an additional 119,020 workers in all industries throughout Colorado, bringing direct and indirect employment supported by the aerospace industry to 176,930 workers.

The nine-county Metro Denver and Northern Colorado region<sup>1</sup> employs 20,630 private workers in the aerospace industry, representing 77 percent of all aerospace workers in Colorado. The region has 90 aerospace companies – or 70 percent of the state's total companies in the cluster.

Recent developments in the aerospace cluster include:

- British satellite company Surrey Satellite Technology Limited opened its new U.S. headquarters in Douglas County.
- Lockheed Martin won a \$1.5 billion contract in 2008 to develop GPS III, the newest military and civilian navigation technology. The company was also selected by NASA to build the next-generation Geostationary Operational Environmental Satellite R-Series, known as GOES-R, for the National Oceanic and Atmospheric Administration. Data from the \$1.09 billion GOES system will provide accurate real-time weather forecast and early warning products to the public and private sectors.
- Longmont-based DigitalGlobe signed a multiyear contract with Microsoft Corporation to provide satellite imagery for Microsoft's Virtual Earth Program. GeoEye, with a location in Thornton, launched and deployed GeoEye-1, the world's highest resolution commercial imaging satellite.

The region is home to numerous federal labs conducting ongoing aerospace research including the National Oceanic and Atmospheric Administration (NOAA) and the University Corporation for Atmospheric Research (UCAR). The Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado Boulder (CU-Boulder) serves as one of the country's premier labs for designing, building, and controlling spacecraft and scientific instruments. A proven training ground for future space scientists and engineers, LASP is the only lab in the world to have designed and built instruments that have visited every planet in the solar system. In 2008, LASP and Lockheed Martin Space Systems won a contract for the \$485 million NASA mission to Mars.

---

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

Colorado is a national hub for the understanding and dissemination of aerospace knowledge. National Space Symposium, considered the premier forum for aerospace in the nation, celebrates its 25<sup>th</sup> anniversary in 2009. Hosted in Colorado Springs, the Symposium focuses on new technologies, discoveries, and industry opportunities, attracting the greatest minds and most influential people in the aerospace industry.

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.

### **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.
- **Air Force Bases** in Colorado Springs include 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), U.S. Army Space and Missile Defense Command/U.S. 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, U.S. 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 threats 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 as an accredited college to educate officers for the U.S. Air Force. The Academy conducts over \$50 million in research annually in the areas of aeronautics and astronautics.

### **Military Aerospace Profile**

<b>Government Installation</b>	<b>Personnel</b>
Buckley Air Force Base	10,110
Peterson Complex*	8,450
U.S. Air Force Academy	8,500
Schriever Air Force Base	3,990
<b>Total Employment</b>	<b>31,050</b>

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

## Private Aerospace Economic Profile

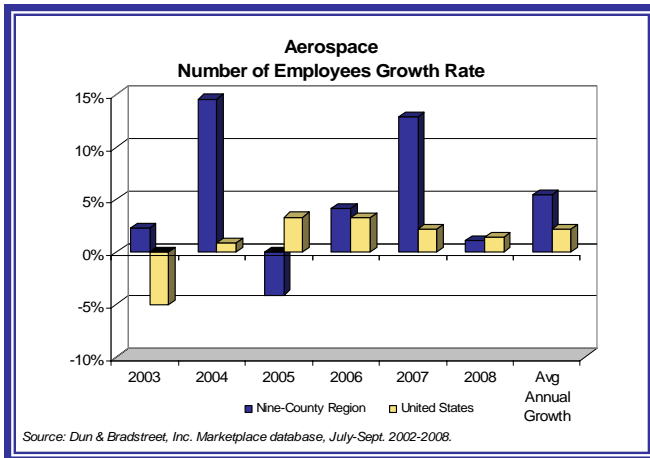
The aerospace industry cluster is defined by 19, six-digit North American Industry Classification System (NAICS) codes including search, detection, and navigation instrument manufacturing; guided missile and space vehicle manufacturing; satellite telecommunications; and research and development.

**The nine-county region ranks first out of the 50 largest metro areas for private aerospace employment concentration in 2008.** With direct employment of about 20,630 aerospace workers, the region ranks first out of the 50 largest metro areas in total private employment.

	<u>Nine-County Region</u>	<u>U.S.</u>
Direct Employment, 2008	20,630	386,610
Number of Direct Industry Cluster Companies, 2008	90	4,690
One-Year Direct Employment Growth, 2007-2008	1.1%	1.4%
Five-Year Direct Employment Growth, 2003-2008	30.6%	11.5%
Avg. Annual Direct Employment Growth, 2003-2008	5.5%	2.2%
Direct Employment Concentration	1.5%	0.3%

*\*Data reflects only private aerospace employment in the region and excludes military employment. Sources: Dun & Bradstreet, Inc. Marketplace database, July-Sept. 2002-2008; Development Research Partners.*

### 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 20,630 people in the nine-county region.
- Total aerospace employment increased 31 percent between 2003 and 2008, compared to a 12 percent increase nationally. Aerospace employment growth in the region averaged 5.5 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 (13 percent).

• About 93 percent of regional aerospace employees work in Jefferson (42 percent), Arapahoe (31 percent), and Boulder (19 percent) Counties. More than three-quarters of Colorado aerospace employees work in the nine-county region.

### Wages

The 2007 average annual salary for an aerospace worker in the nine-county region was \$101,490 compared to the national average of \$84,230. Given this average salary, total payroll in the aerospace industry cluster in the region reached an estimated \$2.1 billion in 2007.

#### Denver-Aurora MSA Occupational Salaries, 2007\*

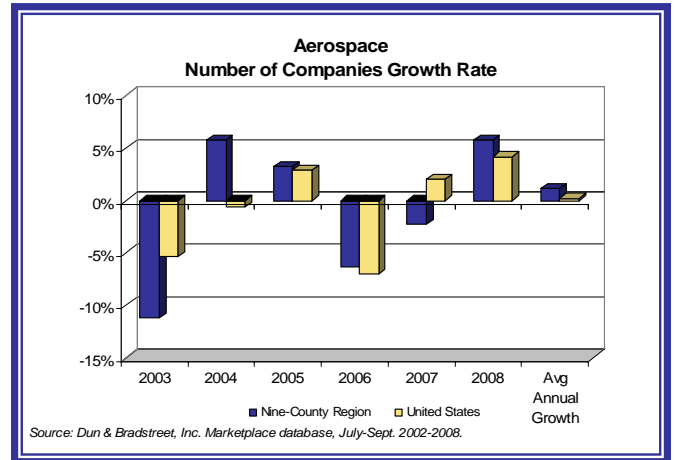
Aerospace Engineers	\$88,180
Computer and information scientists, research	\$86,480
Computer Software Engineers, Systems Software	\$89,640

*\*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 2007, [www.bls.gov](http://www.bls.gov).*

## Private Companies

- About 90 aerospace companies were located in the nine-county region in 2008.
- About 51 percent of the companies employ fewer than 10 people while 12 percent employ more than 250 workers.
- The number of aerospace companies in the region grew 5.7 percent from 2003 to 2008. The number of aerospace companies nationwide grew one 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 (28 percent), Arapahoe (21 percent), and Jefferson (17 percent) Counties. About 70 percent of Colorado aerospace companies are located in the Metro Denver and Northern Colorado region.



## Major Colorado Aerospace Contractors

Seven of the country's major space contractors have a significant presence in Colorado. These companies help the Department of Defense (DoD) procure, place, and manage national space assets for the military. They also provide manned and unmanned spacecraft, instrumentation, and ground control services for NASA and other agencies.

- **Ball Corporation** employs about 3,600 people in Colorado. Of these workers, about 2,500 are employed by **Ball Aerospace & Technologies Corporation** in Boulder County. The company provides imaging and communications equipment, software, and services to its government and commercial aerospace customers. [www.ballaerospace.com](http://www.ballaerospace.com)
- **Boeing Company** employs more than 2,300 workers in Colorado and 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. About 80 percent of Boeing's employment is in the nine-county region. [www.boeing.com](http://www.boeing.com)
- **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 120 people in Boulder. The company provides software solutions and training for commercial, research, and government markets. [www.itt.com](http://www.itt.com)
- **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 advanced technology systems for space and defense. Nearly 8,200 Lockheed Martin employees are in the nine-county region. [www.lockheedmartin.com](http://www.lockheedmartin.com)
- **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 over 2,700 people throughout the state, over half of which are located in the nine-county region. [www.northropgrumman.com](http://www.northropgrumman.com)
- **Raytheon Company** manages spacecraft missions and analyzes post-launch data. The company employs about 2,700 people at eight worksites throughout the state. Most employees are spread across five locations in Aurora. [www.raytheon.com](http://www.raytheon.com)

- **United Launch Alliance (ULA)**, a joint venture between Lockheed Martin's Atlas and Boeing's Delta launch divisions is headquartered in Centennial, with about 1,800 members of its 4,200-person workforce in Metro Denver. Most of ULA's management, engineering, and mission support functions are concentrated in Colorado, while most assembly and integration operations are concentrated in Alabama, Texas, and California. [www.ulalaunch.com](http://www.ulalaunch.com)

#### **Additional Major Private Aerospace Companies**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• ABSL Space Products<br/><a href="http://www.abslspaceproducts.com">www.abslspaceproducts.com</a></li> <li>• Barber-Nichols<br/><a href="http://www.barber-nichols.com">www.barber-nichols.com</a></li> <li>• DigitalGlobe<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>• IHS Aerospace &amp; Defense<br/><a href="http://aero-defense.ihs.com">http://aero-defense.ihs.com</a></li> </ul> | <ul style="list-style-type: none"> <li>• Merrick &amp; Company<br/><a href="http://www.merrick.com">www.merrick.com</a></li> <li>• MicroSat Systems Inc.<br/><a href="http://www.micosatsystems.com">www.micosatsystems.com</a></li> <li>• SEAKR Engineering, Inc.<br/><a href="http://www.seakr.com">www.seakr.com</a></li> <li>• SpaceDev Inc. (Sierra Nevada Corp.)<br/><a href="http://www.sncorp.com">www.sncorp.com</a></li> <li>• Surrey Satellite Technology Ltd.<br/><a href="http://www.sstl.co.uk">www.sstl.co.uk</a></li> </ul> |
|--|---|

### ***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, 35 percent have completed at least a bachelor's degree. That makes Colorado the third-most educated state in the country behind Massachusetts and Maryland. (U.S. Census Bureau, American Community Survey, 2007)
- Colorado ranked eighth in the number of Ph.D. scientists and engineers as a percent of the workforce in 2006. The state ranked fourth in computer specialists as a share of the workforce. These measures point to a large pool of potential innovators in the state. (National Science Foundation, 2008)
- Two Colorado communities rank in the top 20 metropolitan areas for the percentage of employment in science and engineering occupations. Boulder ranked first in the nation in 2006, and Colorado Springs ranked 16th. (National Science Board, 2008)
- 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). This benefits Colorado's fastest-growing industries, including aerospace. WIRED awarded two grants to space programs and incubators. (Metro Denver WIRED Initiative)
- *Forbes* magazine named Boulder first among the 25 "Smartest Cities in America" in 2008. The ranking of the nation's largest metro areas was based on each area's percentage of adult population with at least a bachelor's degree, and Boulder's 53 percent was highest overall. (*Forbes*, 2008)
- Colorado ranks 11th 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 and U.S. Census Bureau, 2007)
- Colorado ranks third in the nation for its ability to support a knowledge- and technology-based economy, according to the Milken Institute's *2008 State Technology and Science Index*. The index measures 77 indicators in five categories – education, the science and engineering workforce, research and development, high-tech employment concentration, and entrepreneurial environment. (Milken Institute, 2008)

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

- The region's aerospace industry 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, 2008)
- Colorado recipients were awarded more than \$354.7 million in NASA prime contracts in 2007, earning the state an eighth-place ranking nationally. This included \$285.9 million in business contracts and \$68.8 million in educational and nonprofit contracts. Major recipients included Lockheed Martin, Ball Aerospace, and the University of Colorado, which received the second-largest amount of research funding among public educational institutions in fiscal year 2007. (National Aeronautics and Space Administration, 2008)

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

- Legislation passed in 2008 simplified Colorado's corporate tax structure by establishing a "single sales factor" for multi-state corporations, effective for tax years beginning January 1, 2009. Single factor apportionment allows companies to pay taxes based solely on their sales in the state. Colorado's corporate income tax rate of 4.63 percent is one of the lowest in the nation. (State of Colorado; The Tax Foundation, 2008)
- The Metro Denver average office occupancy cost of \$27.55 per square foot in the central business district falls in the middle of the rates for 65 major cities in the U.S. and Canada. (CB Richard Ellis, *Global Marketview Office Occupancy Costs*, November 2008)

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

- Colorado ranked sixth on *Forbes'* 2008 "Best States for Business" list. The magazine ranks the business climate in all fifty states based on labor force quality, regulatory environment, quality of life, overall growth potential, and other criteria. (*Forbes*, 2008)
- Colorado ranked third in the "U.S. Economic Freedom Index." The state earned high scores for fiscal indicators, indicators of social welfare and related spending, and the measure of overall government size. (Pacific Research Institute, 2008)
- CNBC named Colorado the fifth-best state for business in its "America's Top States for Business 2008" ranking. The state placed among the nation's top 10 for quality of life and business friendliness and among the top 15 for workforce quality, access to capital, technology, and the overall economy. (CNBC, 2008)
- Metro Denver placed third among the nation's 50 largest metro areas as the best location for businesses. Criteria for the ranking included population growth, job growth and unemployment, and the number of companies listed among the Fortune 1000, S&P 500, and Russell 2000. (MarketWatch, 2009)
- A stable economy and outdoor lifestyle make Metro Denver one of the top places to live and start a business, according to CNNMoney.com. Metro Denver ranked seventh on the online magazine's 2008 "Best Places to Live and Launch" list, and the report describes the region's transportation infrastructure and well-educated workforce as key enticements for entrepreneurs. (CNNMoney.com, 2008)
- Fort Collins is the third-best place in the U.S. for business and careers. Home to Colorado State University, the city offers a highly educated workforce, strong job growth, and low business costs. (*Forbes*, 2008)

## 5. Proximity to Colleges/Universities

- Two academic institutions in Colorado offer nationally ranked aerospace programs or degrees:
  - The U.S. Air Force Academy, located in Colorado Springs, offers the second-best aerospace engineering and undergraduate program in the nation. (*U.S. News & World Report*, 2008)
  - The University of Colorado at Boulder (CU-Boulder) offers a top-20 ranked aerospace engineering doctorate program. CU-Boulder is a member of the U.S. Air Force Space Education Consortium. (*U.S. News & World Report*, 2008)
- In 2008, the 8th Continent Aerospace Business Incubator opened at the Colorado School of Mines. The incubator will link developing aerospace companies with investors, legal resources, and public relations assistance.
- CU-Boulder and SpaceDev Inc. partnered to create eSpace: The Center for Space Entrepreneurship. eSpace is a not-for-profit organization dedicated to creating new entrepreneurial space companies, commercializing aerospace technologies created within these companies, and developing the aerospace workforce to support them.
- Colorado State University (CSU) in Fort Collins is nationally known for its programs and institutes dedicated to atmospheric science and research. Scientists from CSU and Boulder-based Ball Aerospace built the \$217 million CloudSat project, the world's most sensitive cloud radar for understanding earth's weather and climate processes.
- Three Colorado universities are members of the Universities Space Research Association – 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.
- As of 2005, 13 astronauts had graduated from the University of Colorado at Boulder, making it the second ranked single-campus, non-military, public university in the country. (National Aeronautics and Space Administration, *Astronaut Fact Book*, January 2005)

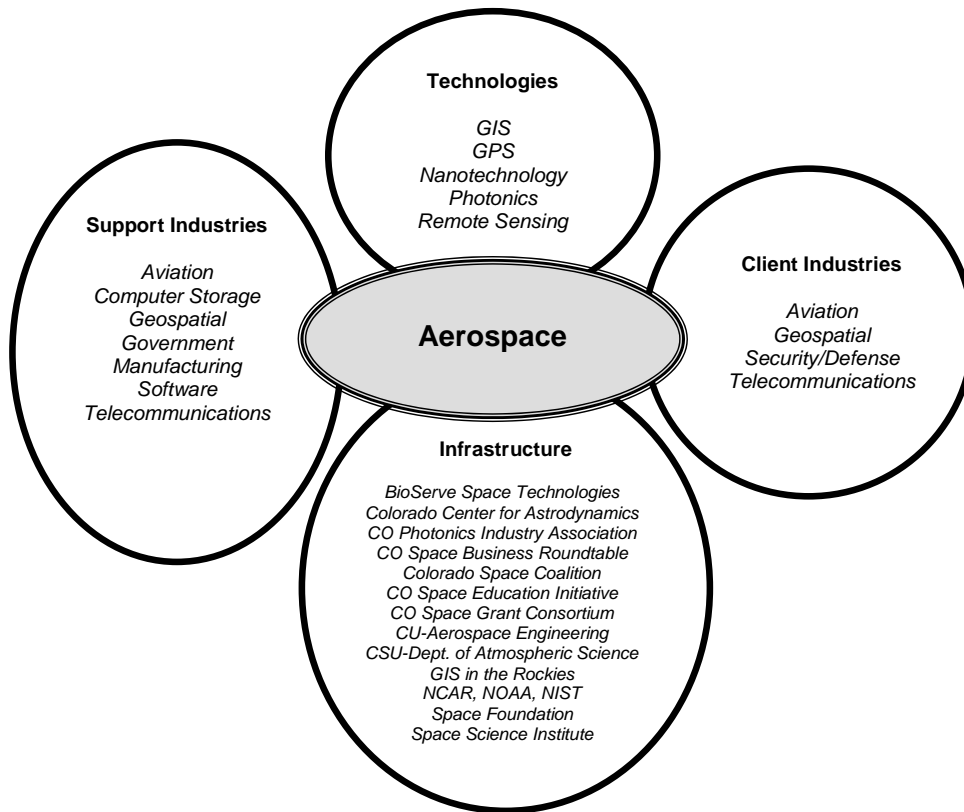
## ***Aerospace Industry Cluster Definition***

<b>NAICS Code*</b>	<b>NAICS Description</b>	<b>SIC Code</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 & steel forging	3462-05	Missile & ordnance forgings mfg.
332111 (P)	Iron & steel forging	3463-02	Nonferrous missile & ordnance forgings mfg.
332313 (P)	Plate work mfg.	3443-1104	Space simulation chambers, metal plate mfg.
332813 (P)	Electroplating, plating, polishing, anodizing & coloring	3471-0204	Decontaminating & cleaning of missile or satellite parts mfg.
332993 (P)	Ammunition (except small arms) mfg.	3483-0101	Arming & fusing devices for missiles mfg.
332993 (P)	Ammunition (except small arms) mfg.	3483-9910	Missile warheads mfg.
333314 (P)	Optical instrument & lens mfg.	3827	Optical instruments & lenses
334220 (P)	Radio & television broadcasting & wireless communications equipment mfg.	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 & supplies mfg.	3842-0113	Space suits mfg.
423860 (P)	Transportation equipment & supplies (except motor vehicle) merchant wholesalers	5088-0300	Aircraft & space vehicle supplies & parts - wholesale trade

NAICS Code*	NAICS Description	SIC Code	SIC Description
423860 (P)	Transportation equipment & supplies (except motor vehicle) merchant wholesalers	5088-0305	Guided missiles & space vehicles - wholesale trade
423860 (P)	Transportation equipment & supplies (except motor vehicle) merchant wholesalers	5088-0307	Space propulsion units & parts - wholesale trade
517110 (P)	Wired telecommunications carriers	4841-9905	Satellite master antenna systems services (smatv)
517410 (P)	Satellite telecommunications	4899-9902	Satellite earth stations
517919 (P)	All other telecommunications	4899-9905	Missile tracking by telemetry or photography
927110	Space research & technology	9661	Space research & technology
927110	Space research & technology	4789-9902	Space flight operations, except government

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

## Aerospace Industry Cluster Relationships



For additional information, contact us:



**Metro Denver**  
 Economic Development Corporation

1445 Market Street  
 Denver, CO 80202-1790  
 303.620.8092  
 e-mail: [info@metrodenver.org](mailto:info@metrodenver.org)  
[www.metrodenver.org](http://www.metrodenver.org)  
[www.metrodenverGIS.org](http://www.metrodenverGIS.org)



**COLORADO SPACE COALITION**

For more information on Colorado's aerospace industry:

1445 Market Street  
 Denver, CO 80202-1790  
 303.620.8092  
 e-mail: [info@spacecolorado.org](mailto:info@spacecolorado.org)  
[www.spacecolorado.org](http://www.spacecolorado.org)