



COLORADO

Department of Military
and Veterans Affairs

Colorado Military Space Strategy



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Executive Summary

Colorado Military Space Strategy

The Department of Defense is reorganizing the national security space structure and enhancing space capabilities. There are many discussions and studies taking place to identify what this enterprise will do and how it will be structured, but in Colorado we believe one thing is clear:

Colorado is the right home for Department of Defense Space assets now and into the future.

Ready Forces

- Colorado is the Department of Defense’s center of gravity for space operations.
- **Today:** Colorado is home to the U.S. Air Force Space Command, and three of its five active-duty space wings; U.S. Northern Command/NORAD; U.S. Army’s only space brigade; GPS satellite control systems; both mobile and fixed space-based missile warning; Missile Defense Agency test operations; 85 percent of Army National Guard space assets; and the largest, oldest Air National Guard Space group.
- **Tomorrow:** Colorado hosts command and control of the nation’s space defense enterprise, as the home to U.S. Space Command and Colorado-hosted military space capabilities meet threats in a vital and increasingly contested domain.

Partnerships

- **Government:** Multiple past and on-going initiatives keep Colorado a military and space friendly host.
- **Industry:** Colorado hosts over 500 space-related businesses and eight major space contractors: Lockheed Martin, Ball, Boeing, Raytheon, Northrup Grumman, Sierra Nevada Corporation and United Launch Alliance.
- **Academia:** From space-focused charter schools to world-renowned university aerospace programs, the state actively engages in space innovation and develops a technically focused workforce. A well-educated state, Colorado has the highest percentage of residents with a bachelors degree, or higher, of any top aerospace state (39.9 percent), and Colorado ranks as the second highest when compared to all states.

People

- **Military Space Professionals:** More than 29,000 military personnel work in Colorado.
- **Military Space Training & Education:** Multiple professional military space-education and training courses exist in Colorado, to include: National Security Space Institute, Functional Area 40, Advanced Space Operations School, and assorted weapons-systems mission qualification courses.
- **Military Families:** Colorado is a signatory to the DoD Education Activity’s Interstate Compact on Educational Opportunities for Military Children; provides in-state tuition for military children; and allows spouses to practice their professions upon arrival through professional license reciprocity.

On the cover: Mars Atmosphere and Volatile Evolution (MAVEN) propellant tank installation at Lockheed Martin, in cooperation with the University of Colorado, performed in the Denver metropolitan area. (Photo by Lockheed Martin)



A Message from The Adjutant General of Colorado

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John W. Hickenlooper
Governor

Major General
Michael A. Loh
The Adjutant General



September 11, 2018

Fellow Coloradans,

The re-establishment of United States Space Command as a combatant command foretells an exciting and dynamic time in the history of our nation's Military Services. As the Department of Defense markedly enhances and reorganizes the National Security Space enterprise, it's important for Colorado's leaders to share with our Congressional delegation and Department of Defense partners the distinct benefits that are a part of working and living in Colorado.

Colorado has a long and deep connection to our nation's military space efforts. Cheyenne Mountain Air Force Station became operational in 1966, foreshadowing the growing importance of the Centennial State in our nation's space strategy. This position solidified with the establishment of U.S. Air Force Space Command at Peterson Air Force Base in 1982. Three years later saw the opening of both U.S. Space Command and Falcon Air Force Station (now Schriever Air Force Base).

As Colorado's military space assets have grown, so has Colorado's aerospace industry. Colorado has the second-largest aerospace industry in the nation and boasts the nation's most aerospace jobs per capita. We are the home to more than 500 space-related companies. This dynamic environment, coupled with our outstanding research institutions and growing population, creates a land of opportunity for both military space operations and the industries that support them.

Those synergies are best seen in the reserve component, where military professionals continue their military careers while furthering industry careers. Colorado is home to the largest concentration of National Guard and Reserve space personnel in both the Air Force and the Army. With eight major aerospace companies operating here, we create a mutually beneficial ecosystem that supports our nation's space efforts in military and civil sectors. Additionally, many of our more than 400,000 military veterans contribute to the space industry in Colorado. With state benefits for veterans and the new Rocky Mountain Regional VA Medical Center, Colorado ensures a welcoming home for veterans to continue their service in space jobs.

We can only attract and maintain the highly skilled personnel who work in both the military and civilian space sectors if we have the support of their families. Colorado has worked hard to create opportunities for all, particularly our military families. As a signatory to the Interstate Compact on Educational Opportunity for Military Children, we've removed barriers to transitioning school-age children. With professional license reciprocity, we allow military spouses to practice their professions immediately upon arrival, ensuring the continuation of their careers. Our state institutions of higher education offer in-state tuition to military children, even if they've moved to another state prior to completing high school.

I encourage you to use this strategy as a guide for your interactions with local and national stakeholders, as Colorado will inevitably feature prominently in ongoing discussions of developing space-focused personnel, units and commands increasingly critical to our nation's defense, now and into the future.

Major General Michael A. Loh
The Adjutant General of Colorado
Executive Director, Colorado Department
of Military and Veterans Affairs

Background



Space Warning Data Providers

460th Space Wing Commander U.S. Air Force Col. Troy Endicott (right) and Lt. Col. Michael Kruk the 11th Space Warning Squadron Commander (center) brief Colorado Gov. John Hickenlooper (left) on the Space-Based Infrared System in the Mission Control Station lobby at Buckley Air Force Base, Colorado, July 17, 2018. While on base, Hickenlooper received an in-depth brief on 460th theater and homeland defense mission capabilities, to include, global infrared surveillance, tracking, and missile warning.

In Section 1601 of the fiscal 2018 National Defense Authorization Act (Public Law 115-91), Congress required a report to “...review and identify a recommended organizational and management structure for the national security space components of the Department of Defense.” On August 9, 2018, the DoD provided that report, entitled “Final Report on Organizational and Management Structure for the National Security Space Components of the Department of Defense” (also known as the “1601 Report”). It outlined five actions to be immediately implemented by the DoD:

1. Accelerate Space Technology

In accordance with National Defense Strategy.

2. Space Development Agency

Establish a joint organization to rapidly develop and field the next-generation space-based capabilities.

3. Establish a Space Operations Force

Train and manage space warfighting professionals as a community.

4. Accountable Civilian Oversight

Oversee an affordable and efficient operating structure to provide service and support to the national security space community.

5. Establish a new U.S. Space Command

Improve and evolve space warfighting.

The report also called upon Congress to establish a sixth branch of the Armed Forces, the U.S. Space Force, which will organize, train and equip forces to protect national security interests in the space domain. The U.S. Space Force proposal will be submitted with the President’s budget for Congress to consider in preparation of the fiscal 2020 National Defense Authorization Act. If established, it is safe to assume the U.S. Space Force headquarters would be stationed with the other armed service headquarters in the Pentagon.

Colorado was the original home to the U.S. Space Command, as it existed from 1985 until 2002. The Centennial State remains poised as the ideal permanent home for a re-established U.S. Space Command headquarters, an objective Colorado leaders should vigorously plan for and pursue.

The following pages highlight why Colorado is the right choice, not only for the new U.S. Space Command headquarters, but also for additive space-missioned personnel and units required for this vision of the future.

233rd Space Group, Colorado Air National Guard, mission vehicles deploy to a secure, undisclosed location during field training, June 11, 2015, to conduct the space warning mission.

Transitions highlighted in this report are happening now.



Nation’s only mobile, survivable Space Warning Group

Colorado is the DoD center of gravity for space operations

Today: Colorado hosts U.S. Air Force Space Command, with three of its five active-duty space wings; U.S. Northern Command and NORAD; U.S. Army's only space brigade; GPS satellite control systems; both mobile and fixed space-based missile warning; Missile Defense Agency test operations; National Security Space Institute; 85 percent of Army National Guard space assets; and the largest, oldest Air National Guard space unit.

Tomorrow: Colorado hosts command and control of the nation's space defense enterprise, as the home to U.S. Space Command and Colorado-hosted military space capabilities meet threats in a vital and increasingly contested domain.

Colorado's goal is that command and control of the nation's space defense enterprise is re-established in Colorado as the U.S. Space Command. We are poised to build off of the array of space and conventional forces across all components and military branches currently in Colorado. This leverages our STEM education capacity and high quality of living to grow the military, civilian and contractor space forces needed to support them.

The Colorado National Guard continues to play a vital role in the space enterprise by growing new space units in the Army and Air National Guard, and transitioning those units to the Space National Guard, if a new Space Force is established. The CONG is home to our nation's first, largest ANG space unit, which is the ANG's only space group; and the Army's only space brigade and missile defense brigade. Colorado also hosts the only ARNG and Army Reserve space battalions.

With 85 percent of the ARNG's space personnel and 45 percent of the ANG's space personnel, Colorado is a natural fit for future military space professionals to live and work while maintaining national-security skills and honing their craft with space-related college and civilian employment opportunities – adding synergy for military, academia and industry.

A ground-based mid-course interceptor missile launches from Vandenberg Air Force Base, California. The defensive launches are initiated and tracked by the CONG-led 100th Missile Defense Brigade from the control center on Schriever AFB, Colorado, toward a ballistic missile test target over the Pacific Ocean Dec. 15, 2010.



We're #1 in Space

Concentration of military & civilian Space personnel
One-bounce satellite communication to Europe, Asia
Number of Reserve-component Space personnel

Collaboration opportunities
500 Space industry businesses
Hub of military Space education and training
Approved Spaceport 1 mile closer to space
5 universities with key aerospace programs
\$3.3 billion civilian space industry payroll
4 Space-related military bases
4 major military commands
500 Space industry businesses
Number of Aerospace jobs per capita



Partnerships

Colorado has the integrated partnerships to support a flourishing space ecosystem in defense and civil sectors. From industry to academia to government, our partner network annually highlights the National Space Symposium in Colorado Springs and Aerospace Day at the Capitol.

Government: Colorado has invested funds in buffer zones, ensured road access to and from military installations, and adopted legislation requiring notification of zoning changes to military installations. From managing encroachment near military runways, to ensuring line-of-sight for satellite transceivers, state and local governments create an enduring environment for successful mission accomplishment. Further ensuring success, state and local partners are completing a joint land-use study to develop best practices for communities near military installations in the Pikes Peak region. This community-driven plan will suggest goals for communities to adopt. The communities realize these measures ensure well-paying aerospace jobs are maintained and grown.

Industry: Colorado hosts over 500 space-related businesses and eight major space contractors: Lockheed Martin, Ball Corp., Boeing Co., Raytheon, Northrup Grumman, Sierra Nevada Corp., Harris Corp. and United Launch Alliance. This creates over 190,880 civilian jobs and \$3.3 billion in payroll. The Federal Aviation Administration granted a license to Spaceport Colorado, a facility for next-generation space vehicles, in August 2018. Only the 11th in the nation, this facility at Front Range Airport in Adams County is postured as a hub for space transportation, research and development. Fostering integration, the Space Foundation, Colorado Space Coalition, and Colorado Space Business Roundtable have flourished as foundational organizations that sustain and grow Colorado's space infrastructure.

As a leader in space, Colorado has hosted the Space Symposium since its founding in 1984. This brings over 11,000 global space-related industry leaders to Colorado to network about technological developments in space, bolstering the value of Colorado's space ecosystem.

Academia: From space-focused charter schools to aerospace programs at universities, Colorado actively engages in space innovation and developing a technologically-focused workforce. A partnership with Metropolitan State University of Denver and York Space Systems, trains a space-centric manufacturing workforce. The University of Colorado-Cororado Springs was selected to lead the Air Force Space Command's Space Education Consortium, made of 10 universities from across the globe, and serves as the primary source of civilian space-related education programs.

University of Colorado-Boulder

- #1 NASA-funded university in the world ~ *Denver Post*
- #4 Aerospace engineering-sciences graduate program ~ 2016 *National Research Council*
- #4 Astronaut producing non-military academy ~ *U.S. News & World Report*

United States Air Force Academy

- #1 Undergrad aerospace engineering program (where PhD is not offered) ~ *U.S. News & World Report 2016*
- #5 Top 21 STEM colleges of 2016 ~ *Forbes*
- #2 Astronaut producing university ~ *U.S. News & World Report*

Colorado School of Mines

- #15 Top 21 STEM colleges of 2016 ~ *Forbes*



U.S. Air Force Maj. Gregory Stewart, 22nd Space Operations Squadron mission commander, oversees Air Force Satellite Control Network antennas on Schriever Air Force Base.



Radomes protect and conceal the satellite dishes inside, which are used for a variety of national security space functions and are operated by the Aerospace Data Facility-Colorado on Buckley Air Force Base, Colorado.

Military installations and commands in Colorado provide \$27 billion to the state's economy and employ over 170,000 people. The personnel and training investment supports Colorado's space assets, reaping benefits as a growing and highly-educated population comes to live and work here.

Colorado works hard to ensure military members and their families thrive. This includes tax benefits for military retirees and active-duty military with their home of record here.

Military Space Professionals

More than 29,000 military space professionals work in Colorado – it's easy to see why. Colorado is the center of gravity for military space missions. As the home of military space education centers, we grow this force every day. By increasing Reserve Component space missions here the DoD will gain access to the nation's second highest college-educated workforce (highest of top aerospace states) and will increase synergy between military and industry experience.

Military Space Training & Education

Multiple professional military space education and training programs exist in here, e.g., National Security Space Institute, Functional Area 40, Advanced Space Operations School, and assorted weapon-systems mission qualification courses.

Military Families

The state understands the value of military families in support of their military members. Colorado is a signatory

on the Interstate Compact on Educational Opportunities for Military Children, which eases the transition of military moves and streamlines transfers into the state and between school districts; and Colorado provides in-state tuition for military children, including those who've left the state and choose to return to a Colorado university.

Military spouses can now practice their professions upon arrival through professional license reciprocity. Licensure portability has also been improved for teachers, and Colorado has joined several interstate compacts, including compacts on nursing, emergency medicine, and physical therapy.



100th Missile Defense Brigade, Colorado Springs

100th Missile Defense Brigade members discuss the unit's mission at the Colorado Aerospace Day at the Capitol, in Denver, March 21, 2016, to raise awareness of the unique missions of the U.S. Army's only missile defense brigade.

Left: U.S. Army Capt. Jennifer Staton, a space operations officer, Sgt. Cassandra Quinones and Pfc. Miranda Yost, Geo-spatial engineers, all with Army Space Support Team 30, 117th Space Support Battalion, Colorado National Guard, use mapping software for an exercise Aug. 4, 2014.

Right: U.S. Air Force Senior Airman Jonathan R. Smail, a satellite transmission systems technician with the 233rd Space Communications Squadron of the Colorado Air National Guard, was chosen from thousands of Airmen as the 2015 Air National Guardsman of the Year.



ARSST 30, 117th Space Battalion, Colorado Springs, Colorado

233rd Space Group, Greeley, Colorado

**We once reached West.
We now reach up.
Leading the way to new frontiers.**



Sculpture of Denver native and Apollo 13 astronaut John L. "Jack" Swigert, Jr., at Denver International Airport. Swigert graduated from Denver's East High School and the University of Colorado. (Photo by Bill Dickinson)

