

# The Aerospace Industry in New Mexico

New Mexico Economic Development Department

New Mexico State Data Center

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## SPACEPORT AMERICA (SA)

Spaceport America is owned by the State of New Mexico and is the world's first purpose-built commercial spaceport. The site area is approximately 28 square miles. The Virgin Galactic Gateway to Space is approximately 115,000 square feet and includes administrative offices, space vehicle hangar space, astronaut training areas, and viewing areas. Virgin Galactic has entered into a 20 year lease to locate its world headquarters at SA, launching its space tourism program at the Spaceport. The Spaceport Operations Center is a 14,000 square foot dome structure that will soon house the Spaceport offices, support contractor offices, and emergency response personnel and equipment. The Spaceport runway is 10,000 feet by 200 feet in the 16-34 orientation. The concrete surface is designed to accommodate all classes of aircraft including wide body commercial aircraft. SA is also used by numerous private companies and scientific and engineering research programs. Currently there are a number of entrepreneurs developing and flying both vertical and horizontal launch vehicles towards exploring commercial space travel opportunities. In addition to Virgin Galactic, SA clients include Lockheed Martin, Boeing, Moog-FTS, UP Aerospace, Microgravity Enterprises, Armadillo Aerospace, and Celestis.

[www.spaceportamerica.com](http://www.spaceportamerica.com)

## UNITED STATES AIR FORCE PRESENCE

### Cannon Air Force Base

#### *Clovis*

Cannon Air Force Base is home to the 27<sup>th</sup> Special Operations Wing. The base is eight miles west of Clovis and totals 3,789 acres. The Melrose Air Force Range training area is located approximately 25 miles west of Cannon and is 60,210 acres. Operations on Melrose Range also cover an area of 2,500 square miles of airspace. Melrose AF Range is used for training such as air to ground, small arms, and electronic combat. Approximately 5,000 military and civilian personnel make up the workforce at Cannon.

The 27<sup>th</sup> Special Operations Group is one of four groups assigned to the 27<sup>th</sup> Special Operations Wing. The group accomplishes global special operations tasking as an Air Force component member of the United States Special Operations Command. It conducts infiltration/exfiltration, combat support, helicopter and tilt-rotor aerial refueling, psychological warfare, and other special missions. It directs the deployment, employment, training, and planning for squadrons that operate the AC-130W, AG-130H, PC-12, Q-200, M-28, CV-22, and other aircraft, and

provides operational support to flying operations. There are three squadrons, three tenant units and one detachment within the group. <http://www.cannon.af.mil/>

### Holloman Air Force Base

#### *Alamogordo*

Holloman AFB was originally established in 1942 as Alamogordo Air Field and renamed for Colonel George Holloman in 1948. It is six miles west of Alamogordo and 59,639 acres. Holloman supports about 21,000 Active Duty, Guard, Reserve, retirees, DoD civilians and their family members.

Present aircraft flown at Holloman: F-22A Raptor, T-38 Talon, MQ-1 Predator, MQ-9 Reaper, QF-4 Drone, F-4 Phantom II and German Air Force Tornado. Holloman is home to the world's longest (50,788 feet, or almost 10 miles) and fastest (approaching 10,000 feet per second, Mach 9) test track. The 846<sup>th</sup> Test Squadron set the world land speed record for a railed vehicle with a recent run of 6,453 mph, or Mach 8.5.

Personnel from Holloman have participated in numerous operations and conflicts such as: Operation Desert Shield/Desert Storm, Operation Allied Force, Operation Southern Watch, Operation Northern Watch, Operations Enduring Freedom, Operation Iraqi Freedom, and many more.

The 49<sup>th</sup> Wing – host wing at Holloman – supports national security objectives by deploying worldwide to support peacetime and wartime contingencies. The wing provides combat-ready Airmen, F-22 Raptors, and trains MQ-1 Predator, and MQ-9 Reaper pilots and sensor operators. <http://www.holloman.af.mil/>

### Kirtland Air Force Base

#### *Albuquerque*

Kirtland Air Force Base is in southeast Albuquerque and is home to the Defense Threat Reduction Agency Albuquerque office, the Air Force Safety Center, the Air Force Inspection Agency, the Air Force Operational Test and Evaluation Center, the 58th Special Operations Wing, Space Development and Test Directorate, the New Mexico Air National Guard 150th Wing, the Directed Energy and Space Vehicle Directorates of the Air Force Research Laboratory, the Department of Energy Albuquerque Office, the National Nuclear Security Administration and Sandia National Laboratories.

The U.S. Air Force Safety Center's Remotely Piloted Aircraft (RPA) Safety Branch is dedicated to substantially reducing RPA mishap rates by developing RPA safety solutions and providing commanders the ability to thoroughly investigate and prevent mishaps without negatively impacting combat operations. The RPA Safety Branch has also taken a lead role integrating RPA's into the National Airspace System. The RPA Safety Branch is taking a proactive approach to preserve combat capability through focused policy, guidance, risk assessment, analysis, and investigations.

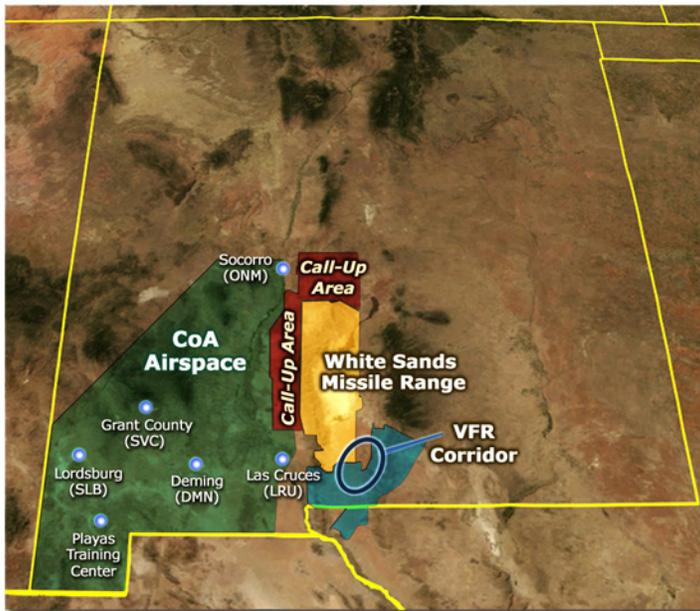
Flying operations at Kirtland AFB share the flightline, runways and airspace with commercial aviation at the Albuquerque Sunport. <http://www.kirtland.af.mil/>

## RESEARCH CAPACITY AND TESTING FACILITIES

### New Mexico State University Physical Science Laboratory (PSL)

#### *Las Cruces*

The Physical Science Laboratory (PSL) at New Mexico State University is a world-recognized leader in sub-orbital platforms, information modeling for predictive decision making, specialized intelligence community support, advanced NASA scientific exploration and experimentation, homeland security sensing and detection technologies, and advanced weapons and countermeasures development and testing. PSL's resources include the Aircraft Systems Flight Test Center, the Environmental Test Facility, and the Propulsion Test Laboratory.



PSL is the only FAA approved Unmanned Aircraft Systems Flight Test Center (UAS FTC) in the U.S. The UAS FTC specializes in UAS flight testing, crew training, and UAS demonstrations. It is currently the one location for which government, manufacturers, and civil entities can test their unmanned aircraft. PSL conducts an airworthiness assessment prior to any flight operations, and the process is accepted and overseen by the FAA. The test center can accommodate any size. The UAS FTC specializes in

unmanned systems flight testing and provides the capability to test several classes of UAS in a common area. The test center can accommodate any UAS size, platform or application and operates under an FAA Certificate of Authorization (CoA) that permits UAS flights in over 15,000 square miles of coordinated airspace in southeastern New Mexico. UAS operators can access the airspace from several airports located within the lateral boundaries of the operating area, including Las Cruces (LRU), Lordsburg (SLB), Deming (DMN), Grant County (SVC), and Socorro (ONM).

UAS FTC processes provide rapid airspace access. The UAS FTC follows FAA-approved procedures that allow federal and civilian UAS manufacturers and operators an alternative to CoA and experimental aircraft certification processes. The time from initial inquiry to first flight can be a matter of weeks. The cost per flight hour at the UAS FTC provides the best value for all users. Flexible scheduling practices and vast airspace allow the UAS FTC to accommodate a wide range of UAS operations.

PSL also has UAS for research and development of sensors and payloads. Their 21' and 24' wingspan Aerostar UAS provide excellent platforms for sensor development and flight testing. The Aerostar can handle up to 100 lbs. In addition to the Aerostar UAS, PSL has several other smaller UAS for R&D testing. Also available are several surrogate UAS platforms (manned) which can carry and test payloads and sensors; PSL flight operations personnel are experienced in defining test plans and methodologies for all of these test operations.

The Physical Science Laboratory's Environmental Test Facility has comprehensive UAS component testing capabilities, and assists the FAA in developing certification standards for the UAS industry. As the industry moves toward safe integration of UAS into the National Airspace System (NAS), the establishment of FAA standards for UAS components becomes more important. Therefore, the facility has been established to assist UAS manufacturers in assessing the operational suitability of various UAS components. PSL personnel have a long history of component quality assurance in aerospace and defense programs.

The Environmental Test Facility is equipped with an anechoic chamber with complete radio frequency testing capabilities for a broad range of applications and is ideally equipped to fully optimize datalink technology. The facility includes a vacuum test chamber, a thermal test chamber, and a vibration *table* .

The Propulsion Test Laboratory collects data for the purpose of defining operating characteristics of UAS engines, to provide data for establishing maintenance procedures and to support regulatory development for UAS engines. The laboratory operates a fully enclosed UAS propulsion test facility with digital data acquisition systems, dynamometer capacity up to 100 horsepower. Current test capabilities include:

- Engine power measurements
- Reliability testing
- Power measurements
- Long duration
- Power cycles
- Failure analysis
- Fuel consumption
- Digital data acquisition
- Maintenance requirements

<http://www.psl.nmsu.edu/>

#### Air Force Research Laboratory (AFRL) at Kirtland Air Force Base Albuquerque

The Air Force Research Laboratory's capabilities and areas of expertise support intelligence, surveillance and reconnaissance, defensive space control, space situational awareness, responsive space and all areas of small satellite development. Additionally, the directorate provides substantial technical and educational outreach programs for students, such as the Space Scholars and University Nanosatellite Program.

The AFRL Space Vehicles Directorate is comprised of three distinct divisions located at Kirtland Air Force Base:

- The Battlespace Environment Division specifies, forecasts, mitigates and explores environmental impacts to U. S. space systems and operations. Research areas include space weather sensing and modeling, hyperspectral data exploration, hypertemporal imaging and space object surveillance. The Space Weather Center of Excellence also operates research facilities at Sunspot, N.M. and Gakona, Alaska.
- The Spacecraft Technology Division develops next-generation spacecraft bus and payload technology elements to reduce cost, improve performance and enable new missions. The division's research areas include space qualifiable electronics; plug-and-play avionics; spacecraft components such as power generation and management, structural systems and guidance; navigation controls and autonomy technologies; and space-based advanced-sensor systems.
- The Integrated Experiments and Evaluation Division's primary mission is to develop and integrate ground, space and near space experiments designed to assess and prove emerging technologies and concept of operations for military space applications. This is facilitated by modeling, simulation, technical analysis and military utility assessment, as well as robust satellite integrations and test facilities, and balloon payload operations.

[http://www.kirtland.af.mil/afri\\_vs/index.asp](http://www.kirtland.af.mil/afri_vs/index.asp)

#### Configurable Space Microsystems Innovations & Applications Center (COSMIAC) at the University of New Mexico

##### *Albuquerque*

COSMIAC promotes innovation in space Microsystems through its research and development efforts that are designed to lead to greater insight into how space Microsystems support new space capabilities as well as to hasten the demonstration and commercialization of key new microsystem-based solutions for use by space system developers. COSMIAC's research and development programs serve each level of the space system hierarchy including:

- complete, compact spacecraft to enhance GPS accuracy and reliability in the space environment for improved weather monitoring and prediction;
- responsive new architectures, interfaces, and systems engineering tools that can be used to quickly compile and integrate new spacecraft designs and functions;
- advanced modules and components that support essential bus and payload operations; and
- new design and verification tools that provide enhanced robustness for new FPGA designs that permit the latest FPGA fabrics and capabilities to be harnessed by the space community.

COSMIAC is building the Trailblazer Satellite, which has been manifested by NASA on the Educational Launch of Nanosatellites (ELaNa) IV Mission. The Trailblazer Satellite is part of a class of nanosatellites called CubeSats. It will be delivered to space as part of the Space-X Commercial Resupply Services (CRS) mission to be launched in 2012. The orbit for the UNM CubeSat is a 325km circular orbit with a 51.6 degree inclination. This satellite will provide a proof-of-concept flight for an Air Force-sponsored bus design called Space Plug-and-play Architecture (SPA). The PnP type architecture is a capability that will allow for rapid development and delivery of satellite and defense systems similar to what is currently available in a home computer. <http://www.cosmiac.org/>

### White Sands Missile Range (WSMR)

White Sands Missile Range provides Army, Navy, Air Force, DoD, and other customers with high quality services for experimentation, test, research, assessment, development, and training in support of the nation at war. WSMR has an extensive history for rockets, missile, UAV, and space vehicle testing and has supported testing and evaluation efforts for Apollo, Skylab, Delta Clipper, X-40, Space Shuttle, and Orion CEV projects as well as numerous military rocket and missile programs. <http://www.wsmr.army.mil/Pages/Home.aspx>

The Testing Facility serves both private and governmental entities in the aerospace industry. Services and facilities include:

- Unmanned Systems Sensors and Weapons (UAS, UAV, UGV)
- Space Systems and Sensors
- Directed Energy (High Power Microwave and Laser)
- Countermeasures (Directed Energy (High Power Microwave and Laser)
- Missiles and Rockets
- Urban Environments Effects
- Command, Control, Communications, and Computers, Intelligence, Surveillance and Reconnaissance (C4ISR)
- Electronic Environmental Effects (E3) (EMI, EMC, EMP, HERO, HERF, HERP)
- Nuclear Weapons Effects
- System of Systems

WSMR owns 3,421 square miles of ground space which can be expanded to as much as 7,619 square miles through agreements with adjacent land owners. It directly controls 10,020 square miles of airspace which can be expanded to 11,130 square miles by activating restrictions.

<http://www.wsmr.army.mil/testcenter/Pages/Home.aspx>

### NASA White Sands Test Facility (WSTF)

#### *Las Cruces*

WSTF conducts simulated mission duty cycle testing to develop numerous full-scale propulsion systems. These systems have been developed for the Apollo Service Propulsion and Lunar modules, Shuttle Orbiter, and the International Space Station (ISS). Additionally, WSTF evaluates upgraded or redesigned shuttle orbiter components to extend service life, enhance performance, and improve mission safety. WSTF is formally certified to perform precision cleaning and depot-level refurbishment of flight-critical propulsion systems components.

The scientific investigation of explosion phenomena at WSTF is aimed at improving safety at launch facilities and other areas where hazardous materials are used. Ultra-high-speed instrumentation helps better define safety and structural requirements for new and existing launch facilities by measuring the effects of exploding liquid and solid propellants.

WSTF is a center of technical excellence in the fields of high-pressure oxygen systems/materials and rocket propellant safety. WSTF offers:

- functional and performance evaluation tests
- hazards/failure analyses of materials, components, and complete systems
- system design evaluation and recommendations

- safety training courses and manuals

The following services are available for government and commercial customers:

#### Testing Materials and Propulsion Systems

- ignition, flammability, odor, and offgassing
- materials compatibility with routine or hazardous fluids
- aerospace fluid systems and components
- hyper- and low-velocity testing
- solid/liquid rocket systems up to 60,000 lb thrust
- nine rocket engine/system test stands, including six vacuum cells
- long-duration high-altitude simulation
- off-limits and life-cycle testing

#### Research and Development

- burn-resistant alloy
- blast phenomena and propellant explosion studies
- propellant chemistry and characterization
- spacecraft material properties
- metals, polymers, composites

#### Technical Consultation

- hazards/failure analyses with system design evaluation and recommendations
- oxygen, hydrogen, propellant hydrazines, nitrogen tetroxide
- cryogenic and hypergolic propellant handling

#### Technical Capabilities

- chemical, physical, and metallurgical analyses
- nondestructive evaluation techniques
- state-of-the-art analytical instrumentation

WSTF supports an extensive number of test programs, most of which are instrumented for temperature, pressure, load, acceleration, and other measurements. The WSTF Measurement Standards and Calibration Laboratory ensures that the instruments used to make these measurements are accurate by calibrating them against recognized standards.

WSTF maintains an 18,000 square foot precision machining and fabrication facility with expert machinists and welders, each with over 20 years experience. The fabrication team is skilled in working with exotic metals like Monel®, Inconel®, titanium, carbon, and alloy steels. With precision machining and welding capabilities, the facility produces flight hardware, ground support equipment, and facility and test hardware. WSTF also has highly automated, computer numerically controlled milling and turning capabilities.

Component service operations consist of hardware precision cleaning, component assembly, and component calibration. Extensive cleaning and refurbishing experience with numerous valve configurations, metal types, and elastometrics is provided via a full-service clean room and valve shop.

WSTF Flight and Critical Hardware Processing employs a small team of highly skilled engineers and technicians with nearly 500 years of combined technical expertise in the processing, development, and qualification of flight hardware. The Hardware Processing Office now includes a Flight Cable Manufacturing Facility capable of fabricating flight-qualified electrical cables and cable harness assemblies.

WSTF maintains several clean rooms and large areas that can be used for test article assembly and checkout. These areas range from Class 100 clean rooms and flow benches to large size assembly areas. <http://www.nasa.gov/centers/wstf/home/index.html>

### The Very Large Array (VLA)

*Datil, New Mexico*

The Very Large Array, one of the world's premier astronomical radio observatories, consists of 27 radio antennas in a Y-shaped configuration on the Plains of San Agustin fifty miles west of Socorro (New Mexico). Each antenna is 25 meters (82 feet) in diameter. The data from the antennas is combined interferometrically to give the resolution of an antenna as much as 36 kilometers (22 miles) across, with the sensitivity of a dish 130 meters (422 feet) in diameter. The results are maps of radio frequency energy sources on the sky that are analogous to optical images.

Radio waves of various wavelengths are produced by many different astronomical processes, and can penetrate dust clouds that are opaque to visible light. Thus, vast and very productive areas of astronomical research are enabled by the facility.

Constructed in 1975, the VLA is used by astronomers around the world and is occasionally used for atmospheric/weather studies and satellite tracking. [www.vla.nrao.edu/](http://www.vla.nrao.edu/)

### Sandia National Laboratories (SNL)

*Albuquerque*

Sandia is a government-owned/contractor operated facility. Sandia Corporation, a Lockheed Martin company, manages Sandia for the U. S. Department of Energy's National Nuclear Security Administration. Sandia's mission falls into five areas:

- Nuclear Weapons
- Energy, Climate & Infrastructure Security
- Nonproliferation
- Defense Systems & Assessments
- Homeland Security & Defense

Sandia has more than 25 years of established space technologies and expertise. SNL is part of a national team developing the Precision Tracking Space System (PTSS), an alternative approach for detecting and tracking dim targets.

Sandia's Radar Fuzing Department falls under the Nuclear Weapons' directorate and designs and produces Arming and Fuzing Subsystems (AFS). The AFS is a highly integrated assembly that performs the missile interface, programmer, re-entry sensor, data multiplexer, and radar functions.

The Aegis Readiness Assessment Vehicle (ARAV) team was presented with the 2010 David Packard Excellence in Acquisition Award by Hon. Ashton Carter, undersecretary of defense for acquisition, technology, and logistics, in recognition of its innovative acquisition practices in building, integrating, and launching eight ballistic missile targets, including a new vehicle that allows the U. S. to test against complex, realistic countermeasures. The ARAV team sought to build and launch a cost-effective family of high fidelity ballistic missile targets. The resultant ARAV-As and -Bs are more than 85 percent less costly than the targets they replaced.

The Key Data Processor (KDP) is a Sandia-designed cryptographic engine at the heart of each Selective Availability Anti-Spoofing Module GPS receiver. The module decrypts GPS satellite transmission and grants access to military signals and data for increased precision and signal authentication.

Sandia developed a next-generation optical sensor that was launched on a Global Positioning System satellite in 2010. The sensor is designed to detect atmospheric and space nuclear detonations.

Located in Sandia Tech Area 4, the Nuclear Detonation Detection System (NDS) Analysis Package (NAP) Ground System is a unique, autonomous earth station capable of tracking and capturing telemetry data from multiple NAP-equipped GPS satellites simultaneously.

The Center for Integrated Nanotechnologies (CINT) is one of five Nanoscale Science Research Centers sponsored by the U. S. Department of Energy. The core facility is at SNL and the gateway facility is at Los Alamos National Laboratory. The scientific staff and capabilities at CINT are organized into four interdisciplinary Science Thrusts:

- Nanoscale Electronics & Mechanics - Control of electronic transport and wave functions, and mechanical coupling and properties using nanomaterials and integrated structures.
- Nanophotonics & Optical Nanomaterials - Synthesis, excitation and energy transformations of optically active nanomaterials and collective or emergent electromagnetic phenomena (plasmonics, metamaterials, photonic lattices).
- Soft, Biological & Composite Nanomaterials - Solution-based materials synthesis and assembly of soft, composite and artificial bio-mimetic nanosystems.
- Theory & Simulation of Nanoscale Phenomena - Assembly, interfacial interactions, and emergent properties of nanoscale systems, including their electronic, magnetic, and optical properties.

SNL Manufacturing Enterprise is comprised of approximately 125 tradespersons and support personnel performing the following services:

1. Machining:
  - Heavy Machining — Machines with capacity of 50,000 pounds and 84 inches long
  - Project Machining — Machining services and project management
  - Rapid Turnaround — Rapid response to manufacturing needs
  - Miniature Machining — Microscopic machining
  - Composite Machining, Grinding, & Polishing — Machining of non-metals
  - Explosive Processes — Explosives machining by remotely operated equipment

2. Manufacturing Liaison: The electronic and mechanical liaison group works with inside shops and over 2,000 outside suppliers.
3. Welding, Fabrication, & Assembly: Onsite or remote welding, assembly and repair
4. Precision Metal Forming: Aircraft quality sheet metal fabrication
5. Heat Treatment: Hardening, normalizing, annealing

[www.sandia.gov](http://www.sandia.gov)

#### Los Alamos National Laboratory (LANL)

##### *Los Alamos*

LANL is located 35 miles northwest of Santa Fe, employing more than 10,000 with an annual budget of more than \$2 billion. The Laboratory is operated by Los Alamos National Security, LLC (LANS), a team composed of Bechtel National, Inc., the University of California, the Babcock & Wilcox Company, and URS Energy and Construction, Inc, for the Department of Energy's National Nuclear Security Administration. From LANL's inception it has provided cutting edge research to the aerospace industry.

Three LANL technologies are aboard the Mars Science Laboratory mission's Curiosity rover, which is set down on the surface of the Red Planet in August 2012.

TAOS is the follow-on to the AngelFire system, an airborne image surveillance method developed at LANL and used in Iraq to provide imagery-based surveillance to ground forces.

In 2012 LANL scientists had two papers published in Science magazine that reported the first oxygen and nitrogen isotopic measurements of the Sun, demonstrating that these elements are very different from the same ones on Earth. These results were the top two priorities of NASA's Genesis mission (the first spacecraft to return from beyond the Moon). <http://lanl.gov/>

#### INDUSTRY PRESENCE IN NEW MEXICO

##### Acme Worldwide Enterprises

###### *Albuquerque*

Acme provides complete, life-cycle support for advanced simulator systems through precise engineering solutions. Acme's product lines include g-cueing dynamic motion seats, gun recoil simulators and air refueling trainers. <http://www.acme-worldwide.com/>

##### Advanced Aircraft Composites

###### *Las Cruces*

Aircraft manufacturing

##### AeroJet

###### *Socorro*

Aerojet is a major space and defense contractor specializing in missile and space propulsion, and defense and armaments. <http://www.aerojet.com/home.php>

### Aero Mechanical Industries (AMII)

*Rio Rancho*

Aero Mechanical is an FAA and EASE certified repair facility for the aerospace industry. AMII repairs composite flight surfaces, sheet metal flight surfaces and structures, nacelles, and mechanical components. <http://www.aero-mechanical.net/>

### AeroParts Manufacturing & Repair Inc.

*Rio Rancho*

AeroParts provides repair and manufacturing services to the aerospace industry. AeroParts has specialized expertise in restoring 'like new' performance to ozone converters and ducting, as well as our facility for custom manufacturing complex three-dimensional sheet metal parts. <http://www.aeroparts.aero/>

### Aerosock

*Hobbs*

Aerosock manufacture windsocks and windsock frames for the aviation industry. <http://www.aerosock.com/>

### Aerospace Corporation

*Albuquerque*

The Aerospace Corporation has provided independent technical and scientific research, development, and advisory services to national security space programs since 1960. <http://www.aerospace.org/>

### AeroVooDoo

*Albuquerque*

AeroVooDoo is a full-service engineering/product development company. Capabilities include design of products including aerodynamic analysis, electrical and software architecture and design and certification services. <http://www.aerovoodoo.com/index.html>

### AerSale

*Roswell*

Located at the Roswell International Air Center, AerSale occupies 200,000 square feet of aircraft hangar and warehouse space. AerSale provides aftermarket aircraft, engines and component parts to airlines, leasing companies and manufacturers of original equipment, as well as repair and overhaul service providers. The company also has tooling, ground support equipment and a certified repair station license approved by the Federal Aviation Administration. <http://www.aersale.com/>

### Applied Technology Associates/A-Tech

*Albuquerque*

A-Tech Corporation, d.b.a. Applied Technology Associates (ATA), in business since 1975, is a privately held small business located in the Sandia Science and Technology Park in Albuquerque, New Mexico. ATA is a precision measurement, sensing and controls company providing services and products to government and commercial customers. ATA products and services span ground, air, and space applications.

ATA is also the managing member of two active Joint Ventures (JV): ATA partnered with ASRC Aerospace to form the ATA Aerospace Joint Venture for the successful bid of the Air Force Research Laboratory Space Technology Research Analysis Integration and Test (STRAIT) contract. ATA partnered with MIRATEC Corporation to form the ATAMIR WSMR Joint Venture for the successful bid of the White Sands Missile Range (WSMR) Test Evaluation and Analysis Support (TEAS) contract. [www.aptec.com](http://www.aptec.com)

#### Armadillo Aerospace

##### *Spaceport America*

Armadillo Aerospace develops reusable rocket powered vehicles; focused on vertical takeoff, vertical landing suborbital research and passenger flights.

<http://armadilloaerospace.com/n.x/Armadillo/Home>

#### Aspen Avionics LLC

##### *Albuquerque*

Aspen's flagship product line is the Evolution Flight Display system. The Evolution system enables aircraft owners to upgrade their primary flight instrument "six pack" to glass cockpit technology all at once, or in stages. <http://www.aspenavionics.com/index.php>

#### ASRC Aerospace

##### *Albuquerque*

ASRC provides scientific engineering and technical services to NASA, the U.S. Air Force, NOAA and other governmental agencies. <http://asrcaerospace.com/>

#### Ball Aerospace & Technologies Corporation

##### *Albuquerque*

Ball Aerospace & Technologies Corporation develops technologies for defense, civil and commercial customers, including full satellite systems and space missions; instruments and sensors; engineering services; antennas, tactical camera systems, and components; as well as a variety of space-qualified subsystems. The company is a recognized leader in the fields of remote sensing, astronomy, optics, laser communications, data exploitation, low-observable antennas and precision cameras. <http://www.ballaerospace.com/>

#### Bendix /King

##### *Albuquerque*

Located on the Honeywell Aerospace campus, Bendix/King develops a broad range of innovative panel-mount avionics and accessories to help improve pilots' flying experience and safety. The proximity to Honeywell provides access to intellectual property and financial resources of Honeywell Aerospace. <http://www.bendixking.com/>

#### Birdman Air Enterprises, Inc.

##### *Roswell*

Birdman provides aviation storage, maintenance, repair and dismantle.

### Boeing/Boeing SVS

#### *Albuquerque*

Boeing-SVS is a wholly-owned subsidiary of Boeing Directed Energy Systems. Boeing SVS designs, develops and builds systems comprised of intricate computer programs linking laser radar, cameras, telescopes, lenses, fast-steering mirrors, gyroscopes and GPS instruments. U. S. [www.boeing-svs.com/](http://www.boeing-svs.com/)

### CALCULEX, Inc.

#### *Las Cruces*

CALCULEX is a world leader in front-end electronics for high-rate digital instrumentation data recorders. The ARMOR Asynchronous Real-time Multiplexer and Output Reconstructor systems have become the industry standard. ARMOR II systems are employed on advanced weapon systems platforms, such as the USAF B-2 stealth bomber, that require the use of advanced telemetry techniques. CALCULEX digital data recorder interface products and support software provide the most cost-effective means to acquire and analyze recorded data. Other products include fiber-optic interfaces and video imaging and distribution systems. Technical services provide timely on-site and depot maintenance assistance to extend the return on customers' investments. CALCULEX systems engineering has provided hardware and software solutions for many diverse applications, such as real-time, high-speed data acquisition and analysis, fault-tolerant closed-loop control, and man-in-the-loop and hardware-in-the-loop computer-based simulation and training. CALCULEX solutions have been used in airborne, ship-board, ground and laboratory environments. <http://www.calculex.com/>

### Comet Solutions

#### *Albuquerque*

Comet develops software that provides performance engineering workspace that lets engineers and engineering project teams carry out multi-fidelity, multi-physics modeling and simulation. <http://cometsolutions.com/>

### Cutter Aviation

#### *Albuquerque*

Cutter is a full-service FBO located at the Albuquerque International Sunport. <http://www.cutteraviation.com/airport-facility-locations/abq-albuquerque-nm/>

### Dean Baldwin Painting

#### *Roswell*

In 1999 Dean Baldwin Painting expanded its capacity by acquiring a 165,000 square foot aircraft strip and refinish facility at the Roswell International Air Center. The hangar complex has six temperature-controlled bays with air filtration systems utilizing two independent integral waste management systems. The company achieved ISO 9001-2000 certification in 2006. The company specializes in aircraft strip and paint services. <http://www.deanbaldwinpainting.com/index.php>

### Desert Aerospace LLC

#### *Albuquerque*

Desert Aerospace designs and manufactures Extreme Light Jets and twin jet sailplanes. <http://desertaerospace.com/>

### Design & Development Engineering Services (DDES)

#### *Albuquerque*

DDES develops, validates, and supports high-reliability space systems.

<http://www.ddesc.com/>

### DeVore Aviation Corporation of America

#### *Albuquerque*

DeVore's primary focus is both internal and external aircraft lighting systems, including their product line of Tel-Tail vertical tail floodlights. DeVore was recently awarded contracts to develop, manufacture and supply all of the exterior lighting systems Landing and Taxi lights for the Raytheon Premier I and Hawker Horizon, as well as the Bell/Augusta 609 Tilt Rotor. Additionally, Raytheon selected DeVore to design and manufacture lightweight carbon fiber wingtip assemblies with high temperature polycarbonate position light lenses.

[www.devoreaviation.com](http://www.devoreaviation.com)

### Eclipse Aerospace

#### *Albuquerque*

Eclipse is a personal jet manufacturer and service center.

<http://www.eclipseaerospace.net/index.php>

### Fort Worth Airworks

#### *Albuquerque*

Fort Worth Airworks, Inc. (FWA) is the OEM of the Zephyr Air Conditioning system. FWA has provided Cessna Aircraft and Cessna operators with quality air conditioning systems for over 20 years. The Zephyr air conditioning system has been standard equipment for the 550 and 560 Citations. <http://fortworthairworks.com/>

### General Dynamics SpacePlex

#### *Las Cruces*

General Dynamics operates the SpacePlex, a state-of-the-art space and communications services facility in Las Cruces. Customers of the SpacePlex receive unique satellite support infrastructure for minimal capital investment including complete satellite service packages, including satellite and network control center, operations, engineering, teleport services, alternate and back-up service. Connectivity is available via a high-bandwidth ATM link and terrestrial fiber optic backbone.

Collocated with the SpacePlex, the Greater Southwest Teleport has both Atlantic and Pacific Ocean region visibility and is currently licensed for C- and Ku- bands.

<http://www.gdc4s.com/>

### Goodrich Space Flight Systems (SFS) (Goodrich ISR Systems?)

#### *Albuquerque*

Goodrich operates an SFS facility in Albuquerque. It is a leading supplier of mission-critical systems on a diverse number of spacecraft platforms, including satellites, the Space Shuttle, experimental reusable launch vehicles, and the International Space Station. SFS is also a leading supplier of data acquisition, command, and control electronics, supporting diverse missions that include launch vehicles, missiles, re-entry vehicles, and interceptor development. [www.goodrich.com/](http://www.goodrich.com/)

Great River Technology, Inc.

*Albuquerque*

Great River Technology (GRT) develops high-performance digital video and data development tools and services for DOD and the aerospace industry. <http://greatrivertech.com/>

Great Southwest Aviation

*Roswell*

Great Southwest Aviation provides aircraft maintenance, teardown and storage.

[www.aarcorp.com](http://www.aarcorp.com)

Honeywell Aerospace (Defense & Space Electronics Systems)

*Albuquerque*

Honeywell develops and manufactures cockpit avionics and control systems for military aircraft and vehicles in Albuquerque. [www.honeywell.com](http://www.honeywell.com)

Honeywell Technology Solutions Inc. (HTSI)

*Las Cruces*

HTSI has a Test Evaluation and Maintenance contract with NASA for specific site operations at the White Sands Test Facility. Under this contract HTSI responsibilities include:

- Altitude Simulation – testing spacecraft engines to 25,000 pounds thrust and simulated altitudes over 200,000 feet and accurate characterization of engines with high expansion ratio nozzles
- Hypergolic Fuels – chemical analysis of hydrazines, nitric acid oxidizers and hydrogen peroxide; characterize propellant residues in and on systems and components; perform trace level analysis of hydrazines in air, gas, soil and water samples; and test and calibrate toxic vapor monitors for fuels and oxidizers
- Exhaust Gas Analysis – laser analysis of plume composition; laboratory analysis of captured exhaust constituents from reaction control thrusters to characterize damage or contamination potential to sensitive optics during rendezvous; and laboratory analysis of captured exhaust constituents from landing retro-rockets to determine contamination potential for probes landing on planets or other extraterrestrial bodies
- Explosions and Detonations – ignition thresholds and energy release for gases, liquids and solids; detonation tests of gases or vapor fuels and oxidizers; explosive tests with solid, cryogenic, and hypergolic propellants and with high explosives up to the equivalent of 500 pounds of TNT
- Material Compatibility – material compatibility with aerospace fluids; immersion testing; isothermal microcalorimetry; and accelerating rate calorimetry
- System Component Qualifications – high pressure oxygen systems; long term exposure to aerospace fluids; functioning during and after exposure; and high accuracy metering of high pressure gas flow

Invertix Corporation

*Las Cruces*

Invertix Corporation is a technology company serving the greater national security community. Invertix addresses complex research and development, engineering, and mission support challenges in the areas of intelligence, surveillance, and reconnaissance; enterprise information technology; and communications mission systems. <http://www.invertix.com/>

### Jacobs Technology

#### *Las Cruces*

NASA Test Evaluation and Maintenance contract for specific testing and site operations at White Sands Test Facility. Provides the expertise and supports the infrastructure to test and evaluate spacecraft materials, components, and rocket propulsion systems.

<http://www.jacobstechnology.com/>

### Kit Pack Company, Inc.

#### *Las Cruces*

Manufactures kits for engine overhaul.

<http://kitpack.com/index.html>

### K. L. Steven Company

#### *Rio Rancho*

K. L. Steven provides custom design, prototyping, engineering, and production of precision machined metal, plastic and material parts for a variety of industries. <http://klsteven.com/>

### L-3 Communications Vertex Aerospace LLC

#### *Albuquerque*

L-3 is a prime contractor in Command, Control, Communications, Intelligence, Surveillance and Reconnaissance (C3ISR) systems, aircraft modernization and maintenance, and government services. L-3 is also a leading provider of a broad range of electronic systems used on military and commercial platforms. L-3 customers include the U.S. Department of Defense and its prime contractors, U.S. government intelligence agencies, the U.S. Department of Homeland Security, U.S. Department of State, U.S. Department of Justice, allied foreign governments, domestic and foreign commercial customers and select other U.S. federal, state and local government agencies. <http://www.l-3com.com/>

### Libration Systems Management

#### *Albuquerque*

Engineering services; flight cable design and manufacturing, test tool development and spacecraft component fabrication. <http://librationsystems.com>

### Lockheed Martin

#### *Albuquerque*

Lockheed Martin manages Sandia National Laboratories and operates aircraft from the three Air Force Bases in New Mexico. In December 2011 Lockheed Martin signed a three-year cooperative research and development agreement to collaborate with the Air Force's Space Development and Test Directorate and research laboratory to improve the operation and affordability of satellite command and control through micro-cloud computing architecture. The research is taking place at Kirtland AFB; live demonstrations will be held in 2012 and 2013 at Kirtland's Multi-Mission Satellite Operations Center. [www.lockheedmartin.com](http://www.lockheedmartin.com)

### Northrop Grumman

#### *Albuquerque*

Northrop Grumman Mission Systems has four key business areas in New Mexico: information and technical services; software development; engineering hardware and design; and test and evaluation support. The software development component

includes graphics software for flight simulation and database software. Engineering design and prototype development includes instrumentation control consoles and missile warning sensor simulators. Measurement system design development includes radiation detection systems, electromagnetic measurement systems, and aircraft alerting communication programs. [www.northropgrumman.com/](http://www.northropgrumman.com/)

#### Raytheon Missile Systems

##### *Navajo Nation*

Raytheon Missile Systems has a facility on NAPI Industrial Park, owned by the Navajo Nation. Raytheon designs, develops, and produces missile systems for critical requirements, including air-to-air, strike, surface Navy air defense, land combat missiles, guided projectiles, exo-atmospheric kill vehicles, and directed energy weapons.

Raytheon also has close ties to New Mexico's research infrastructure, including its research universities. In February 2006 Raytheon tested its new Quick Kill System at the New Mexico Tech test center. The System is the first active protection system to destroy a rocket-propelled grenade at close range.

Raytheon is under contract to manufacture Improvised Explosive Device (IED) and Countermeasure Equipment (ICE) systems. The ICE system was designed as a collaborative effort between the Army Research Laboratory at the White Sands Missile Range and the Physical Science Laboratory at New Mexico State University.

[www.raytheon.com/](http://www.raytheon.com/)

#### RIEtech Global

##### *Albuquerque*

Design and manufactures motion control systems, precision machining and prototype development for aerospace and defense customers.

<http://rietechglobal.com/>

#### Sagebrush Technology

##### *Albuquerque*

Sagebrush has developed a line of standard products that are used in a wide array of stationary, ground mobile, airborne, and marine applications. Sagebrush designs and manufactures computer controlled, precision motion control devices ('gimbals') that enable the effective and efficient utilization of detectors, cameras, lasers, optics, radars, telescopes, antennas and other sensors. <http://www.sagebrushtech.com/index.php>

#### Sandia Aerospace

##### *Albuquerque*

Sandia designs and manufactures avionics products for the industry. Major product offerings include the SAE 5-35 Altitude Encoder, SAC 7-35 Airdata Computer, Avionics Cooling Fans, and MARC 70 interface modules. The company also provides hardware and software engineering services. [www.sandia.aero/](http://www.sandia.aero/)

### Schafer Corporation

#### *Albuquerque*

Schafer Corporation is a scientific and engineering company with extensive capabilities in the national security, information technology and communications industries. Schafer's Advanced Concepts and Technology (ACT) Division is located in Albuquerque. ACT develops and provides analysis of new space concepts and systems through the modeling, simulation, and visualization of space assets. The ACT division has created and maintains state-of-the-art modeling and simulation packages to support multiple customers' diverse programs.

<http://www.schafercorp.com/index.php>

### Sennheiser

#### *Albuquerque*

The Albuquerque facility represents Sennheiser's presence in the United States. The company also has production plants in Germany and Ireland. The New Mexico plant produces wireless systems for distribution to customers in this country, with a focus on microphone and monitor systems. [www.sennheiser.com](http://www.sennheiser.com)

### Silent Falcon UAS Technologies

#### *Albuquerque*

Manufactures technologically disruptive small Unmanned Aerial Systems and components

<http://www.silentfalconuas.com/index.html>

### Stewart Industries (SII)

#### *Roswell*

SII Roswell is an affiliate of Stewart Industries International LLC, located in Guthrie, Oklahoma. SII Roswell is a FAA Part 145 repair station that provides many services designed to help aircraft operators recover assets associated with operating an aging fleet. SII's services include aircraft storage with active maintenance programs, aircraft dismantling, aircraft recycling programs, and aircraft fleet procurements. <http://www.siiroswell.com/>

### Sun Country Industries

#### *Albuquerque*

Sun Country is a contract manufacturer of aerospace components and assemblies. The company specializes in close tolerance machining and precision assembly of jet engine and airframe components, complex assemblies and kits.

<http://www.mcnally-group.com/suncountryindustries/about>

### TMC Design Corporation

#### *Las Cruces*

TMC is an engineering services and manufacturing company providing cost-effective solutions for governmental and commercial customers, headquartered in Las Cruces with additional offices in Colorado and Virginia. TMC is a pioneer in Defensive Counter-Space, Offensive Counter-Space and Space Situational Awareness systems through the integration of antenna design, radio frequency electronics, state-of-the-art fabrication, and intelligent software solutions. TMC's clients include the Department of Defense and the Department of Energy, who also rely on the company to assess GPS weapons systems for vulnerability and susceptibility.

[www.tmcdesign.com](http://www.tmcdesign.com)

ULTRAMAIN Systems Inc.

*Albuquerque*

ULTRAMAIN designs maintenance and engineering software that serves the aviation industry worldwide. The software provides comprehensive integrated support for airline technical, flight and cabin organizations. [www.ultramain.com](http://www.ultramain.com)

UP Aerospace Inc.

*Spaceport America*

UP Aerospace is a space launch and flight test service provider that operates a launch facility at the Spaceport. <http://www.upaerospace.us.com/>

Vertical Power

*Albuquerque*

Vertical Power designs and produces Electronic Circuit Breakers for experimental and light sport aircraft. <http://verticalpower.com/>

Vibrant Corporation

*Albuquerque*

Process Compensated Resonance Testing (PCRT) is a non-destructive technology initially developed at Los Alamos National Laboratory. PCRT measures the variations in resonance signatures that are a result of variations in the structural integrity of a component. PCRT's proprietary software identifies acceptable manufacturing variations as well as the unacceptable variations caused by material problems, process problems, and in process damage.

<http://www.vibrantndt.com/>

Virgin Galactic (VG)

*Las Cruces*

Virgin Galactic, a company within Sir Richard Branson's Virgin Group, is a pioneer in the space tourism industry. Virgin Galactic will provide suborbital space flights to the paying public, space science missions and orbital launches of small satellites. VG is headquartered at Spaceport America. <http://www.virgingalactic.com/>

## HISTORY OF SPACE IN NEW MEXICO

Around 1054 A.D. Native Americans drew petroglyphs depicting the supernova explosion that created the Crab Nebula on the stone walls of Chaco Canyon, New Mexico.

Fast forward to the 20<sup>th</sup> century, 1929, Robert Goddard, the “Father of Modern Rocketry,” relocates to Roswell to build and test rockets. Clyde Tombaugh also discovered Pluto in 1929 and went on to become a revered astronomy professor at New Mexico State University.

In 1945 White Sands Proving Ground (now White Sands Missile Range) was established near Las Cruces. One year later New Mexico became the official birthplace of the space age in the United States when Wernher von Braun successfully launched the V2-Rocket into space from White Sands.

In 1947 a U. S. Air Force press release announced that a UFO had landed outside Roswell. Hours later the press release was retracted, but what became known as the “Roswell Incident” lives on in legend.

In 1975 the Very Large Array was constructed near Magdalena, New Mexico.

In 1982 the Space Shuttle Columbia landed at White Sands.

During the decade between 1992 and 2002 the idea that would eventually become Spaceport America was developed and refined.

In 2005 the State of New Mexico and Sir Richard Branson identified the location of Spaceport America near Truth or Consequences, New Mexico in 2005. Virgin Galactic has located its world headquarters at the Spaceport and anticipates its first flight into space by the end of 2012.

*Sources: The information provided in this document was taken from the web sites of each entity.*