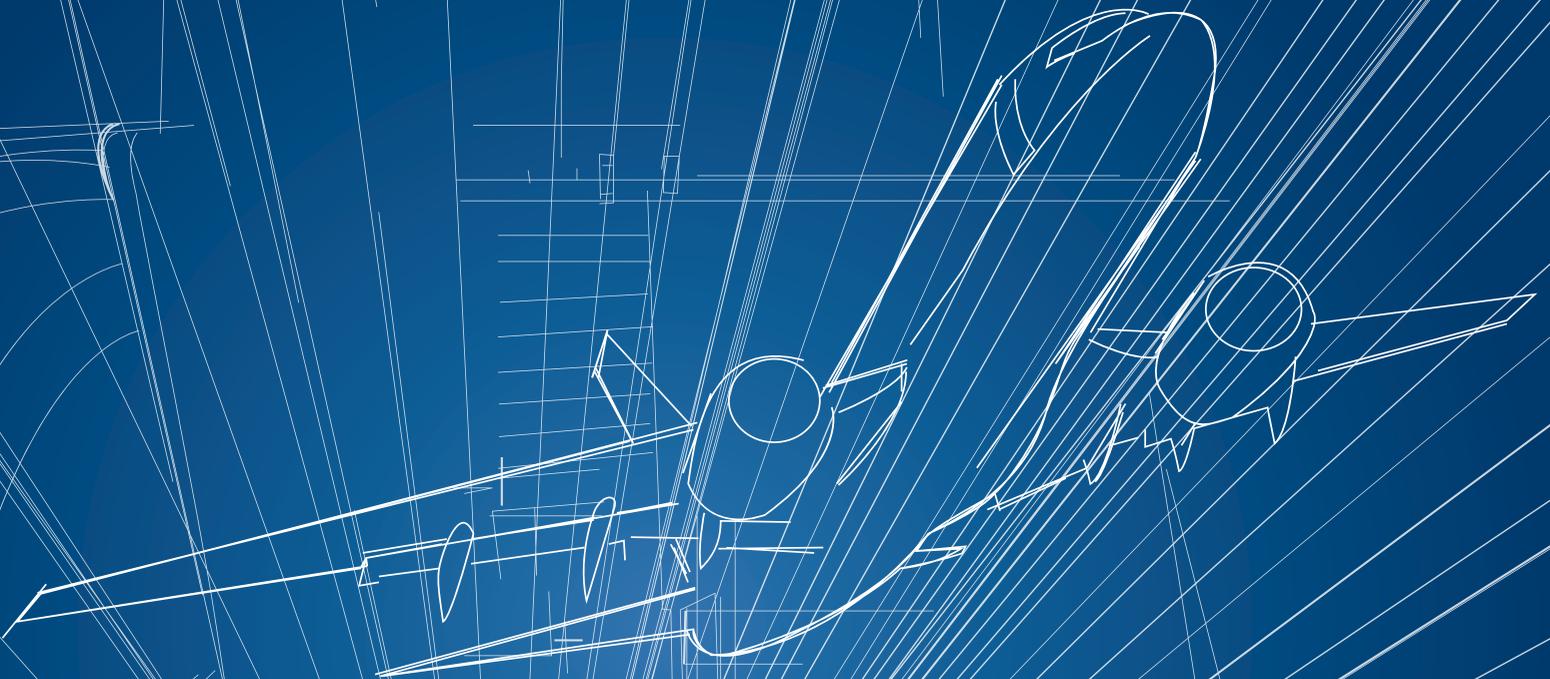




2017 TEXAS AEROSPACE, AVIATION AND DEFENSE



AEROSPACE AND AVIATION IN TEXAS

Texas is one of the most important locations for the global aerospace and aviation industry. As home to the headquarters of two international airlines and two of the world’s busiest airports, as well as NASA’s world-famous Johnson Space Center, the state is key for many of the largest global aerospace and aviation companies.

The broad range of aerospace activities in Texas includes fighter plane and helicopter assembly, navigation instrument development, advanced space-flight research, military pilot training, and commercial space travel. The aerospace and aviation industry directly employs more than 135,000 Texas workers at approximately 1,300 firms.

Geographically, the aerospace and aviation industry has a substantial presence in many regions of the state. In North Texas, the Dallas-Fort Worth region boasts the state’s largest

concentration of aerospace manufacturing workers, as well as the headquarters of American Airlines and Southwest Airlines. San Antonio, sometimes referred to as “Military City USA,” is home to tens of thousands of U.S. Air Force personnel and is a major national hub for aircraft maintenance, repair and overhaul (MRO).

On the Gulf Coast, Houston is the legendary home to NASA mission control and dozens of related spaceflight contractor firms. Elsewhere in the state, one of the world’s largest helicopter repair facilities resides in Corpus Christi, while the cities of Amarillo, El Paso, Harlingen, McAllen, Waco, and Wichita Falls all support manufacturing facilities for various Fortune 500 aerospace companies. Major Fixed Base Operators (FBOs) have locations in Texas providing sales and service for their general aviation (GA) and business aviation (BA) customers.

MAJOR AEROSPACE & AVIATION COMPANIES IN TEXAS

Selected firms with engineering, manufacturing, or maintenance facilities in the state.

“ 17 of the 20 largest aerospace manufacturers in the world, including Airbus, Boeing, Bell Helicopter, Textron, Gulfstream and Lockheed Martin, have major operations in Texas. ”



AEROSPACE AND AVIATION WORKFORCE

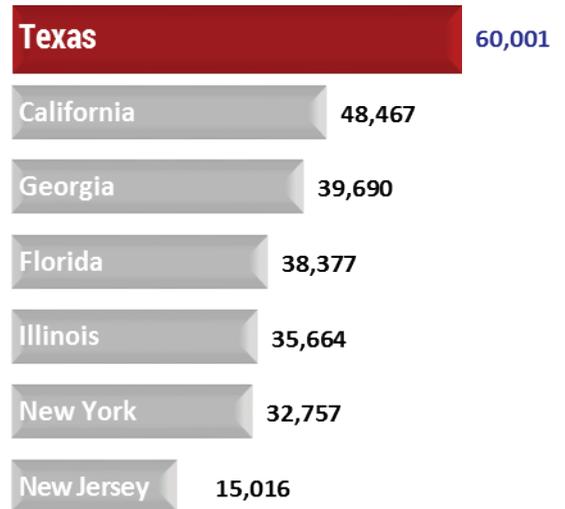
Texas' aerospace and aviation labor force is one of the largest in the nation, directly employing more than 135,000 workers. Within the industry, the largest subsector in the state is air transportation, which includes airlines, airport operations, and aircraft maintenance. This category accounts for about 44% of aerospace and aviation employment in Texas. Texas ranks number one in the U.S. for total direct air transportation jobs.

Additionally, the Texas workforce is significantly more specialized in aerospace manufacturing than most other U.S. states, measured by workers per capita. The share of the Texas workforce employed in aerospace manufacturing is greater than the national average.

Also, general aviation (GA) and business aviation (BA) play a major role in the industry in Texas. GA and BA generate jobs in sales of new and previously owned aircraft, maintenance, parts sales, completion, and refurbishment. In addition, personnel are needed to fly and maintain the aircraft.

Texas also leads the nation in the number of workers employed in key aerospace and aviation occupations, including aircraft mechanics, commercial pilots, engine assemblers, and airfield operations specialists.

Texas Ranks No. 1 in the U.S. in Air Transportation Employment

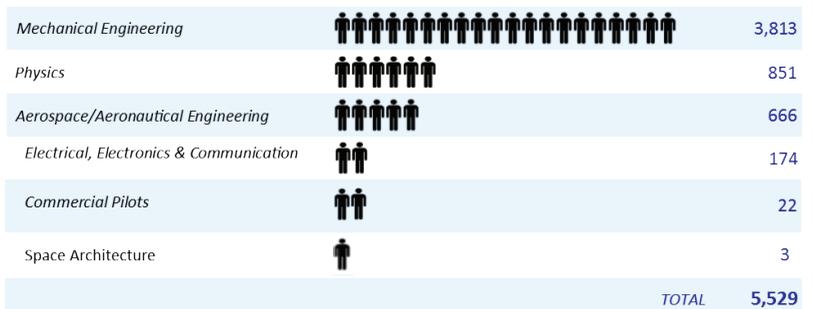


Source: Dec. 2015 U.S. Bureau of Labor Statistics

EDUCATION AND TRAINING

Aerospace and aviation education in Texas is supported by a highly developed network of higher education institutions around the state. Eleven of the state's public and private universities provide aeronautical programs offering degrees in aerospace engineering, aviation science, and related specialties. Elsewhere, 14 public and private colleges around Texas offer Federal Aviation Administration-approved aviation maintenance technology programs.

Aerospace & Aviation-Related Degrees Awarded in Texas, 2012-2014
All Texas Public Institutions, All Degree Levels



Source: Texas Higher Education Coordinating Board

AEROSPACE RESEARCH AND DEVELOPMENT

R&D AT TEXAS UNIVERSITIES

From 2013-2015, Texas universities dedicated over \$93 million to aerospace technology research, according to the Texas Higher Education Coordinating Board. The University of Texas at Austin and Texas A&M University together accounted for more than half of the total expenditures in this field. Texas A&M Corpus Christi was selected in 2014 as 1 of 6 UAS test sites selected by the FAA. The Lone Star UAS program conducts research vital to integrating UAS into the nation's airspace. Research will concentrate on multiple areas including safety of operations and data gathering in authorized airspace, UAS airworthiness standards, command and control link technologies, human-factors issue for UAS control-station layout, and detect-and-avoid technologies.

AEROSPACE MANUFACTURING

Texas has a long history as a core location for the global aerospace industry, and today 17 of the world’s 20 largest aerospace companies have major operations in the state. Within the U.S., Texas is home to about 9% of all aerospace manufacturing jobs. In particular, North Texas is one of the most highly concentrated regions of aircraft and aircraft parts production in the country. In the Dallas-Fort Worth metro area, anchored by heavyweights like Lockheed Martin, Bell Helicopter, and L-3 Communications, the percentage of the workforce employed in aircraft manufacturing is nearly five times the national average. Elsewhere in the state, Amarillo, San Antonio, Waco, and Wichita Falls are additional hubs of diverse aerospace manufacturing, from parts fabrication to complete aircraft assembly and overhaul.

WORKFORCE CONCENTRATIONS

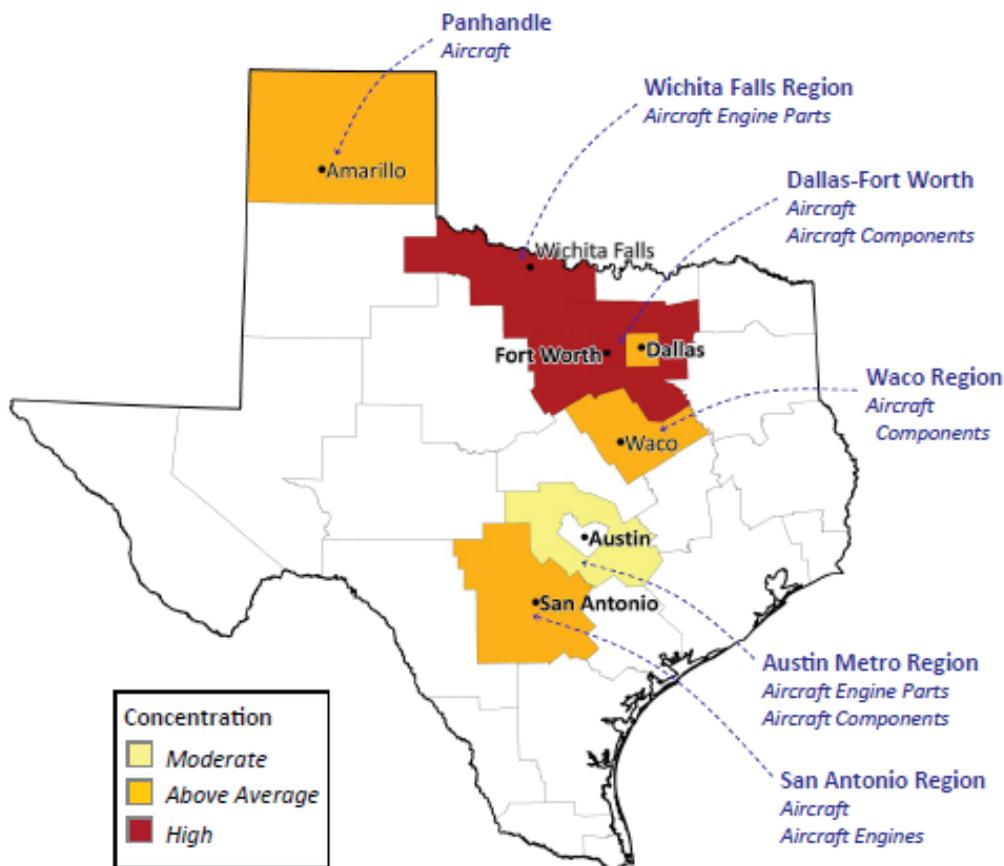
Aerospace Product Manufacturing

The map identifies the state’s Workforce Development regions with above-average specializations in aerospace product manufacturing. The highlighted regions are not the only areas in Texas where workers in this sector can be found, but rather represent areas with the greatest concentrations relative to the size of the local labor force. Regions with significant workforce concentrations in this sector are ranked as moderate, above average, or high.

Texas Leads the Nation in Skilled Aerospace Occupations

Occupation	Texas Rank
Aircraft Mechanics	No. 1
Aerospace Engineers	No. 3
Avionics Technicians	No. 3
Aircraft Assemblers	No. 3
Engine Assemblers	No. 2
Commercial Pilots	No. 3
Airfield Operations Specialists	No. 1

Source: May 2015, U.S. Bureau of Labor Statistics



MAINTENANCE, REPAIR & OVERHAUL

Texas' aerospace workforce also supports the state's many maintenance, repair, and overhaul (MRO) operations, where aircraft are modified and completed or components, like engines, are rebuilt. Texas is home to many MRO facilities, including, but not limited to the following:

- Boeing Global Services—San Antonio
- Kelly Aviation Center—San Antonio (Lockheed Martin/Rolls-Royce joint venture)
- L-3 Mission Integration—Greenville
- Gulfstream—Dallas
- Textron Aviation—Dallas, Houston, San Antonio
- L-3 Platform Integration—Waco
- Elbit Systems (M7 Aerospace)—San Antonio
- Chromalloy—San Antonio
- Pratt & Whitney—Grand Prairie
- Standard Aero—Dallas, Houston, San Antonio
- BBA Aviation (Dallas Airmotive)—Dallas
- ST Aerospace—San Antonio
- Bombardier—Dallas
- GDC Technics—San Antonio
- McTurbine, Inc.—Corpus Christi

AIR TRANSPORTATION

Texas is home to the largest air transportation workforce in the nation, with the state's airlines, airports, and related support services directly employing more than 82,000. Dallas-Fort Worth is home to the headquarters of two international air carriers, American Airlines and Southwest Airlines. A third, United Airlines, operates a major hub in Houston.

Nationally, the past decade was a turbulent one for the industry. Between 2001 and 2012, as the sector weathered the bankruptcies and consolidations of multiple major airlines, U.S. carriers cut jobs by more than 26% around the country. Texas' airline industry fared slightly better during this period, with employment contracting by about 20%.

Texas is home to six of the top 50 busiest airports in the U.S., by passengers boarded annually. These include No. 4 Dallas/Fort Worth (DFW) and No. 11 George Bush Intercontinental Houston (IAH).

General aviation (GA) and business aviation (BA) are also a vital part of the industry. The majority of GA aircraft used for business purposes are manufactured, operated, serviced, and maintained in the U.S. These aircraft allow companies to access airports that are not served by airlines. They allow companies to be more productive.

Texas has 1,433 airports. Of these, 285 are public owned, public used airports, more than any other state. These airports provide sales, service, operations, and maintenance positions along with a boost to the local economy. They support Fixed Base Operators (FBOs), manufacturing, maintenance, flight operations, charter services, business aviation departments, airport personnel, air traffic controllers, and many other non-aviation specific industries, e.g. rental car, restaurants, hotel, etc.

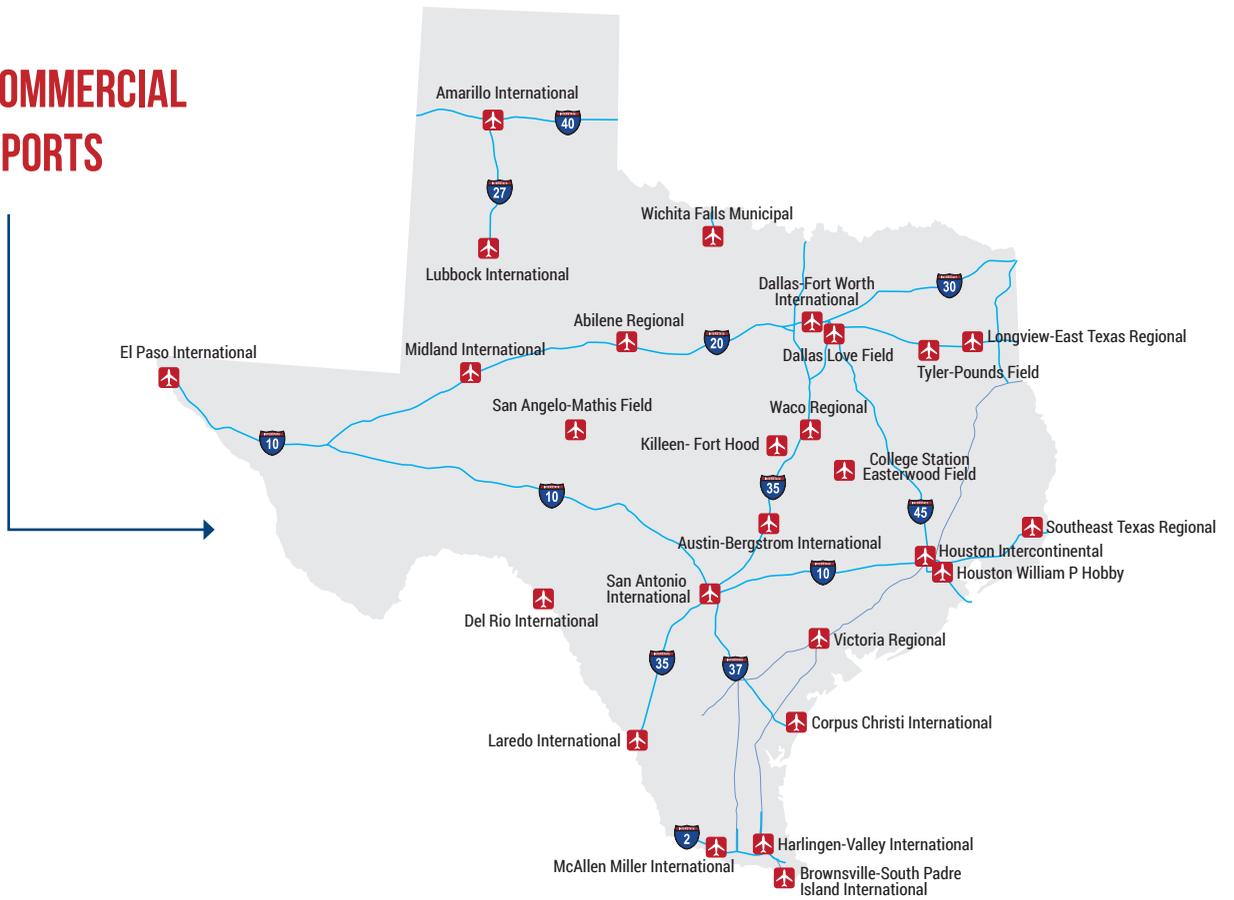
GOVERNMENT AVIATION AND DEFENSE

From aerospace research and flight training, to military aircraft development and space exploration, Texas is an epicenter of government and defense-related aerospace and aviation. NASA's Johnson Space Center in Houston and the 15 active military bases around the state are a testament to Texas' importance to the country's aerospace and defense initiatives.

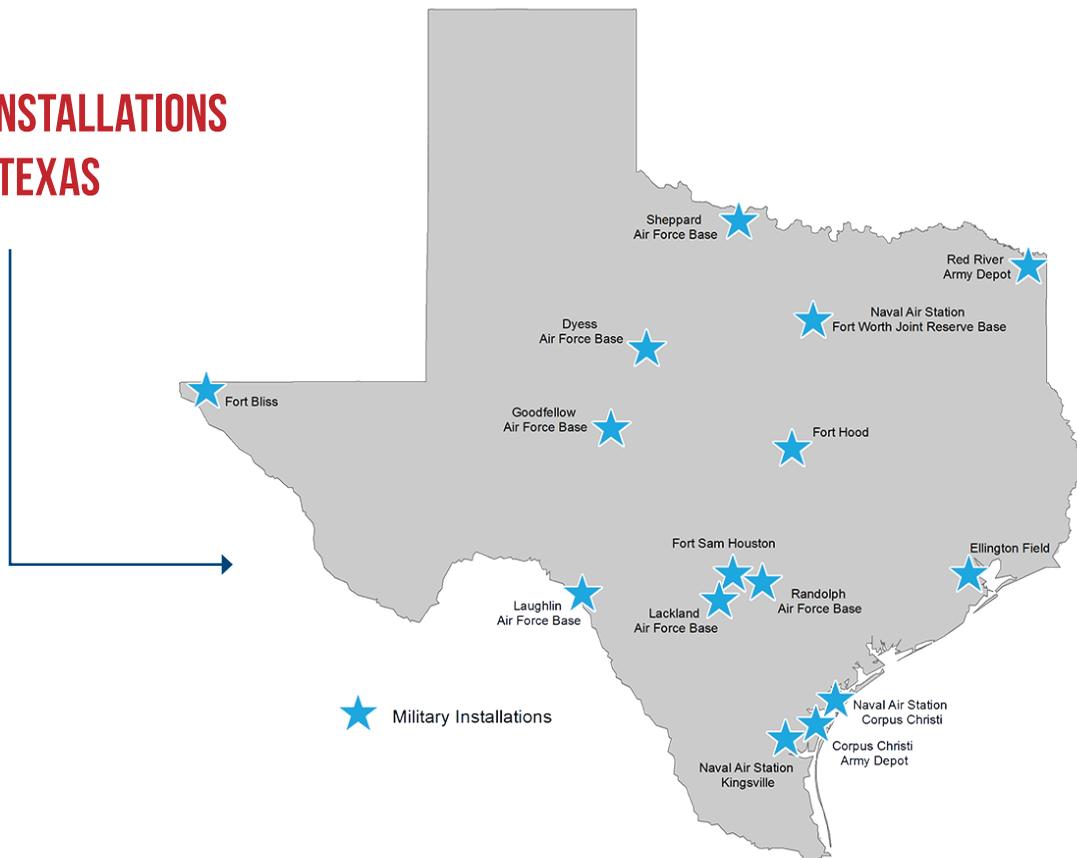
The history of global military aviation began in Texas in 1910, when the first ever military flights took place at Fort Sam Houston in San Antonio. Today, Texas is host to the nation's largest population of active duty military personnel, with more than 131,000 serving in the ranks of the U.S. Army, Air Force, and Navy. Texas is an especially important location for the country's defense aviation operations, as the U.S. Air Force stations 60% more active personnel in Texas than in any other state.

Texas is home to six active Air Force bases and three naval air stations. Additionally, private defense, space, and civil contractors employ tens of thousands in Texas in aircraft and avionics manufacturing, defense R&D, and maintenance and overhaul.

TEXAS COMMERCIAL AIRPORTS



MILITARY INSTALLATIONS IN TEXAS





NASA Johnson Space Center protects critical data with NetApp

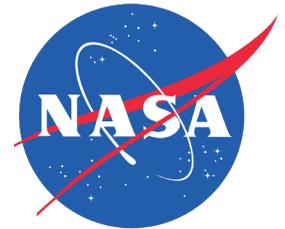
SPACE TRAVEL AND EXPLORATION

Texas has played a long role in the history of human spaceflight. Since NASA's Project Gemini in 1965, Houston's Johnson Space Center has served as the primary flight control center for all U.S. manned space missions, including the Apollo, Space Shuttle, and International Space Station programs. Today, companies in Texas are leading the way in commercial spaceflight technology, developing the next generation of transport systems.

While Houston, with its large concentration of diverse engineering talent, registers as the epicenter of Texas' space technology industry, spacecraft manufacturing and testing is happening around the state, from Brownsville and Harlingen in the Rio Grande Valley, to McGregor in Central Texas, and Midland and Van Horn in West Texas.

NASA JOHNSON SPACE CENTER

For the past 50 years, NASA's Lyndon B. Johnson Space Center (JSC) in Houston has led the U.S. and the world through leaps in human discovery. The JSC was established in 1961 as the Manned Spaceflight Center and the home of Mission Control for the U.S. human space flight program. In 1973, the complex was renamed in honor of the late U.S. President and Texas native, Lyndon B. Johnson. Together, Houston and JSC share an identity around the world as geographic landmarks of space travel and scientific breakthrough.



Today JSC leads NASA's International Space Station operations under a multinational contract in place through 2020. JSC also leads the development of the Orion crew vehicle, which NASA is designing to carry astronauts to new destinations in deep space. JSC is also playing a vital role in the future of space exploration through its technology development and commercial partnerships, as well as its management of NASA's Commercial Crew and Cargo Program, which invests financial and technical resources into the private-sector space transportation industry.

In 2014, Johnson Space Center managed an annual budget of \$4.4 billion, with nearly \$3 billion of that expended on contracts with Texas-based businesses. JSC directly employs about 3,000 workers in Houston, 65% of whom are engineers and scientists, while around 50 contractor firms employ an additional 7,400 workers at the space center.

NASA officially retired its space shuttle fleet in 2011 after 30 years of service in order to focus on future programs aimed at sending astronauts to new destinations beyond earth's orbit. Over the past several years, this major shift in space program direction has led to job realignment and reductions around the country at shuttle-related NASA facilities and their contractors, particularly in Florida.

While NASA-related jobs in Houston declined by an estimated 20% between 2007 and 2013, JSC still employs approximately 10,400 in the region. Additionally, the strong economy of the Houston region has helped absorb the changes at NASA. Estimated unemployment in the Houston MSA was 4.9% in 2014, according to the Texas Workforce Commission. The U.S. unemployment rate in 2014 was 6.2%.



NASA's Shuttle Flight Control Room in Houston, Texas

Building on decades of exploration, NASA is working to send humans to Mars in the 2030s. The Space Launch System (SLS) and Orion will carry astronauts into deep space. They will conduct a robotic Mars sampling mission, and test techniques for landing on and living on the Red Planet.

The journey to Mars will pass through three thresholds, each with increasing challenges as humans move farther from Earth. NASA and their partners are managing these challenges by developing and demonstrating capabilities in incremental steps. Their plan is to test technologies, advance human health and performance, advance and validate capabilities required for human exploration of Mars. Their working toward enabling human missions to Mars vicinity, including the Martian moons, and eventually the Martian surface. Mars is not just to visit, but to stay.

COMMERCIAL SPACE INDUSTRY

In recent years, the traditional government-monopoly model of space travel has begun opening to the private sector, as startup companies have become capable of designing and launching competitive space systems. Today, Texas is home to development and test sites of multiple commercial space firms, including Boeing, SpaceX, Blue Origin, ULA, and XCOR, that are leading the way in cargo, satellite, and tourism transport.

NASA COMMERCIAL SPACE INVESTMENT PROGRAM BASED IN HOUSTON

In the wake of the retired shuttle program, NASA has ramped up programs to support the U.S. commercial space transportation industry. Based at Johnson Space Center in Houston, the Commercial Crew and Cargo Program Office (C3PO) invests in the development of private transportation systems capable of ferrying both cargo and human crews to the International Space Station. For some of the most promising private space ventures, including SpaceX and Blue Origin, NASA may serve as a lead investor during development, as well as a customer of transportation services. Furthermore, NASA provides technical assistance as the companies develop.



Artist's rendering of the proposed Houston Spaceport at Ellington Field in Texas.
Credit: Houston Airport System

SPACEX



Space Exploration Technologies (SpaceX) designs, manufactures, tests, and launches satellites and spacecraft for orbit and cargo transport. The company aims to eventually shuttle astronauts to and from the International Space Station (ISS). In early 2012, SpaceX completed an office and launch pad expansion at its McGregor, TX, rocket development facility, where the company conducts engine tests for its Falcon 9 launch vehicle. In May 2012, SpaceX became the first private company to send a spacecraft to the ISS, when the Falcon 9 delivered a Dragon cargo capsule, another of the company's products, to the space station. SpaceX, based in Hawthorne, CA, was founded by Elon Musk, who also started PayPal and Tesla Motors. In 2014, SpaceX selected Boca Chica Beach, near Brownsville, Texas, to build the world's first commercial rocket launch site. Construction is already underway and is estimated to cost \$100 million.

BLUE ORIGIN



Blue Origin is a private aerospace company started in 2000 by Amazon.com founder Jeff Bezos to develop a lower-cost system for human spaceflight. Blue Origin's New Shepard reusable launch vehicle is a rocket-propelled, vertical take-off, vertical-landing spacecraft designed for suborbital space tourism. Based in Washington State, the company conducts all flight tests of prototype vehicles at its launch facility in West Texas' Culberson County. In late 2012, Blue Origin marked a milestone when it successfully tested a NASA-backed Crew Capsule escape rocket, designed to propel crew away from the launch pad in cases of pre-launch emergency.

XCOR AEROSPACE

In July 2012, spacecraft developer XCOR Aerospace announced the location of its new Commercial Space Research and Development headquarters in Midland, TX. XCOR designs and produces reusable launch vehicles, rocket engines and rocket propulsion systems, and plans to create 100 jobs at the new facility, located at the Midland International Air and Space Port (MAF).



BOEING

Boeing's Crew Space Transportation (CST) system will provide NASA with transportation to and from the International Space Station (ISS). The CST-100, also known as Starliner, spacecraft was developed as part of NASA's Commercial Crew Program. It is a reusable capsule-shaped spacecraft that can accommodate up to seven passengers, or a mix of crew and cargo to low-earth orbit destinations such as the ISS or the Bigelow planned station. Boeing has designed the spacecraft to be compatible with a variety of expendable rockets and selected United Launch Alliance's Atlas V vehicle. The CST-100 capsule has an innovative, weld-less design and features Boeing LED "Sky Lighting," wireless internet and tablet technology for crew interfaces. Boeings award from NASA to develop the Starliner marked the first time in human spaceflight history that NASA had contracted with a commercial company for a human spaceflight mission.



Boeing's Crew Space Transportation (CST) system. Credit: Boeing

In Houston, Boeing supports civil space programs and various NASA programs such as the International Space Station, Commercial Crew Development program, and the Space Launch System.

SPACEPORTS AND LAUNCH SITES

According to the Federal Aviation Administration (FAA), Texas is currently home to two (2) of the ten (10) commercial spaceports that hold an active launch site operators license in the USA, the Houston Spaceport and the Midland International Air and Space Port. The Lone Star State also has the distinction of a launch site outside Van Horn and one being developed outside of Brownsville.



MIDLAND INTERNATIONAL AIR & SPACE PORT

In 2014, the Midland International Airport (MAF) became the first airport in the USA with regular passenger air service to also be issued a commercial spaceport license by the FAA. Now known as the Midland International Air and Space Port. MAF and the Midland Development Corporation are currently establishing a spaceport business part to accommodate a wide range of aerospace and aviation businesses. The Midland Altitude Chamber Complex features three hypobaric chambers for testing equipment and training personnel.



Blue Origin's New Shepard prototype spaceship lifts off from its West Texas launch pad during a test flight in April. (Blue Origin photo)



HOUSTON APPROVED FOR SPACEPORT AT ELLINGTON AIRPORT

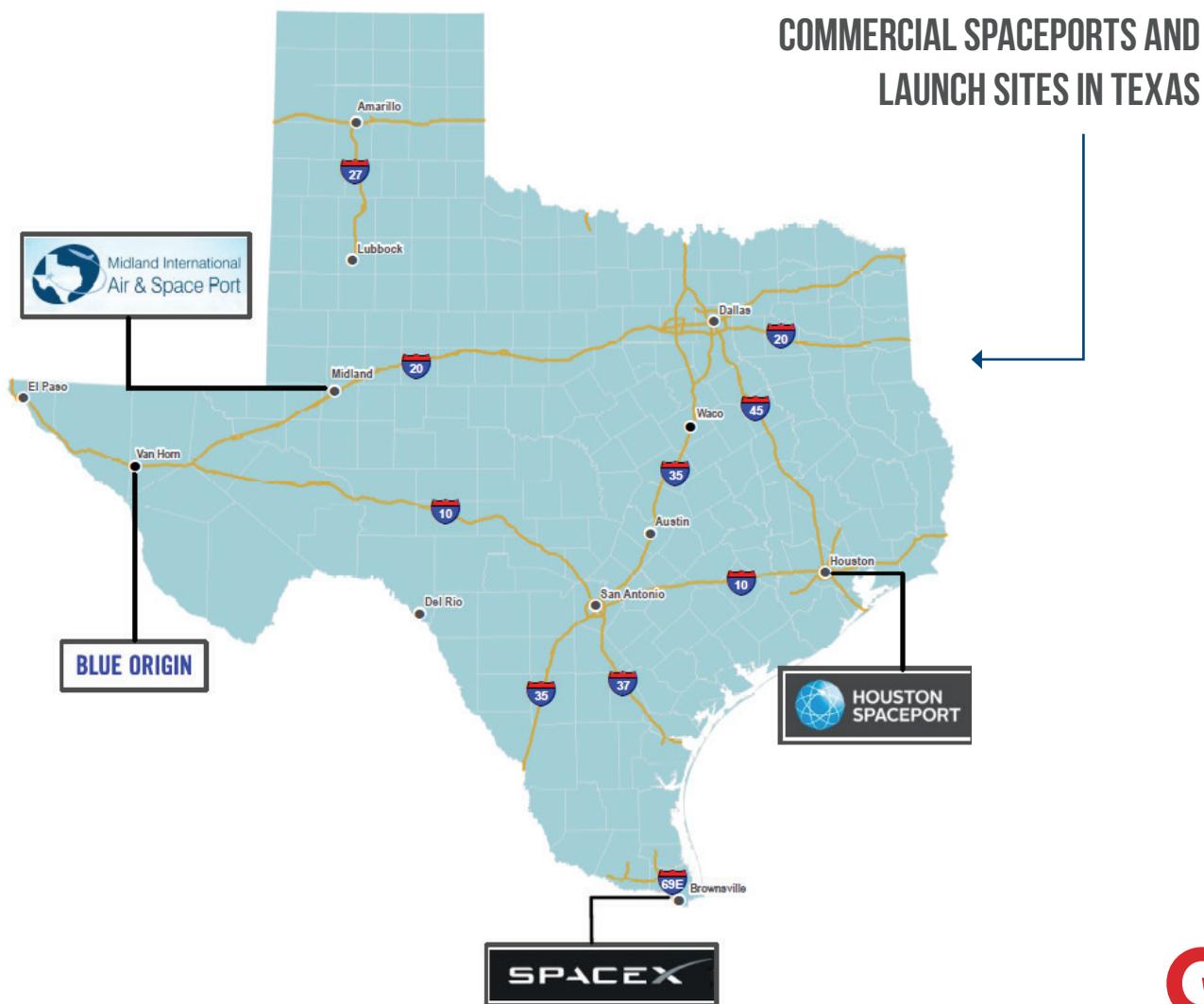
In 2013, the Houston Airport System presented a plan to the Houston City Council envisioning future spaceport development at the city's Ellington Airport, a Joint Reserve Base and former NASA training facility. On June 30, 2015 the Federal Aviation Administration announced the City of Houston had been approved for the spaceport. The spaceport will support reusable launch vehicles, with potential use for space tourism, R&D services, astronaut training, and more. The Houston Airport System was awarded \$3.1 million in state funds from the Defense Economic Adjustment Assistance Grant. The grant will help cover \$2 million of the construction cost and \$1 million for the cost of equipping the facility. The total project is estimated to cost \$7 million.

SPACEX

SpaceX selected Boca Chica Beach, near Brownsville, Texas, to build the world's first commercial rocket launch site. Construction is already underway and SpaceX plans to launch rockets in the near future.

BLUE ORIGIN

Blue Origin currently conducts all engine and flight tests for the New Shepard reusable launch vehicles at their privately owned and operated launch facility outside of Van Horn in Culberson County.



Texas invests in its future by offering competitive incentives to companies that create jobs and drive innovation. The following incentives are the most commonly applied offerings.

STATE GOVERNMENT INITIATIVES

The Office of Aerospace and Aviation, within the Office of the Governor, Economic Development & Tourism Division, works closely with decision makers in the aerospace industry, other governmental agencies, and academic institutions to coordinate industry development efforts.

SPACEPORT TRUST FUND

In 2013, the Texas Legislature passed multiple bills to nurture the growth of the commercial space industry in the state, including legislation limiting liability of space flight operators and the appropriation of \$15 million to the state's Spaceport Trust Fund. The Spaceport Trust Fund is a tool to assist in fostering the growth of the aerospace industry in Texas. This includes job creation, capital investment, and energizing students to pursue an interest in space. The fund is a grant program that assists a spaceport development corporation establish infrastructure needed to operate a launch facility.

TEXAS ENTERPRISE FUND

The Texas Enterprise Fund (TEF) is one of the nation's largest "deal closing" funds created to attract businesses and new jobs to Texas. Since the program's inception, the TEF has awarded approximately \$595 million to companies that have committed to an expansion or relocation in Texas.

TEXAS ENTERPRISE ZONE PROGRAM

State sales and use tax refunds to promote job creation and investment that will assist economically distressed areas of the state.

MANUFACTURING EXEMPTIONS

State sales and use tax exemptions for tangible property, natural gas and electricity.

GOVERNOR'S UNIVERSITY RESEARCH INITIATIVE

In 2015, Governor Greg Abbott passed legislation to create a new Governor's University Research Initiative (GURI), which allocated \$40 million to attract and recruit top researchers to Texas' higher education institutions.

SKILLS DEVELOPMENT FUND

The Skills Development Fund is Texas' premier workforce development program created to assist Texas community and technical colleges with financing for customized job training for Texas businesses and workers.

CONTACT US



Office of the Governor Economic Development and Tourism Division

The Governor's Office of Economic Development and Tourism (EDT) serves as the state's leading economic development organization marketing Texas as the world's premier business investment destination. The division pursues business expansion and relocation prospects, with the goal of developing job creation and export opportunities for the Texas business community.

P.O. Box 12428 | Austin, TX | 78711-2428

Phone: (512) 936-0100

www.TexasWideOpenForBusiness.com



**Office of the Governor
Economic Development & Tourism**

P.O. Box 12428 | Austin, TX 78711
(p) 512.936.0100

www.BusinessInTexas.com

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