

NASA

TEXAS ECONOMIC SNAPSHOT

Located in Clear Lake, Texas, just outside Houston, the Lyndon B. Johnson Space Center (JSC) is the seat of human spaceflight operations for the National Aeronautics and Space Administration (NASA). JSC is the site of the Mission Control Center (which manages crewed space missions including continuous International Space Station [ISS] operations), and the home of astronaut training, and NASA's Orion spacecraft and lunar-orbiting Gateway outpost programs. Both help make up NASA's Artemis program, an agency-wide effort to return astronauts to the moon within five years. With the aid of international and commercial partners, Artemis will test key technologies and capabilities to enable sustainable operations on and around the moon, preparing future explorers for landings on Mars.

DIRECT AND
INDIRECT
EMPLOYMENT

52,352

GROSS
DOMESTIC
PRODUCT

\$4.7 BILLION

OUTPUT

\$7.9 BILLION

SOURCES: NASA, TEXAS COMPTROLLER OF PUBLIC ACCOUNTS, REMI

NASA ESTABLISHED ITS MANNED SPACECRAFT CENTER (MSC) IN 1961, ON A 1,000-ACRE SITE DONATED BY RICE UNIVERSITY. THE MSC LATER WAS RENAMED TO HONOR FORMER PRESIDENT JOHNSON, AN EARLY CHAMPION OF NASA'S TEXAS OPERATIONS. HOUSTON PROVIDED NASA WITH THE ECONOMIC, LOGISTICAL AND INTELLECTUAL SUPPORT NEEDED FOR HUMAN SPACEFLIGHT. TODAY, NASA EMPLOYS ABOUT 11,000 PUBLIC AND PRIVATE WORKERS IN TEXAS, CONTRIBUTING TO LOCAL AND STATE ECONOMIES AS WELL AS UNIVERSITY AND COMMERCIAL RESEARCH.

FACILITIES

JOHNSON SPACE CENTER

JSC operates three facilities in Texas covering nearly 1,700 acres. JSC Main Campus is by far the largest at 1,620 acres. Additional operations are located at nearby Ellington Field Joint Reserve Base (JRB) and the Sonny Carter Training Facility/Neutral Buoyancy Lab (NBL).

JSC is NASA's training base for its 38 active astronauts and 11 astronaut candidates. It's the site of Mission Control, which managed the Gemini, Apollo, Skylab and Space Shuttle programs. JSC also is the lead control center for ISS operations. The ISS offers access to international, commercial and economic microgravity research opportunities not available anywhere else, and more than 250 research and technology development experiments are operating continuously on the station. NASA recently set aside a 5 percent crew time allocation for commercial and marketing activities, setting the stage for future private space operations.

JOHNSON SPACE CENTER MAIN CAMPUS

163 FACILITIES

3,986,403 sq. ft.
TOTAL FACILITY SPACE

ELLINGTON FIELD

26 FACILITIES

302,568 sq. ft.
TOTAL FACILITY SPACE

ELLINGTON JRB IS A JOINT INSTALLATION SHARED BY THE FIVE U.S. MILITARY BRANCHES AND NASA. IT'S THE CENTER OF JSC'S ASTRONAUT FLIGHT TRAINING OPERATIONS. JRB ALSO HOSTS JSC'S AIRCRAFT LOGISTICS, CARGO AND HIGH-ALTITUDE RESEARCH AIRCRAFT, WITH 13 PILOTS ON STAFF.

JOHNSON SPACE CENTER TOTAL BUDGET BY PROGRAM

ALL U.S. FACILITIES, FISCAL 2018

| | |
|----------------------------------|-----------------|
| INTERNATIONAL SPACE STATION | \$1.11 BILLION |
| ORION MULTI-PURPOSE CREW VEHICLE | \$1.21 BILLION |
| HUMAN RESEARCH PROGRAM | \$115.4 MILLION |
| COMMERCIAL CREW PROGRAM | \$68.2 MILLION |
| ADVANCED EXPLORATION SYSTEMS | \$75.5 MILLION |
| COMMERCIAL CARGO PROGRAM | \$1.35 BILLION |

SOURCE: NASA'S JOHNSON SPACE CENTER

SONNY CARTER TRAINING FACILITY/NBL

2 FACILITIES

278,401 sq. ft.
TOTAL FACILITY SPACE

THE NBL'S MAIN PURPOSE IS TO PREPARE ASTRONAUTS FOR SPACEFLIGHT AND SPACEWALKS. NBL PROVIDES CONTROLLED NEUTRAL BUOYANCY OPERATIONS IN A 6.2-MILLION-GALLON POOL TO SIMULATE THE WEIGHTLESS CONDITIONS EXPERIENCED DURING SPACE FLIGHT. THE NBL HAS A FULL-TIME SCUBA DIVE TEAM OF ABOUT 40 AS WELL AS A TEAM OF MEDICAL, ADMINISTRATIVE AND MAINTENANCE PERSONNEL.



EDUCATION

NASA AND HIGHER EDUCATION IN TEXAS

- In 2018 the city of Houston approved \$18.8 million toward the development of a "Houston Spaceport" at Ellington Field, a proposed hub for aerospace companies.
- The McDonald Geodetic Observatory, a new facility under construction on the grounds of McDonald Observatory in West Texas, was created through a \$4.25 million contract between NASA and the University of Texas at Austin's Center for Space Research.
- Texas State University's LBJ Institute for STEM (Science, Technology, Engineering and Math) Education and Research recently participated in a \$3 million NASA grant program to support its STEM Teacher Excellence Project.

2018 PAYMENTS TO TEXAS PUBLIC AND PRIVATE UNIVERSITIES AND AFFILIATED RESEARCH ORGANIZATIONS FOR GRANTS AWARDED BY NASA

| ENTITY | FUNDING PROVIDED IN 2018 |
|---|--------------------------|
| CENTER FOR THE ADVANCEMENT OF SCIENCE | \$11,808,000 |
| BAYLOR COLLEGE OF MEDICINE | \$7,924,000 |
| UNIVERSITIES SPACE RESEARCH ASSOCIATION | \$6,838,000 |
| TEXAS A&M UNIVERSITY | \$922,000 |
| UNIVERSITY OF TEXAS MEDICAL BRANCH | \$907,000 |
| UNIVERSITY OF HOUSTON SYSTEM | \$624,000 |
| ALPHA SPACE TEST AND RESEARCH ALLIANCE | \$502,000 |
| UNIVERSITY OF TEXAS SOUTHWESTERN MEDICAL CENTER | \$444,000 |
| WILLIAM MARSH RICE UNIVERSITY | \$362,000 |
| UNIVERSITY OF TEXAS AT AUSTIN | \$318,000 |
| TEXAS TECH UNIVERSITY SYSTEM | \$166,000 |
| UNIVERSITY OF TEXAS AT EL PASO | \$95,000 |
| PRAIRIE VIEW A&M UNIVERSITY | \$78,000 |
| TEXAS A&M ENGINEERING EXPERIMENT STATION | \$52,000 |
| METHODIST HOSPITAL | \$29,000 |
| TEXAS A&M AGRILIFE RESEARCH | \$20,000 |

FROM 2010 TO 2018, NASA PAID OUT **\$375 MILLION** IN GRANTS TO TEXAS PUBLIC AND PRIVATE UNIVERSITIES AS WELL AS AFFILIATED RESEARCH ORGANIZATIONS.

GRAND TOTAL **\$31,088,000**

RICE UNIVERSITY:

ON SEPT. 12, 1962, PRESIDENT JOHN F. KENNEDY ADDRESSED THE NATION FROM THE RICE UNIVERSITY STADIUM, URGING AMERICANS TO EMBRACE SPACE EXPLORATION BY SENDING MAN TO THE MOON. RICE TOOK PRESIDENT KENNEDY'S WORDS TO HEART AND IN 1963 CREATED THE NATION'S FIRST-EVER SPACE SCIENCE DEPARTMENT.

THE UNIVERSITY'S CONNECTION WITH NASA AND JSC CONTINUES TODAY. NASA PERSONNEL SERVE AS INSTRUCTORS, MENTORS AND BOARD MEMBERS. RICE CURRENTLY EMPLOYS TWO ASTRONAUTS AS ADJUNCT PROFESSORS. AS OF SUMMER 2019, RICE WAS THE BENEFICIARY OF 33 ACTIVE NASA GRANTS WORTH **\$14.7 MILLION.**

NASA ESTABLISHED ITS MANNED SPACECRAFT CENTER IN 1961, ON A 1,000-ACRE SITE DONATED BY RICE UNIVERSITY.

TOURISM AND ENTERTAINMENT

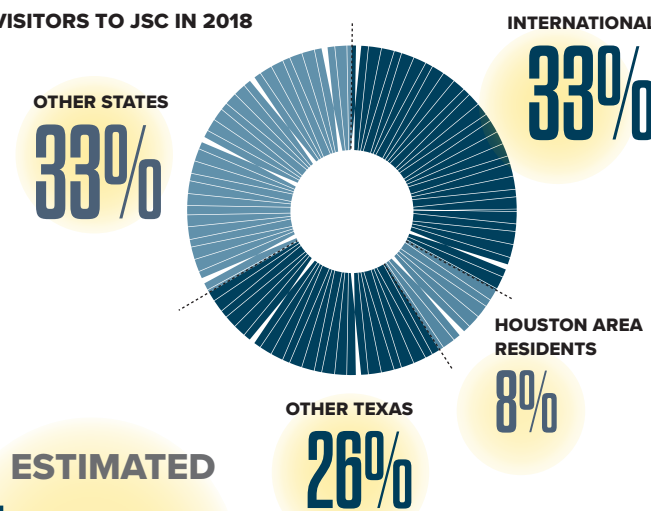
SPACE CENTER HOUSTON

The nonprofit Space Center Houston is JSC's official visitor center. Space Center Houston was originally funded from \$68.4 million in tax-exempt bonds with experts from Walt Disney Imagineering helping the Manned Spaceflight Education Foundation to create "a world-class facility where the public could come to touch the space program — and be touched by it."

CALLED "THE BEST MUSEUM IN TEXAS" BY USA TODAY, SPACE CENTER HOUSTON IS ONE OF THE STATE'S TOP TOURIST ATTRACTIONS, DRAWING AN ESTIMATED 1.1 MILLION VISITORS IN 2018, ABOUT 66 PERCENT OF THEM (726,000) FROM OUTSIDE TEXAS. THESE OUT-OF-STATE VISITORS ACCOUNT FOR IN-STATE PURCHASES SUCH AS MUSEUM TICKETS, HOTEL STAYS, FOOD AND BEVERAGES AS WELL AS PURCHASES AT THE SPACE CENTER HOUSTON GIFT SHOP.

IT IS ESTIMATED THAT OUT-OF-STATE VISITORS SPEND MORE THAN \$150 MILLION ANNUALLY IN TEXAS AS A RESULT OF THEIR VISITS TO JSC, AN AMOUNT THAT IN TURN GENERATES ABOUT \$10 MILLION IN STATE TAXES.

VISITORS TO JSC IN 2018



AN ESTIMATED

1.1 MILLION

PEOPLE VISITED JSC IN 2018

SOURCE: NASA'S JOHNSON SPACE CENTER

JSC ON THE SILVER SCREEN

NASA also plays a role in the Texas film industry. In 2018, NASA worked on more than 174 documentaries, 58 notable features and 15 feature films. JSC facilities provided a backdrop for film projects such as *Apollo 13*, *Space Cowboys*, *First Man* and *The Martian*, as well as documentary and educational programming.

1/2 FOOTBALL FIELD X 35 FEET DEEP

THE APPROXIMATE SIZE OF THE POOL USED TO PREPARE ASTRONAUTS FOR SPACEFLIGHT AND SPACEWALKS AT THE NEUTRAL BUOYANCY LAB.

NATIONAL HISTORIC LANDMARK

THE DESIGNATION GIVEN TO THE APOLLO MISSION CONTROL CENTER IN 1985, REFURBISHED AND REOPENED TO THE PUBLIC IN 2019.

> 250,000

THE NUMBER OF TEACHERS AND STUDENTS FROM AROUND THE WORLD WHO VISIT JSC ANNUALLY.

\$189 MILLION

JSC SPENDING THAT DIRECTLY SUPPORTED SMALL BUSINESSES IN 2018.

\$31M/\$375M

PAYMENTS TO TEXAS PUBLIC AND PRIVATE UNIVERSITIES AS WELL AS AFFILIATED RESEARCH ORGANIZATIONS FOR GRANTS AWARDED BY NASA FOR THE YEAR 2018 AND THE YEARS 2010 TO 2018, RESPECTIVELY.

\$4.6 BILLION

JSC'S TOTAL BUDGET FOR 2018, WITH \$2.3 BILLION (51 PERCENT) OF THAT SPENT IN TEXAS.

TEXAS' FIRSTS:



MOON ORBITING SPACE STATION

PART OF THE LUNAR INITIATIVE KNOWN AS "GATEWAY", PLANNED AND ADMINISTERED BY JOHNSON SPACE CENTER.

1.1 MILLION

NUMBER OF VISITORS SPACE CENTER HOUSTON DRAWS ANNUALLY

THE WORK FORCE

POWERED BY TEXANS

In 2018, NASA's Texas operations employed about 11,000. The Comptroller's office estimates NASA's Texas operations contributed more than \$4.7 billion to the state's GDP and supported more than 52,000 Texas jobs in 2018, including direct and contractor employees as well as jobs related to NASA activities.

TEXAS AVERAGE ANNUAL WAGES BY INDUSTRY, 2018

| INDUSTRY | AVERAGE ANNUAL WAGE |
|---|---------------------|
| GUIDED MISSILE AND SPACE VEHICLE MANUFACTURING | \$163,126 |
| NONSCHEDULED CHARTERED FREIGHT AIR TRANSPORTATION | \$66,393 |
| ENGINEERING SERVICES | \$111,607 |
| RESEARCH AND DEVELOPMENT IN THE PHYSICAL, ENGINEERING AND LIFE SCIENCES | \$116,359 |
| RESEARCH AND DEVELOPMENT IN NANOTECHNOLOGY | \$148,753 |
| RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY (EXCEPT NANOBIOLOGY) | \$121,140 |
| RESEARCH AND DEVELOPMENT IN THE PHYSICAL, ENGINEERING AND LIFE SCIENCES (EXCEPT NANOTECHNOLOGY AND BIOTECHNOLOGY) | \$111,848 |

SOURCE: CHIMURA ECONOMICS

INDUSTRIES ASSOCIATED WITH JSC PAY AVERAGE WAGES TWO TO THREE TIMES HIGHER THAN THE AVERAGE WAGE FOR ALL INDUSTRIES IN TEXAS AND THE GULF COAST REGION.

OF NASA'S APPROXIMATELY 11,000 PUBLIC AND PRIVATE EMPLOYEES IN TEXAS, 96 PERCENT HOLD AT LEAST A BACHELOR'S DEGREE AND 43 PERCENT HOLD A MASTER'S DEGREE OR HIGHER.

JSC AND SMALL BUSINESSES

The federal Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program provides opportunities for small businesses (up to 500 employees) to collaborate with NASA on research and development efforts in key technology areas.

IN 2018, THE STTR PROGRAM AWARDED 146 BUSINESSES APPROXIMATELY \$123 MILLION.

In all, \$189 million in JSC spending directly supported 163 small businesses in Texas in 2018.

THE FUTURE

TEXAS AND THE NEW SPACE AGE

THE GATEWAY PROGRAM, A PLANNED MOON-ORBITING SPACE STATION

JSC is home to the Gateway Program: a moon-orbiting space station designed as a key part of the Artemis Program. JSC also leads the Orion Crew Vehicle Program (for deep space exploration) and the Human Research Program (biomedical methods and technologies for safe space travel) and shares responsibility for leading the Commercial Crew and Cargo Program (commercial human spacecraft for low-earth orbit).

THE CLEVER PLANET PROJECT

A Rice-led research team was awarded a \$7.7 million grant to join the Nexus for Exoplanet System Science Project to determine how planets capable of supporting life are formed.

THE TULIPSS PROJECT

The Tunable Light-Guide Image Processing Snapshot Spectrometer (TuLIPSS) Project, led by Dr. David Alexander, director of the Rice Space Institute, and bioengineer Dr. Tomasz Tkaczyk, is developing technology to place a small spectrometer in space for the remote sensing of surface and atmospheric phenomena.

CONCLUSION

JSC will contribute significantly to NASA's Artemis Program with the Orion crew vehicle, the Gateway Program, astronaut training and mission operations. JSC will play a large part in international and commercial partnerships for the Artemis Program, pulling significantly from the foundation set by the ISS program.

NASA makes a \$4.7 billion annual impact on the Texas economy and directly and indirectly supports more than 52,000 public and private jobs. It plays a critical role in education, research, tourism and business activities in Texas' Gulf Coast Region and the state as a whole. NASA's relationship with Texas continues to prosper and evolve.

Glenn Hegar

Texas Comptroller of Public Accounts