



## Inspiring the next generation STEM workforce

2019

### REQUEST FOR FY 2020 APPROPRIATIONS

**Report Language** —"The recommendation provides \$120 million for NASA's Office of STEM Engagement, of which no less than \$50 million shall be allocated to the National Space Grant College and Fellowship Program. The Committee allocates no more than 10% to an administrative fee for each program in the NASA Office of STEM Engagement. The Space Grant balance of no less than \$45 million shall be allocated annually to jurisdiction consortia as base funding so that they may competitively distribute the funds to meet local, regional, and national needs."

### SPACE GRANT HIGHLIGHTS

**Space Grant**, established in 1989, is a competitive, highly effective national partnership program responsive to NASA-aligned regional and national priorities.

**Space Grant** is administered by consortia in 52 jurisdictions—all 50 states, plus PR and DC. Consortia serve as catalysts in each jurisdiction to help grow the future STEM workforce and to meet needs for existing and new STEM-related jobs.

**Space Grant** initiatives include STEM programs with experiential learning through apprenticeships, internships, industry partnerships, and other hands-on experiences. Examples of experiential learning include: launch vehicle and payload development, engineering, and assembly; personal and commercial space flight operations; space science and engineering; UAV operations; remote sensing; aircraft maintenance; cybersecurity; and space flight design.

**Space Grant** is leveraging partnerships across state consortia and with NASA to recruit and retain students to build a diverse STEM workforce in academia, industry/business, and government. Space Grant funded students achieve an impressive 80% graduation rate.



### JUSTIFICATION

The requested \$50 million would:

- **Strengthen and promote our national network** of state-based systems in partnership with NASA, committed to developing and sustaining a diverse well-prepared STEM workforce.
- **Improve student accessibility** to an expanded range of STEM-based experiential learning opportunities, STEM researchers, and faculty mentors.
- **Broaden, extend, and accelerate participation** of underrepresented minorities and women in STEM-based academic fields and careers.
- **Advance the nation's STEM education & workforce pipeline** to further the progress of science and create knowledge that transforms the future and sustains our global leadership.

The NATIONAL SPACE GRANT ALLIANCE exists to enhance the capacity of the United States of America to carry out education, research, and public outreach activities in science, technology, engineering, and mathematics (STEM) disciplines, particularly in fields related to space, aeronautics, and earth system science.

## STEM WORKFORCE CRISIS

**24<sup>th</sup>, 38<sup>th</sup>** U.S. LAGS IN STEM LITERACY. U.S. 15 year old students ranking in science and math among 71 countries.

**30<sup>th</sup>** U.S. RANKING OUT OF 35 OECD COUNTRIES IN ENGINEERING AS PERCENTAGE DEGREES AWARDED.

**14,000** BOEING EMPLOYEES APPROACHING RETIREMENT (>AGE 61). Expected to take 10-20 years to fully restaff.

**225,000** U.S. SPACE SCIENCE, ENGINEERING, AND TECHNICIAN JOB OPENINGS PREDICTED BY 2026. Including 8,600 scientists and 172,000 engineers.

## SPACE GRANT PARTICIPANTS

**>1,000** AFFILIATES and COLLABORATORS

**50** – in all – STATES plus DC and PR

Universities, community colleges, NASA field centers, industry, museums, and agencies

FY17

## SPACE GRANT STUDENTS

**>5,300** COLLEGE STUDENTS received Space Grant funding, including >1,000 community college students

**83%** of Space Grant COLLEGE STUDENTS remain in STEM fields

FY17

## ENGAGEMENT WITH NASA

**615** Total Space Grant Consortium Programs with NASA Entities

**70%** Involved Mission Directorates

**21%** Involved Centers and Facilities

**9%** Involved Office of STEM Engagement

FY17

## DIVERSITY

**29%** UNDERREPRESENTED PARTICIPANTS

**40%** FEMALE PARTICIPANTS

FY17

## FOR EACH NASA DOLLAR

**>\$1** Contributed from Non-federal Sources

FY17

## OUTREACH

**>43,000** EDUCATORS ENGAGED

**>720,000** PRECOLLEGE STUDENTS REACHED

FY17

## EXAMPLES OF STEM STUDENT INTERNSHIPS AND CAREER PLACEMENTS





**Texas Space Grant Consortium (TSGC)** is part of NASA's National Space Grant College and Fellowship Program, a network of 52 state-based consortia plus Puerto Rico and the District of Columbia.

- **TSGC membership includes more than 50 Texas organizations:** community colleges and four-year universities, industrial and non-profit organizations, and government agencies.

- **Our mission is to vigorously educate,** inspire and motivate students at all levels to pursue careers in science, technology, engineering and mathematics (STEM); to assist in the **professional development** of faculty members and researchers in pursuits aligned with **NASA's mission**; and to engage students and the general public in sharing and shaping the experience of **exploration and discovery** through contemporary STEM programs.

- **TSGC engages the state's brightest,** most creative and most innovative students, engineers, scientists, and educators in programs aimed at providing NASA and high tech industries with a vital, diverse and **prepared technical workforce.**



## VISION

To enable the people of Texas,  
at all points in their lives and educational careers,  
to be inspired by, and participate in,  
the exploration of the great unknown of outer space.

## OBJECTIVES

- **Foster** the development of multi-institutional space research efforts including industry-university teaming
- **Promote** sharing of space-related course materials among consortium academic institutions
- **Support** high quality graduate level space research at consortium academic institutions
- **Capitalize** on interest in NASA and space to increase participation in STEM in public schools
- **Advance** space-related programs and curricula for schools and for the public
- **Increase** the pool of high school graduates who enter college to study science, mathematics, and engineering with emphasis on underrepresented minorities and women



**Community College Affiliates:** Austin Community College ♦ El Paso Community College ♦ Houston Community College ♦ Lone Star College ♦ McLennan Community College ♦ San Jacinto College ♦ **Four-Year University Affiliates:** Angelo State University ♦ Baylor University ♦ Lamar University ♦ Prairie View A&M University ♦ Rice University ♦ Southern Methodist University ♦ St. Edwards University ♦ Sul Ross State University ♦ Tarleton State University ♦ Texas A&M University ♦ Texas A&M University Commerce ♦ Texas A&M University Corpus Christi ♦ Texas A&M International University ♦ Texas A&M University Kingsville ♦ Texas A&M University Texarkana ♦ Texas Christian University ♦ Texas Southern University ♦ Texas State University San Marcos ♦ Texas Tech University ♦ Texas Woman's University ♦ Trinity University ♦ University of Dallas ♦ University of Houston ♦ University of Houston Clear Lake ♦ University of Houston Downtown ♦ University of North Texas ♦ University of Texas at Arlington ♦ University of Texas at Austin ♦ University of Texas at Dallas ♦ University of Texas at El Paso ♦ University of Texas at San Antonio ♦ University of Texas at Tyler ♦ University of Texas Rio Grande Valley ♦ UT Health Science Center Houston ♦ UT Health Science Center San Antonio ♦ UT Medical Branch Galveston ♦ UT Southwestern Medical Center ♦ University of St. Thomas ♦ **Industry / State Agency / Non-Profit Affiliates:** Austin Astronomical Society ♦ Austin Planetarium ♦ Bob Bullock State History Museum ♦ Capitol Area Council Boy Scouts of America ♦ Don Harrington Discovery Center ♦ Girlstart ♦ Lockheed Martin ♦ National Society of Black Engineers ♦ Office of the Governor ♦ Rio Grande Valley Science Association ♦ Scobee Education Center ♦ Seal of Valor ♦ Southwest Research Institute ♦ Texas Higher Education Coordinating Board ♦ Texas Medical Center ♦ United Space Alliance ♦ University Space Research Association

## *Without funding provided by Space Grant, NONE of the following impacts would have happened*

### Scholarships, Fellowships, and Internships

- Nationally, thousands of college students have been placed in paid internships with NASA, industry and other federal labs, and millions of dollars of scholarships and fellowships have been awarded.
- In Texas, TSGC has competitively awarded **more than \$2,000,000 to more than 1000 students** for undergraduate STEM Scholarships, STEM Educator Scholarships, and Graduate Fellowships

Higher education student tracking data

- Since 2006, **95% have been successfully tracked** and taken a next step in academia or career
- **27% are minorities and 39% are women**

For all the students significantly supported and tracked:

- **30% are pursuing advanced STEM degrees**
- **14% accepted STEM positions in academia**
- **40% accepted STEM positions at NASA, contractors, or space-related industries**



### Research and Partnerships

- We are focused on developing and fostering partnerships between NASA, academia and industry in support of NASA's mission. To date TSGC has sponsored and funded **over 250 research efforts**.
- Design Challenge Program: Since 2002, this NASA-Academia partnership has involved more than 200 undergraduate teams to propose, design and fabricate a mission-relevant solution for a NASA project. This has engaged **more than 1000 students and 150 faculty** representing more than 15 different Texas institutions with support from dozens of NASA mentors.

### Outreach and General Public

- With a goal to engage and empower Texas educators, students, and the general public with space exploration and STEM education, **we reach over 1,600,000 direct and indirect participants** over the span of five years, including more than 700 collaborative efforts with non-affiliate organizations.



### Workforce Pipeline


- We inspire and educate students to fill the workforce pipeline by delivering hands-on STEM programs and activities for students, focusing on grades 6-12 and **directly reaching more than 2000 students** per year.
- Our nationally-competitive SEES (STEM Enhancement in Earth Science) summer internship program has engaged more than 100 high school students directly with NASA scientists, engineers and missions with **98% then starting college with a STEM major**

### Teacher professional development

- With a Train the Trainer model, **more than 24,000 teachers** have been directly impacted by our programs, leading to **more than 900,000 students** who have had direct experience with program materials in the classroom.





	TSGC DESIGN CHALLENGE
	PROGRAM PROFILE INSPIRING THE NEXT GENERATION OF SPACE-RELATED INVENTION & DESIGN

## WHAT IS THE TSGC DESIGN CHALLENGE?

Sponsored by NASA and administered by the Texas Space Grant Consortium, the TSGC Design Challenge is a unique academic experience that exposes undergraduate students to space-related careers as they work toward solving a research/design objective of importance to NASA and its mission.



Design Challenge topics are submitted for student selection by researchers working on real-world projects of interest to the space community. Students work as a team to meet the design objectives over the course of one or two semesters, all the while interacting with a workplace mentor. The overall experience pairs the student team and faculty advisor with a professional working in a space-related field; exposes students to current space-based workplace initiatives; and provides opportunities in scientific research, hands-on design, presentations and educational outreach.

## PROGRAM OBJECTIVES and GOALS

- *Impact the space career workforce*
- *Bridge the school-to-work transition through engaging topics*
- *Invigorate student interest in academic pursuits that solidify interest in space-related careers*




- *Encourage institutions of higher learning to implement, improve, or expand the design curriculum*

## HOW DOES THE CHALLENGE WORK?

- Structured to accommodate a variety of design sequences taught in curriculums throughout the State of Texas in institutions of higher learning.
- Incorporates team-directed increments that build upon one-another through the course of a semester: base design proposal, three specific design Levels, and optional outreach.
- Teams earn funding to support both the design effort and site visits as program milestones are completed.
- Workforce Development Initiatives include incorporation of a site visit, travel funds that allow associated field experiences, and industry mentoring.





## TSGC DESIGN CHALLENGE

### PROGRAM PROFILE

INSPIRING THE NEXT GENERATION  
OF SPACE-RELATED INVENTION & DESIGN



### HISTORY

The genesis of what would become the TSGC Design Challenge began as the NASA-USRA Advanced Design Program in the 1980s. After that ended, Dr. Wallace Fowler and others at TSGC continued the program model and ran several versions. In 2002 Debbie Mullins focused the program on pairing Texas schools with NASA JSC projects. In 2013 the program direction was turned over to Dr. Tim Urban and Talia Jurgens.

The program has grown to include the wider NASA Johnson Space Center community as mentors and judges, partnered with NASA’s Education Systems Mission Directorate, and has become a widely-acclaimed program by students, faculty and NASA.

Year	Teams	Institutions	Students
2002	3	3	11
2003	18	11	109
2004	25	16	154
2005	30	15	142
2006	20	10	79
2007	24	10	118
2008	17	10	80
2009	17	12	71
2010	23	14	90
2011	18	10	76
2012	19	11	89
2013	8	6	40
2014	18	10	102
2015	24	11	125
2016	24	19	108
2017	26	13	118
2018	36	13	162
TOTAL	350	-	1674

