

FY 2019 Year 5 Extension Annual Performance Document

New Jersey Space Grant Consortium
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A. PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The New Jersey Space Grant Consortium is a Program Grant Consortium funded at a level of \$581,400 for fiscal year 2019.

B. PROGRAM GOALS

Goal 1: To develop a scholarship and fellowship program that provides graduate as well as undergraduate research and educational opportunities to a diverse spectrum of New Jersey students in the disciplines of science, math, technology, and engineering, with emphasis on aerospace, and with research opportunities at NASA centers.

- Objective 1.1: \$145,000 will be awarded in fellowships to N.J. students in STEM fields and in a way that reflects the diversity characteristics of N.J. college students.
- Objective 1.2: \$15,000 will be awarded through research fellowships to graduate students, through the NASA/NJSGC Graduate Student Fellowship program.
- Objective 1.3: \$70,000 will be awarded as Summer Fellowships to undergraduates in N.J. to conduct research at a NJSGC member university, at an approved industrial corporation, or at a NASA Center.
- Objective 1.4: \$60,000 will be awarded as Academic Year Fellowships to New Jersey undergraduate students in STEM.
- Objective 1.5: At least 90% of the summer fellowship students and graduate research fellows will present their research at the NJSGC fellowship conference.
- Objective 1.6: All of the fellowship recipients will be subject to longitudinal tracking. At least 80% of award recipients will respond to the longitudinal tracking survey.

- Objective 1.7: Based on national statistics on minority enrollment in N.J. colleges, at least 37.4% (28% prior to 2018) of all student awards and other direct support will be awarded to underrepresented minority students. At least 45% of award recipients will be females.

Goal 2: To produce diverse and well-educated college graduates in STEM who will be inspired by their NJSJC experience and will be motivated to pursue careers in STEM and aerospace, as well as graduate study; thus, creating a pipeline to the STEM workforce. Further nurture interdisciplinary approaches and to develop higher education networks.

- Objective 2.1: Allocate \$20,000 for support of Design Projects that will foster a higher education network in New Jersey and provide a hands-on experience to students.
- Objective 2.2: Allocate \$5,000 for an Industry Co-Op/Internship program for students to receive co-op or internship experience.
- Objective 2.3: \$10,000 will be allocated for the Aerospace Course Development program, for N.J. faculty to develop new college courses in aerospace and teach them.
- Objective 2.4: \$20,000 will be provided to New Jersey universities for Summer Development Programs for entering freshmen and for K-12 college bridge programs.
- Objective 2.5: \$6,000 will be allocated to support the NASA GISS Summer Internship Programs at the Goddard Institute for Space Studies in NYC, formerly the NYCRI program. NJSJC will match funds for student support from “The Opportunity Network.”
- Objective 2.6: \$37,009 will be allocated to New Jersey college students and faculty members to participate in the CubeSat, Rock-SAT-C, and Ballooning Programs at Rowan University, Stevens Institute of Technology, Princeton University, and Rutgers University.
- Objective 2.7: \$20,000 will be allocated for the running of K-12 bridge programs, which connect K-12 students with college faculty and industrial experts for enrichment.

Goal 3: To promote research activities relevant to NASA and New Jersey industry, to build research networks and to create pipelines from research to industrial development, and support STEM workforce development. To support junior faculty and graduate students in research, to increase diversity among researchers and graduate students.

- Objective 3.0: \$4,000 will be provided for Travel Support to students to attend scientific conferences.
- Objective 3.1: The Research Clusters and Mini Grants program will provide \$70,000 to research clusters in N.J. universities or to junior faculty in STEM.
- Objective 3.2: \$10,000 will be allocated for Community College Research with the goal of supporting the students through acceptance in a 4-year institution of higher learning.
- Objective 3.3: \$25,000 will be allocated to programs for Minority Student Development for Graduate Study (name of program: RiSE – Research in Science and Engineering).

Goal 4: To inspire, motivate, and develop New Jersey’s math and science teachers by means of teacher training, educational outreach, and professional development programs.

- Objective 4.1: Allocate \$20,000 to support science Teacher Training programs.
- Objective 4.2: At least 80% of teachers will respond to our survey. At least 75% of teachers will have used their training within a year and 90% within two years of training.

Goal 5: To stimulate a broad interest in, and an understanding of, various scientific and technical disciplines of interest to NASA by supporting informal education STEM programs. Promote awareness of NASA’s mission and its contribution to society.

- Objective 5.1: \$6,500 will be allocated for support of planetariums, science centers and new programs.
- Objective 5.2: \$10,000 will be allocated to the “50th Anniversary of the Moon Landing” anniversary programs.

Goal 6: NJS GC will be a proactive and diverse organization that is run efficiently and effectively. All activities will continually be monitored, and new initiatives pursued.

- Objective 6.1: NJS GC will have an effective, efficient and frugal office which continuously monitors itself, and whose documents are up to date. NJS GC will have well-defined operational policies and procedures for all of its activities.
- Objective 6.2: NJS GC will have a set of active affiliates who contribute to the programs of the consortium by serving on committees, publicizing NJS GC activities at their organizations, and by recruiting students and faculty to apply for NJS GC awards.

Goal 7: NJS GC will strive for diversity in all of its programs by awarding students who reflect the diversity of New Jersey. NJS GC will inspire members of the minority community to choose careers in STEM and will work with minority serving institutions in New Jersey, as well as other states, and will support them with funding, fellowships and internships.

- Objective 7.1: Based on national statistics on minority enrollment in New Jersey colleges, at least 37.4% of all students receiving stipends should be underrepresented minorities. At least 45% of all student award recipients will be female students. This is a transition year for New Jersey Space Grant. Whereas the diversity statistics were previously 28% for the last 10 years, they are now 37.4%. NJ Space Grant has been able to raise its diversity statistic to 28.6% in the last year, and we will endeavor to target programs statewide to produce a further increase.
- Objective 7.2: NJS GC will actively engage and support minority serving institutions in New Jersey and in nearby states, including universities and community colleges with sizable minority populations.

C. PROGRAM/PROJECT BENEFITS TO PROGRAM AREAS

NJS GC award recipients continue to make strides in their careers.

Two NJS GC-supported student alumni, Kristene Aguinaldo (Rutgers Student Ambassador) and Alexander Sanduccu (Rocketry Program), made presentations that were very well received at the Fall 2019 Mid-Atlantic Regional conference in Charleston, West Virginia. Mr. Sanduccu is continuing on to graduate study in engineering at Rutgers.

Jade Alvarez (FY2017 summer fellow) presented her research at the Fall 2018 Space Grant Directors meeting in Stowe, Vt., by participating in the poster session. As a result of the conversations she had with Space Grant directors, Ms. Alvarez decided to pursue graduate study. She is currently pursuing a Master’s Degree at Towson University in Astrobiology supported by the Pathways to the Ph.D. program of NIH.

Rock-SAT-C team member (FY2017), Richard Thornton, after graduating Stevens, was hired as a Space Systems Engineer with Northrop Grumman and primarily works on simulation and modeling tasks specifically within the EO/IR remote sensing field. He assesses payload performance, designs constellation orbits and while working on more mature programs optimized processes for handling telemetry, calibrating sensors and resolving anomalies.

Rock-SAT-C team member (FY2016, FY2017 and FY2018), Stephen Kontrimas will be hired eminently by L3Harris in Palm Bay, Florida. His title is Senior Associate Mechanical Engineer and he will be working in Space & Airborne Systems.

Doug Sholander, Rock-SAT-C team member (FY2016 to FY2018), accepted a position of Systems Engineer at The Boeing Company in 2018.

D. PROGRAM ACCOMPLISHMENTS

- NASA Internships, Fellowships, and Scholarships (NIFS):
 - ❖ NJSGC runs three fellowship programs: Undergraduate Academic Year, Summer and NASA Internships, and Graduate. In FY2019, we expect to support around 42 fellows, and to send at least one student to a NASA Center.
 - ❖ While fellowship programs do not require match, NJSGC requires graduate fellowships to have cash match from the student's institution, which makes the stipends more attractive.
 - ❖ NJSGC holds two annual conferences. One meeting is held in spring, with the academic year fellows highlighting their work in a poster session. The poster session is held on the afternoon of the NJSGC annual affiliate meeting. The second meeting is in August, where the summer fellows and research cluster participants make presentations. The poster session in Spring 2019, which was held at The College of New Jersey, was video conference statewide so affiliates from the northern region of the state could participate.
 - ❖ NJSGC considers all fellowships it gives out as major awards and tracks the fellowship recipients.
- Higher Education projects:
 - ❖ The Design Project program provides support for project supplies for New Jersey college student projects. We also support student design groups who participate in national competitions. In FY2019, we supported travel support for the "Solar Splash Competition" and "The Formula SAE Competition" both entered into by Stevens Institute of Technology. Matching funds were provided by Stevens.
 - ❖ An autonomous airplane project by the AIAA student section at Rutgers, as well as at Rowan is underway. We are currently working on expanding this program statewide and plan to hold a statewide autonomous aircraft competition in the near future.
 - ❖ The Course Development program supports development of new aerospace courses. In FY2019, Stevens developed a course in Advanced Gas Dynamics, which will be a follow up on a course on compressible flow offered at Stevens.
 - ❖ With the introduction of the B.S. degree program in Aerospace Engineering at Rutgers, which was supported in part by NJSGC, the number of engineering students interested in aerospace has increased substantially. This has led to the development of student organizations with interest in aerodynamics, flight, aviation, and space flight. NJSGC is supporting the activities of these student organizations. We sent two rocketry groups to New Mexico (SpacePort) in summer 2019. Both launches had limited success.
 - ❖ NJSGC continues to participate annually in the Rock-SAT-C program and has done so since 2012. NJSGC initiated participation in the Rock-ON program in 2010 by sending

Joseph S. Miles, NJSGC's Program Coordinator, to the program. The following year, 2011, six Stevens students attended Rock-ON.

We continue to expand NJSGC's hands on programs. In summer 2019, we supported two rocketry programs, one at Rutgers University and one at Princeton University. The Cube SAT program at Rowan University is drawing to a conclusion. The ballooning program was not active in FY2019.

- ❖ The Partners in Science program of the Liberty Science Center brings high school students together for a summer of enrichment under the tutelage of an industry professional. We supported ten high school students in FY2019.
 - ❖ NJSGC has been supporting Equal Opportunity Fund (EOF) programs at affiliate institutions. This initiative is a part of our bridge programs. The EOF programs bring students entering STEM fields to campus before their first semester and provides them with enrichment, as well as a small stipend.
 - ❖ The Academy at Rutgers for Girls in Engineering and Technology (TARGET) program sponsors female middle school students during the summer and introduces them to hands-on engineering. NJSGC funds about 20% of the program.
 - ❖ NJSGC was able to support a Student Ambassadors program at Rutgers School of Engineering. This program, which was funded using carryover funds from previous years, enhances the learning experiences of new and continuing students. The vast majority of the ambassadors are female students, which affected our direct-supported FY2019 student database with an unprecedented high female percentage.
- Research Infrastructure projects:
 - ❖ Research clusters for summer 2019 were at Rowan, Rutgers, Seton Hall, Stevens, TCNJ, and Ramapo College/NJIT. Approximately 40 students are supported. The research clusters program has become very popular. In FY2018, we brought Rutgers Newark into our research and outreach programs. A group of four Rutgers Newark students, under the supervision of Prof. Ed Bonder, participated. We are continuing with this program in FY2019.
 - ❖ The Research in Science and Engineering (RiSE) program, run by the Graduate School of Rutgers University, recruits, trains and mentors underrepresented, disadvantaged and underserved students in STEM disciplines, and prepares them for graduate school and research. In summer 2019, NJSGC supported five students.
 - ❖ Since FY2013, NJSGC has been supporting community college programs that encourage students to advance to four-year colleges. NJSGC was the recipient of a community college award for \$500,000 which ended in September 2017. In FY2019, NJSGC supported three community colleges with research and mentoring programs: Middlesex CC, Essex CC, and Brookdale CC. We also have ongoing discussions with Atlantic Cape, Union County and Passaic County Community Colleges. For the FY2020 to FY2024 Space Grant solicitation, Union County and Essex County Colleges have collaborated to propose for the NCAS program by submitting a proposal. We are also building ties with Passaic County College for the NCAS program.
 - Pre-College projects:
 - ❖ The bulk of our pre-college programs consist of teacher training. In FY 2019, besides the New Jersey Astronomy Center for Education at Raritan Valley Community

College, NJSGC is also supporting a pre-service science teacher training program, jointly run by Rutgers School of Education and Rutgers School of Engineering. STEM students begin taking education courses in their fourth year and receive a B.S. Degree in a STEM field and a Master's Degree in Education at the end of their fifth year.

- Informal Education projects:
 - ❖ NJSGC supports informal education programs minimally; about 1% of its budget. Our informal education programs are primarily planetarium support at Liberty Science Center and at other institutions. We have also supported planetariums at Raritan Valley Community College, and at Rowan University in the past.
 - ❖ Rowan University and Princeton University had seminars by astronauts and space researchers in March and April 2019, but the bulk of our Apollo-related activities took place during the summer of 2019, primarily at Rutgers University and at the Liberty Science Center as detailed below.
 - ❖ During July 2019, several of our affiliates ran activities in commemoration of the 50th anniversary of the moon landing. Funds were allocated for support of various programs commemorating the 50th anniversary of the moon landing in July 1969 and its contribution to society. Programs consisted of lectures at Rowan University, programs for K-12 students at The College of New Jersey and Rutgers, a night (July 17th) at Liberty Science Center entitled “50 Years to the Moon: An Exploration of Space” Lectures by Princeton University Professor Robert F. Stengel, and the Imagine the Moon and Environment Tour (July 17th) at The Newark Museum. Additionally, the Office of Student Development at Rutgers University partnered with NJSGC to hold a celebratory day on July 19, 2019, in honor of the 50th anniversary of the Moon landing. Astronaut Bob Cenker spoke to a standing room only audience consisting of college students, faculty and K-12 students. Also, Haim Baruh gave a lecture to K-12 students at the Newark Museum on the Moon and space exploration.

E. MILESTONES

- 1.2 to 1.4 Fellowships – New Jersey has fully met its fellowship milestone though the allocation of all budgeted funds between summer, graduate and academic year fellowship programs though the funds may be allocated slightly differently than originally budgeted.
- 2.1 Design Projects – Milestone met by supporting programs at Rutgers and Stevens
- 2.2 Co-Op Industry Program – Milestone met of supporting one student.
- 2.3 Course and Faculty Development – Milestone met.
- 2.4 Summer development programs – Milestone met.
- 2.5 NASA-GISS Program – Program enters its 15 year and has met its milestone.
- 2.6 Rocketry, Ballooning and CubeSat Program – The rocketry program has met its milestone of engaging 11 students. Ballooning program was not run during FY2019 with the funds being diverted to the rocketry and CubeSat programs. The CubeSat program is ongoing.
- 2.7 K-12 Bridge Program – Milestone met.
- 3.0 Travel Support for Conferences – Milestone met.
- 3.1 Research Clusters and mini-grants program has met its milestone of engaging and training 40 students across 6 academic institutions.
- 3.2 Community College Research – Milestone met with proposals for NCAS program.

- Also, ongoing mentoring and research programs.
- 3.3 RiSE program for Minority Students – Milestone met for funding 5 students.
- 4.1 Teacher Training – Over 480 teachers have been trained in meeting the NJ State astronomy standard.
- 5.1 Planetarium Support and Moon landing 50th Anniversary programs – Both milestones have been met by supporting three planetariums and four 50th anniversary programs.

One of the milestones in need of discussion is our financial expenditures. There are two factors that come up when we discuss our budgetary expenditures. One factor is that the lead institution has charged us much less than expected in indirect costs. The other factor involves budgeting dates. Programs for our summer 2020 programs are part of the FY2019 budget but we have not made those expenditures yet. As a result, our FY2015-2019 expenditures seem low at this point in time. Also, changes in our budget dates in the last five years left us with carryover funds. We are expending these funds by funding additional research and higher education projects, such as the Ambassadors Program at Rutgers New Brunswick and research and outreach program at Rutgers Newark.

F. PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE GOALS

Diversity:

- FY2019 statistics so indicate that for the fifth year in a row, we will come very close to or exceed our 10-year historical targets in diversity. There is a huge increase in female participation, primarily due to the Student Ambassadors Program at Rutgers we have started supporting. Because of population shifts in New Jersey, there has been a sizable increase in minority enrollment at New Jersey Universities with our targets raised to 37.4% starting in FY2019. Our results were higher than previous years (33.4%) but lower than our new targets. We plan to further increase our minority participation by developing programs similar to the Ambassadors Program but exclusively for minority students.
- NJS GC has geographic diversity as well. From the north to the south, we have programs at most New Jersey colleges. We make efforts to ensure each congressional district is represented among our award recipients. We also regularly contact colleges that are not part of NJS GC. In FY2018, Stockton University became an affiliate, and in FY2019, we made contact with Marc Favata at Montclair State University and Montclair State University became an affiliate, in addition to William Paterson University. We are about to add Brookdale Community College and Middlesex County College as affiliates very soon.

Minority Serving Institution Collaborations:

- There are no historically black or other minority institutions in New Jersey. However, because of their location, there are several two-year and four-year institutions classified as minority serving. Most are affiliates of NJS GC and we support them with fellowships and higher education programs.
- NJS GC has continued supporting the RiSE (Research in Science and Engineering) program, where minority college students from all over the country come to Rutgers University and conduct research. In FY2019, five students were supported.

- New Jersey City University is minority serving and has a relatively large science program. We have partnered with them for fellowships and proposals. They have also helped us with contacts at community colleges.
- Bloomfield College has a sizable minority enrollment (nearing 50%). We support academic-year fellows at Bloomfield College.
- Both of our newest affiliates; Montclair State and William Paterson, are MSIs and we expect our minority statistics to improve with the inclusion of these affiliates to our network.
- NJSJC actively supports the NCAS program, which is intended for community colleges that are MSI. We have proposed funding for Essex County College and Union County College in our FY2020 proposal. We are currently developing our relationship with Passaic County College.
- **Office of Education Annual Performance Indicators:**
 - API 3.3.3: STEM-19-1 Provide Significant, direct student awards in higher education
 - (1) Students across all institutional categories and levels: 105
 - (2) racially or ethnically underrepresented students: (30/105) 28.6% NJ Target: 37.4%
 - (3) women (50/105): 47.6% NJ Target: 45.0%
 - (4) persons with disabilities (4/105): 3.8% NJ Target: 10.0%
 - API 3.3.5: STEM-19-5: Contribute to American technical capability by supporting the release of at least 1,200 paper presentations and peer-reviewed research publications through National Space Grant College and Fellowship Program to Stimulate Competitive Research (EPSCoR), and MUREP investments. We have not had the opportunity to participate in these programs.

G. IMPROVEMENTS MADE IN THE PAST YEAR

- NJSJC has significantly increased its funding of hands-on projects for New Jersey students in recent years. In FY2019, we supported two new rocketry programs and established a new CubeSat program at Princeton University.
- NJSJC continues to expand its outreach efforts to attract and retain minority students in STEM. For five years in a row, NJSJC has met or exceeded its 10-year historical targets. Our new minority target is 9 to 10% higher and we are close to meeting it.
- We have become an essentially paperless office. We have not purchased any printing paper in over three years. We have maintained a very frugal operation and our administrative expenses are below the Space Grant average.
- We are keeping better track of our expenditures and making efforts to reduce carryover funds. Specifically, we are discussing with our accountants indirect cost expenditures, which contribute to our carryover.

H. CURRENT AND PROJECTED CHALLENGES

NJSJC programs and the NJSJC office are running smoothly. We continue to expand our organization. Our greatest challenge is to maintain the enthusiasm of our affiliates and to keep them involved. The activity level of an affiliate is very much in the hands of the affiliate representative and we need to keep the affiliate representatives engaged at all

times. One persistent challenge is the accounting and procurement system at the lead institution.

Another issue associated with keeping our affiliates involved is the fluctuation in funding levels and the activities we can support at affiliate institutions. Also, it has been difficult to attract our affiliates to submit their own proposals for competitive awards announced by NASA, such as MUREP.

With the end of the community college grant upon us, we are faced with the challenge of continuing our relationships with community colleges with which we have worked in the past. Our community college partners have had difficulty in obtaining match from their institutions or from other sources. We are working with them to identify sources of match. Meanwhile, Union and Essex Community Colleges are collaborating for the NCAS program in the FY2020 – FY2024 solicitation.

I. PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Affiliate Partners:

- Astronomy Center at Raritan Valley Community College; Very active, key player in our pre-college efforts.
- Bloomfield College; Active and participates in our academic year fellowship program.
- Essex County College; Active and we have supported fellowship programs as well as STEM clubs and research. We also started work with them on the NCAS program.
- Georgian Court University; Very active with academic year fellowships, K-12 bridge programs and support of teacher workshops.
- NASA Summer Internship Programs at the Goddard Institute for Space Studies in NYC; While not an official affiliate, as it is part of a NASA Center, we consider it an affiliate and partner with them for summer programs.
- Liberty Science Center; Very Active and our only non-academic affiliate. Participates with their Partners in Science program. We also support the LSC planetarium.
- New Jersey City University; Active and designated minority-serving institution. We have partnered with them for responding to NASA solicitations.
- New Jersey Institute of Technology; Active, we have funded research programs and bridge programs for graduate study.
- Montclair State University; Active new affiliate supported with two fellowships.
- Princeton University; Active, we have funded research programs with them and sent their students to NASA centers. We also support a rocketry program there.
- Ramapo College; Active and participates in our research clusters.
- Rowan University; Very active with research, fellowships, research clusters, and informal education.
- Rutgers, New Brunswick; Lead institution and very active affiliate.
- Rutgers Camden; Active affiliate where we have supported academic year and summer fellowships, as well as course development programs.

- Rutgers Newark; Active affiliate and we began to support a research and outreach program there.
- Seton Hall University; Very active with academic year fellowships and also research clusters program.
- Stevens Institute of Technology; Very active and involved in most of our programs. Private university that provides undergraduate and graduate education in STEM topics.
- Stockton University; New affiliate and we have been sponsoring two hands-on student projects and academic year fellows.
- Union County College; Actively participates in the academic year fellowship program and in the community college grant. New NCAS collaboration.
- The College of New Jersey; Active affiliate which we have supported with fellowships and research clusters. Small public college with primarily undergraduate programs.
- William Paterson University; New affiliate and they have begun their NJSGC participation with academic year fellowships.

Non-Affiliate Partners:

- Princeton Plasma Physics Laboratory; Part of the Department of Energy, we have sent summer fellows there to work on research projects. Not very active in last two years.
- RiSE - Research in Science and Engineering; This program, which is run by the Graduate School at Rutgers University, is a strong magnet to attract minority students to STEM and encourage these students to continue on to graduate school.
- Our relations with the FAA have expanded but slowed down in FY2018. We are reinvigorating in FY2019. We visited them a few weeks ago and pitched to them a fellowship program similar to Space Grant fellowships. We also are doing a limited amount of research with them.
- The following community colleges have partnered actively with us, especially with regards to the community college grant: Atlantic Cape County College, Brookdale Community College, and Middlesex County College. We are currently making plans to increase our community college involvement. Middlesex and Brookdale CC are officially joining our affiliate network with the vote taken at the next NJSGC affiliate meeting.