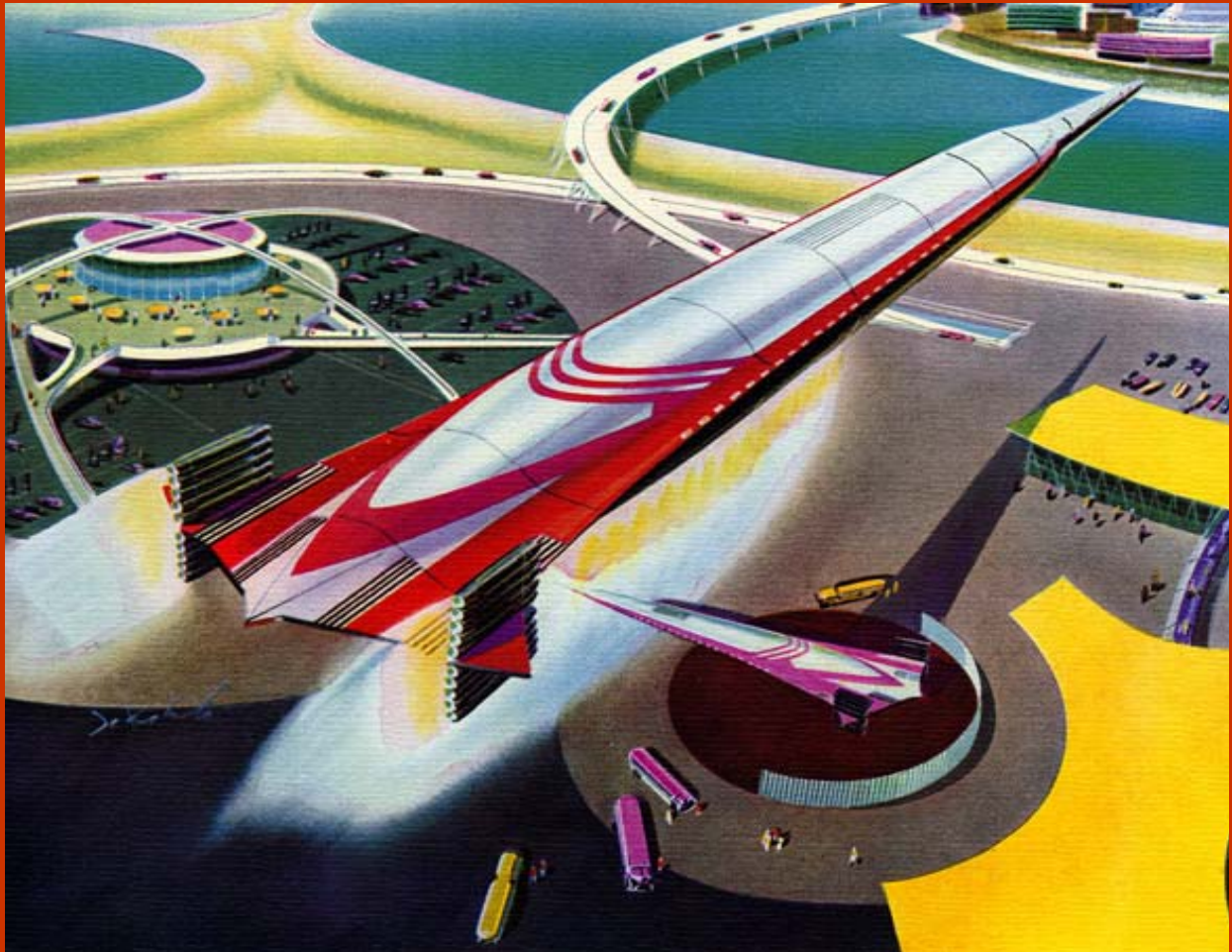


20 Years Into the Future

Program Performance & Results of the Florida Space Grant Consortium

October 2008



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Table of Contents(1.0)	2
Statement of Consortium Concurrence (2.0)	3
Executive Summary & Consortium Impact (3.0)	4
Foreword (4.0)	6
Programmatic Elements (5.0)	8
Consortium Management	8
NASA Education Outcome: Consortium Programs	12
- Fellowship/Scholarship	12
- Research Infrastructure	15
- Higher Education	18
NASA Education Outcome: National Program Emphases	20
- Diversity of Participants	20
- Workforce Development	23
- Longitudinal Tracking	24
- Minority Serving Institutions	25
NASA Education Outcome: Consortium Programs	26
- Precollege Education	26
NASA Education Outcome: Consortium Programs	29
- Public Service: General Public & External Relations	29



1.0 Statement of Consortium Concurrence

The affiliates of the Florida Space Grant Consortium (FSGC) have reviewed this document on-line and concur that it accurately describes the FSGC's performance and results over the past five years. The affiliates have approved this report via the online concurrence method set up by the National Space Grant Foundation

3.0 Executive Summary & Consortium Impact

The late 1980s were formative years for Florida’s active involvement in our nation’s space program. The state created a Commission on Space that put forward a long list of recommendations in 1988 for expanding and diversifying Florida’s space industry. That same year, Congress passed the National Space Grant Act and paved the way for two decades of close collaboration between the Florida Space Grant Consortium (FSGC) and various Florida agencies tasked with supporting space education, workforce development, research, and technology development.

Since 1989, FSGC has grown from an initial membership of seven affiliate universities to today’s total of 20 affiliates, including public and private universities, community colleges, informal educational organizations, and state agencies. These partners give FSGC a statewide presence and they provide resources that expand our reach into K-12 and post-secondary classrooms, university and NASA laboratories, and corporate boardrooms. FSGC has evolved to fill an important niche in Florida, linking NASA with state policy makers, academic institutions, and industry partners to sponsor a variety of programs of common interest. FSGC leverages resources from these stakeholders to provide grants, scholarships, and fellowships to students and educators, and support research and technology development, policy planning, and outreach throughout the state.

3.1 FSGC’s Long Term Goals and Objectives

- Fund research with student involvement that supports NASA's Mission Directorates with an emphasis on space exploration and science.
- Create public programs that support literacy in science, engineering, technology, and mathematics for the citizens of Florida.
- Increase interest and learning in STEM, using the challenge of NASA’s Mission Directorates.
- Recruit women, underrepresented minorities, and the disabled for careers in math, science, engineering and technology.
- Encourage interdisciplinary education and training, research, and public service programs related to aerospace and encourage collaborative development programs among universities, industry, and federal, state, and local governments.
- Facilitate the post-graduate training of K-12 teachers.

3.2 FSGC Impact on NASA

FSGC has long supported Kennedy Space Center’s efforts to increase its collaboration with colleges and universities, its outreach to the state’s K-12 community, its desire for increased outreach to the “informal education” community (science museums, Challenger Learning Centers, science fairs, etc.), and its need for the availability of a skilled workforce.

- FSGC Affiliates**
- Astronaut Memorial Foundation
 - Bethune-Cookman University
 - Eckerd College
 - Embry-Riddle Aeronautical University
 - Florida Atlantic University
 - Florida Division of Community Colleges
 - Florida Gulf Coast University
 - Florida Institute of Technology
 - Florida International University
 - Florida Southern College
 - Florida State University
 - Florida A&M University
 - Kennedy Space Center
 - Orlando Science Center
 - Space Florida
 - Univ. of Central Florida
 - University of Florida
 - University of Miami
 - Univ. of North Florida
 - Univ. of South Florida
 - University of West Florida

One way we support KSC is through sponsorship, management, or coordination of events and programs identified as priorities at the Center. For example, under cooperative agreements with KSC, FSGC has managed the following KSC-sponsored projects:

Workshop for Informal Educators	FSGC-KSC Research Conference
Spaceport Engineering Design Competition	Exploration Station and Educators Resource Center
Summer Internships at KSC	2005 ESMD Summer Research Opportunity

In addition, FSGC has funded 32 Projects (through the Florida Research and Education Grant Program) for a total of \$663K, that is directly connected with KSC technology priorities.

3.3 FSGC Impact on the State of Florida

In addition to meeting NASA’s needs, FSGC provides a consistent benefit to Florida by supporting STEM education in the state’s schools, leveraging state education and aerospace research investments with FSGC funding, supporting aerospace workforce development, and sponsoring research and technology projects that diversify the state’s space industry. FSGC has established various partnership initiatives with state-level organizations like the Florida Space Authority (now “Space Florida”), the Astronauts Memorial Foundation (AMF), and the recently dissolved Florida Space Research Institute (FSRI). FSGC officials have also been called upon to serve on organizations like the Florida Aviation Aerospace Alliance, and the Florida Emerging Technology Commission.

FSGC’s most significant state-level partnerships have been with FSRI and Space Florida. From 2003 to 2004, Dr. Sam Durrance served as both the Director of FSGC and FSRI. Dr. Durrance leveraged funding from FSGC with investments from FSRI, the Florida Space Authority, and the University of Central Florida to more than double the amount of grant funds available through FSGC’s Joint Grants Program. In 2005, Dr. Jaydeep Mukherjee became the Director of FSGC and continued the fruitful partnership with FSRI. He also started a rewarding partnership with the Florida Space Authority and its Executive Director, Winston Scott, (a former astronaut) to operate a “Florida Space Academy” for high school students. In 2006 the state dissolved FSRI and the Space Authority to form Space Florida. Space Florida has continued the FSGC partnerships initiated by its predecessor organizations.

3.4 Significant Accomplishments of FSGC

Received state funding since 2003	Received cash matching from UCF (\$650K)
Awarded \$2.2 million since 2003 under the Florida Research and Education Grant program	Hosted Informal Educators “Return to Flight” Workshop
Hosted 2003 Southeast Region Space Grant Directors meeting.	Hosted 2005 National Council of Space Grant Directors meeting.
Managed Exploration Systems Summer Research Opportunity	Managed 2003 National Spaceport Student Design Competition
Representation on 2005 Florida Governor’s Commission on the Future of Space and Aeronautics	Managing KSC Exploration Station and Educator Resource Center

4.0 Foreword

With over 18 million residents, Florida is the nation's fourth largest state. These residents are served by 11 state universities, 28 state community colleges, over 30 private universities and colleges, and 67 county-based public school districts. Some of Florida's county school districts serve more students than entire states.

Florida's state universities conferred 5,187 bachelor's degrees in physical sciences, mathematics and statistics, biology and engineering, 1,709 master's degrees, and 716 doctorates in 2007. Florida ranks among the top 10 states for total degrees awarded in each of these areas, and the number of students receiving these degrees is increasing more rapidly than the state's population. Meanwhile, according to the National Center for Education Statistics (NCES), the state's elementary and middle schools have the highest average enrollment in the nation, while enrollment in its high schools is more than twice the national average.

Florida's economic growth during the past 50 years owes much to the space, aeronautics, and aviation industries. All told, space, aeronautics, and aviation accounted for nearly 148,000 jobs and more than \$7 billion in wages in 2004, with the average wage some 40 percent above the state average. During the next decade, Florida has the opportunity to broaden its existing leadership in civil and military launch activity, while also emerging as the nation's leader in new commercial space opportunities and the integration of space, aeronautics, and aviation technologies.

To remain competitive and to react to the needs of the state's high tech employers (including NASA and its contractors), Florida has instituted improvement measures for STEM education, including new science and math elements for the state's standardized Florida Comprehensive Assessment Test (FCAT). Because the state is so well known for its historic and continuing role in our nation's space programs, organizations like NASA and FSGC are viewed as resources to support the state's goals for K-12 education improvement.

At the university and community college levels, especially with the planned retirement of the Space Shuttle, NASA and FSGC are increasingly relied upon to support research, technology development, and workforce training programs aimed at diversifying the state's space industry beyond its current ties to Space Shuttle operations. FSGC has risen to the challenge by partnering with its affiliates on a range of programs that are designed to be consistent with the state's priorities for space-related economic and academic development. Fortunately, Florida's priorities usually align quite well with NASA's priorities at KSC, so FSGC is often able to structure programs that both meet the needs and leverage the resources of these constituents.

Among FSGC's challenges is the need to serve the interests of such a large and diverse state. The temptation is great to support small grant projects that expand our reach into new areas of the state, but we learned many years ago that it makes more sense to fund a few medium-sized projects than a lot of small ones. We try to expand our presence by matching and leveraging NASA's modest investment in FSGC so that more larger and far-reaching projects can be funded.

Our NASA-provided budget has been multiplied many times with matching contributions from our host university (UCF), various state government partners, and by our growing number of grant recipient awards (refer to *CMIS Table III-A. Consortium Management Report - Match and Other Federal Funds (Cash and Non-Cash)*). But we must always seek other sources of support, and we are always careful not to diminish our effectiveness by spreading our resources too thin.

The FSGC, through its programs and partnerships, has grown over the past 20 years into a vital contributor to Florida's nationally recognized initiatives to promote statewide aerospace economic and academic development. While incorporating all of NASA's objectives and requirements under the *National Space Grant College and Fellowship Program*, FSGC has tailored its activities to advance the shared goals of NASA Kennedy Space Center and the State of Florida.

In advancing its goals, FSGC has emphasized student research at both the undergraduate and graduate levels, and statewide competitive solicitation and peer-review of proposed projects (including pre-college projects). We work very closely with KSC's technical and education staff to ensure that our research proposal topics meet the needs of KSC and its contractors. Our goal is to build a capability in Florida's academic institutions to support the research, education and training needs of NASA and Florida's space industry.

An example of a project strategically designed to respond to the state's needs and NASA priorities over the past five years is the Florida Space Research and Education Grant Program, where the categories for awards were selected to support NASA KSC priorities (Spaceport Technology Development) and the state's (Space Research and Payload Development) priorities.

4.1 Report Intent

This report is intended for three audiences: NASA, under whose sponsorship FSGC operates; our colleagues within the 52-member Space Grant family, who may benefit from our experiences in Florida; and our colleagues in the twenty-one FSGC affiliate organizations, who have contributed their time and energy to support FSGC's programs.

It is an integral part of the program renewal process for FY 2009-2014 and, as such, has been prepared in consultation with the FSGC Advisory Board (with representation from all of our affiliates), members of the FSGC staff, and colleagues from agencies and companies who have had an ongoing supportive relationship with FSGC.

Like previous FSGC reports, this one is part of a continuing planning and evaluation process that is constantly subject to revision and improvement. It is an attempt to represent the mainstream of views of our diverse faculties on the future development of FSGC. It is presented to NASA and the State of Florida in that spirit.

5.0 Programmatic Elements

5.1 Consortium Management

The Lead Institution for FSGC is the University of Central Florida. UCF is responsible for receiving and disbursing Space Grant funds, certifying non-federal matching funds for all program awards, and preparing required reports. FSGC is served by a “Board” composed of individual representatives from each of the affiliates that constitute the FSGC at the time. FSGC’s Director is accountable to the Lead Institution.

The FSGC is funded annually with a Space Grant Award from NASA’s National Space Grant College and Fellowship Award. In addition to funds received from NASA in its normal course of business, the Lead Institution also receives funds for FSGC from other sources, whether public or private, federal or non-federal, and may utilize these funds as appropriate for FSGC activities. Such funds obtained from other sources are accounted for separately by the Lead Institution. A budget for each fiscal year is prepared by the Director and is put forward for approval / ratification at the next meeting of the Board.

5.1.1 Management Structure and Operations

Dr. Jaydeep Mukherjee’s affiliation with FSGC dates back to 1995 when he was on the faculty of the University of Florida and served as the Consortium’s Administrator. When FSGC’s Lead Institution status was transferred to the UCF, Dr. Mukherjee transferred along with it, bringing critical corporate memory and an invaluable working knowledge of FSGC’s programs and processes. Dr. Mukherjee is supported by a staff of four full- and part-time professionals, including Assistant Director Sreela Mallick and Program Assistant Patti Szszerba (both full-time), and Associate Director Penny Haskins, Ph.D., and Supervisory Engineer Bob Eppig, FSGC also makes regular use of a deep well of talent and resources within UCF, headquartered only 45 minutes to the west in Orlando. UCF organizations that provide regular support to FSGC include the Office of Sponsored Programs, College of Engineering, and Florida Space Institute.

Dr. Mukherjee spends half of his time working with colleagues in the space industry to develop opportunities for the recipients of the FSGC grants, fellowships, and scholarships. The Associate Director, Dr. Haskins, oversees K-12 activities and represents FSGC when Dr. Mukherjee is not available. She runs her own technology-based small business and devotes about one-tenth of her time to FSGC. Ms. Mallick is in charge of fiscal and contracts management. Bob Eppig, FSGC engineer, manages the hybrid rocket competition and assists Space Florida with the Undergraduate Academy.

FSGC is headquartered on KSC property, adjacent to UCF’s Florida Space Institute at the Center for Space Education (CSE). Our combined accommodations include 1,550 square feet of office space (200 solely for FSGC) and two joint-use classrooms (one with 2-way video-conferencing). Our offices include dedicated phone and fax lines and a high-speed Internet connection.

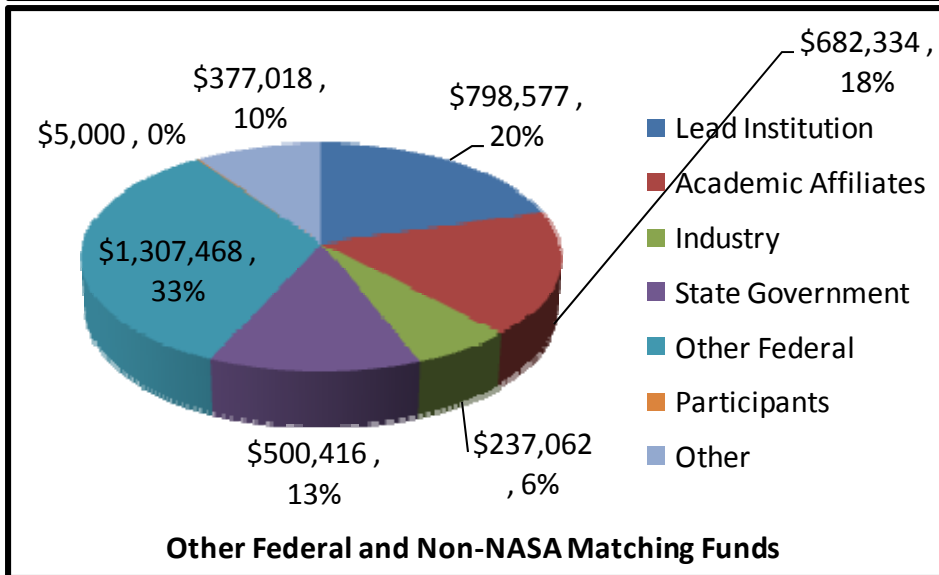
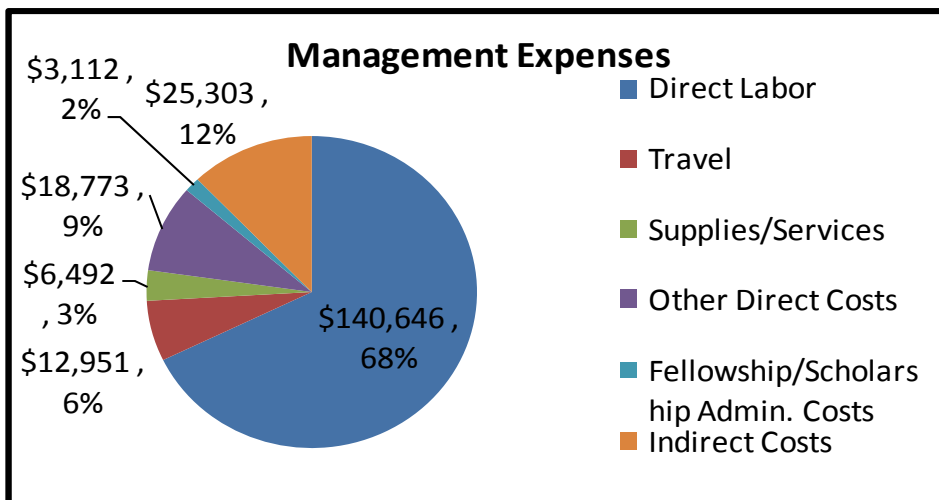
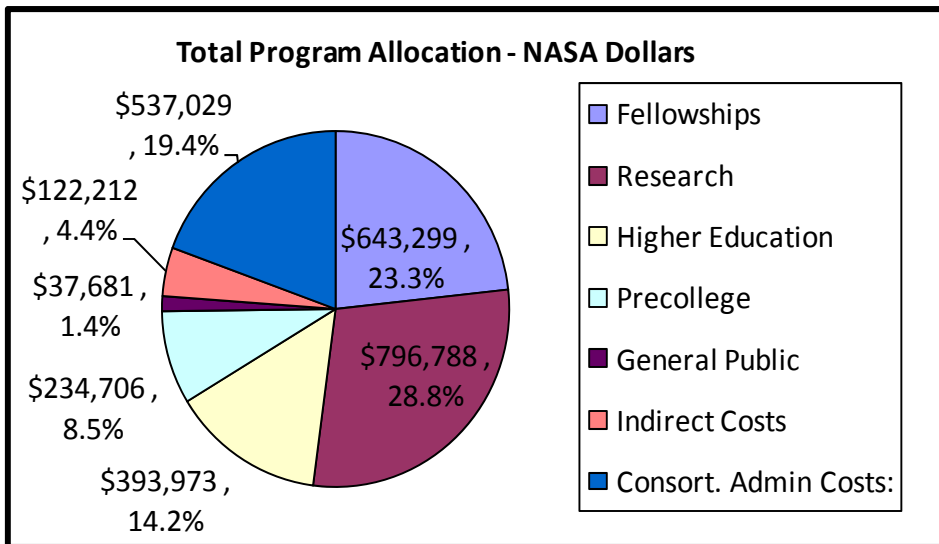
Built with state license tag revenues, the CSE is managed by the Astronaut Memorial Founda-

tion and houses a variety of other educational organizations and programs, including KSC's Educator Resource Center (managed by FSGC) and UCF's Florida Space Institute (for which Dr. Mukherjee currently serves as Interim Director).

The CSE is located on the grounds of the KSC Visitor Complex, making FSGC visible to hundreds of thousands of space-minded domestic and international tourists every year. We take advantage of this outreach opportunity by displaying FSGC posters on the walls outside our offices, and running a promotional slideshow on a wall-mounted flat-screen display.

5.1.2 Resource Management

The charts on this page describe FSGC's use of FY-2007 NASA-provided funds, the breakdown of administrative/



management costs within that budget, and a five-year breakdown of matching investments (which totaled \$3.9 million over the five-year period), including other federal funds totaling \$1.3 million. These figures were generated from the data in CMIS Table III-A. CONSORTIUM MANAGEMENT REPORT (2003-2007)

FSGC intends that as much of its resources as possible be put into programs. Management and administrative costs are kept as low as possible. This approach is aided by the many contributions of resources (over and above the cash contribution) from the Lead Institution. Our strength is in being able to leverage NASA's investments with multiple sources of matching support, in addition to the annual commitment of our Lead Institution. One weakness is our inability to provide a guaranteed direct benefit to all of our affiliate members. This is due to our commitment for peer-reviewed competitive solicitations, and to limitations on our funding. As successful as FSGC has been in increasing our overall financial footprint, we always find ourselves oversubscribed with regard to grant requests versus funding availability.

On average, the allocation of NASA funds across FSGC program elements is well balanced and is in line with the NASA priorities for the Space Grant program. The Fellowship program dollars all go to graduate fellowships. The undergraduate scholarships are included in our higher education program and are awarded in a ratio of almost 5:1 to the number of graduate fellowships. Research program funds from NASA are at the same level as the fellowships funds. Pre-college programs consume only 8.5% of the NASA funding. Administrative costs are less than 20% of the total, with 4.4% indirect costs.

5.1.3 FSGC Advisory Board Network

The FSGC Advisory Board meets at least twice per year (once in the fall and once in the spring) to provide guidance and feedback that improves the effectiveness of our programs. The October/November meeting is primarily for the discussion of the next year's budget and the structure of the various programs prior to the release of the RFPs. Discussions of the selection of awards under our various programs are held during the spring meetings. The Board members share information on local concerns and activities and provide input to FSGC on policies and programs.

The Board members also provide an important service by promoting FSGC programs and opportunities to faculty and students within their own institutions. Although their input is by-definition advisory, many decisions are made during their meetings by consensus among the members and staff. The Board brings together faculty and administrators who would not ordinarily have contact with one another, which has resulted in collaborations that would not otherwise take place.

Participation and effectiveness of the individual Board members varies both with time and with the individual. Some are much more involved than others, which can reflect the interest of their institution in FSGC's programs. There has been increased involvement since the funding levels for the various programs have increased. It is now worth the time of the faculty to put together a proposal. With more faculty and student participation, affiliates see more reason to be involved.

Communication among our affiliates is primarily via email. Affiliate representatives are asked to pass information on FSGC programs along to appropriate people within their institutions. This approach has had mixed results, as some affiliate representatives are more effective than others in disseminating information. To assure broad dissemination, information from the FSGC office is also sent to the chairs of all the science and engineering departments of our affiliates. Notices of FSGC programs and meetings are also included in two widely distributed email newsletters produced by Embry-Riddle Aeronautical University. Information (including solicitations) is also available on the FSGC website.

To become an affiliate, an organization must apply in writing and be approved by the FSGC Advisory Board. There is no financial obligation or encumbrance on the part of either the applicant or FSGC. Membership continues as long as the affiliate demonstrates active interest and participation. An affiliate is dropped from membership if there has been no representation from that affiliate for three consecutive Board meetings without submission of a letter requesting a leave of absence.

5.1.4 Collaborations and Partnerships

FSGC has a number of outside collaborations and partnerships. They are listed briefly here with an indication of the prime area of common interest. All of these relationships have been effective in furthering the goals and objectives of FSGC. More details on these partnerships can be found in other sections of this document.

- Coalition for Improving Mathematics and Science Literacy – Education
- Florida Aviation Aerospace Alliance – Industry relations and education
- Florida Department of Education – Education programs
- Space Florida (and its predecessor organizations) – Joint Grant Program, education
- Goddard Space Flight Center – Radio Jove Program
- Kennedy Space Center - Research and education programs
- Office of Tourism, Trade and Economic Development – Industry support

In many cases, FSGC's relationships with its grant recipients can be considered partnerships. This is true when grant-funded projects directly support of priorities we have established for the consortium, or which have been established by NASA or the state of Florida. We often require that these grant initiatives highlight FSGC's sponsorship and support role in their final product.

5.1.5 Board and Staff Diversity

FSGC's Advisory Board and staff have long mirrored Florida's racial and ethnic diversity. Makeup of the Board includes 4 women, 2 minorities, and one member with a disability. Among the 20 affiliates, there are two HBCU institutions and one Hispanic Serving Institution (although participation by these affiliates has not been strong). Out of five FSGC staff members, three are women, including two in senior management: our Assistant Director and Associate Director. FSGC and our Lead Institution are committed to workplace diversity and equal opportunity employment.

Over the last 2 years we have been successful in involving Bethune-Cookman University in FSGC's programs. This HBCU hosted our April 2008 Advisory Board meeting, giving us a chance to talk to faculty and students about FSGC programs. Our Bethune-Cookman representative subsequently participated in an ESMD faculty program at KSC, and a Bethune-Cookman student was selected by KSC for a summer internship.

5.1.6 Management Impact and Results

From FSGC's inception in 1989, our members decided that all programs would be competitive and there would be no pre-established allocation of funds among affiliates. Unfortunately, this caused the seven affiliates with the most active space programs to receive the majority of funds. To get more involvement from our other academic affiliates we changed our Undergraduate Space Research Program (USRP) to allow each affiliate to award an undergraduate scholarship. This was also not very successful, so in 2007 we replaced USRP with an Internship Program at KSC. This resulted in more applicants (even from the minority institutions) and more matching funds from the State of Florida (Space Florida) and NASA.

The strength of FSGC's approach is that we have very competitive, high-quality research and education programs designed to have direct benefits for NASA and for the state. There is broad participation by those institutions that have strong aerospace-related programs, and increasing participation from some that have not traditionally had strong aerospace-related programs.

One weakness is that we have limited participation by our minority-serving affiliate institutions, and from minorities within our other affiliate institutions. By letting each affiliate choose its own level of participation, we are not reaching the faculty and students targeted by NASA for inclusion in some of its programs. We intend to be more proactive in addressing this weakness through campus visits and by building relationships with space enthusiasts within the target institutions.

Over the past 20 years FSGC's management structure has evolved to be more responsive to the needs of the organization. Our strategic plan was initially developed during Advisory Board meetings in 2004. With the guidance of the Board, we have made changes when it was apparent that our programs or policies were not achieving the goals they were designed to meet. One example is the USRP program (as described above).

We are proud that FSGC is an open consortium, welcoming all organizations and institutions interested in participating. With this approach FSGC has built a broad statewide network of supporters who generally agree with our goals and objectives and are committed to accomplishing them.

5.2 Fellowships and Scholarships

5.2.1 SMART Goals

- Enable exceptional students to pursue their dreams of being involved in the space program – whether through graduate, undergraduate, or Community College technical training;

- Require students who received awards from FSGC to participate in some form of outreach – either to the community or through the schools; and
- Facilitate research symposia for graduate students.

5.2.2 Purpose and Progress

The purpose of FSGC's Fellowship Program is to:

- Provide a prestigious instrument to reward and attract the best and the brightest U.S. (citizen) students to space-related Master's and doctoral programs;
- Facilitate access to aerospace career paths for these students; and
- Enhance cooperation among FSGC-affiliated university faculty and peers in industry, government and private laboratories.

The funds allocated by NASA for FSGC's Fellowship Program is open only to graduate students enrolled in a Master's or Ph.D. program. While FSGC does make awards to undergraduate students, the funding for these is not taken from the NASA-allocated funds. Each Fellow receives an Academic Year fellowship stipend of \$20,000 for full-time doctoral students or \$12,000 for full time Master's students. The award may be renewable for two years for doctoral students or one year for Master's students. The award may be renewable for two years for doctoral students or one year for Master's students. On average, about 23.3% of the FSGC NASA funds are allocated for the fellowship program, or about \$128,000 per year. The total funds spent on the Fellowship Program, including matching, is \$182,000 per year (refer to *CMIS Table IV-A. Fellowships and Scholarships Report - Funding Sources*). In 2003 and 2004, all the funds in the fellowship program was used for the graduate student fellowship program. From 2005-2007, when FSGC's budget increased along with the fellowship budget, students selected for the NASA Academy and the undergraduate scholarship program (see below) was funded under the fellowship program. In 2007, the students selected for the internship program at KSC was also funded under the program. Since we have mixed our funds from the fellowship portion and the Higher Education funds, we have concentrated on the graduate fellowship program in this section. The other programs like the NASA Academy, KSC Internship, and undergraduate scholarship is described in detail in the Higher Education section.

The undergraduate scholarship program is explained in detail under the Higher Education Category. The scholarship program is called the Undergraduate Space Research Participation Program (USRP) and its purpose is to provide opportunities for students from throughout Florida to become actively involved in ongoing research programs. The program is intended to enhance student interest in a wide variety of space-related areas. Faculty researchers from FSGC-affiliated universities and researchers from industry may propose to mentor undergraduate students during a 10-week summer period. FSGC annually funds 14-15 students and sets aside \$45,000 for this program. In 2007, we replaced the USRP program with an Internship Program at KSC, jointly funded by FSGC and Space Florida.

5.2.3 Competitive and Diverse

As with our other programs, the Fellowship Program is competitive and open to all U.S citizens enrolled in Master's and Doctoral programs in a Florida university or college. Proposals

are requested from the student faculty advisor. Appointments are made upon recommendation of an appropriate panel appointed by the FSGC Director.

Minority Participation in Fellowships and Scholarships.

For graduate fellowships, FSGC's long term (5-year) goal is to award 2-3 fellowships out of a possible 10 to underrepresented minorities. Our long term goal is to see that at least 20% of the new fellows are underrepresented minorities. This would exceed the graduate student enrollment of underrepresented minorities. In 2007, we received a record 23 applications for the fellowship program. This was a two-fold increase from 2006. We funded one new doctoral student and one new Master's student in 2007. Only 2 applications were from underrepresented minorities and one was selected but she accepted a better paying fellowship.

For undergraduate scholarships, FSGC's short term goal (year to year) is to award at least four scholarships out of a possible 12 to underrepresented minorities each year. The scholarships will be in the form of internships at KSC and KSC contractors. In 2007, we received 34 applicants from seven universities. Only three underrepresented minorities were chosen out of 11 students funded by FSGC. (FSGC does not make the final decision in the student selection. KSC engineers and scientists make the final choice.) This was below our goal of funding four students out of 12. However, we have attracted a number of minority students in our Space Academy program. Since the students are not provided any stipends, they are not listed in the student award list. We have requested that these students spread the word about the FSGC programs at their universities.

A look at CMIS Table IV-A. FELLOWSHIPS AND SCHOLARSHIPS REPORT (2003-07) shows that on an average 14.9% of our awards go to underrepresented students and 41.4% of our awards go to women. We are still below our goals for minorities because of the fact that even when under-represented are provided fellowships they usually opt for a higher paying fellowship like the NASA GSRP.

5.2.4 Impacts and Results

In the summer of 2007, FSGC and Space Florida jointly sponsored an internship program at the Kennedy Space Center. We received 34 applications for 11 internship spots at KSC. NASA fellowship funds were used to make the awards to the students. In the past, under the USRP program, we just received 10-11 applications per year. However in 2007, with the support of Space Florida, we decided to change our scholarship program from a university based program to a KSC based program. This change made the program more attractive to the students, though we did not make any change in the amount of the award.

Between 2003 and 2007, FSGC selected 10 students to receive three-year Ph.D. fellowships, and five students to receive two-year Master's fellowships. Since a significant amount of our fellowship/scholarship funds go to relatively few graduate students, we have been following the progress of these 15 students very closely. Here are some results:

- Four are still in graduate school working toward their Ph.D. (one of the Master's fellows received a NASA GSRP award).
- Four are employed by universities either as researchers or assistant professors.
- Five are employed by industry such as Raytheon, Millennium Engineering, Boeing, and oth-

ers.

- One Master’s fellow is enrolled as a Finance graduate student in Chicago.
- One Master’s fellow (graduated May, 2008) is searching for employment in Florida.
- 35 total publications (refer to *CMIS Table IV-A. Fellowships and Scholarships Report - Publications*).

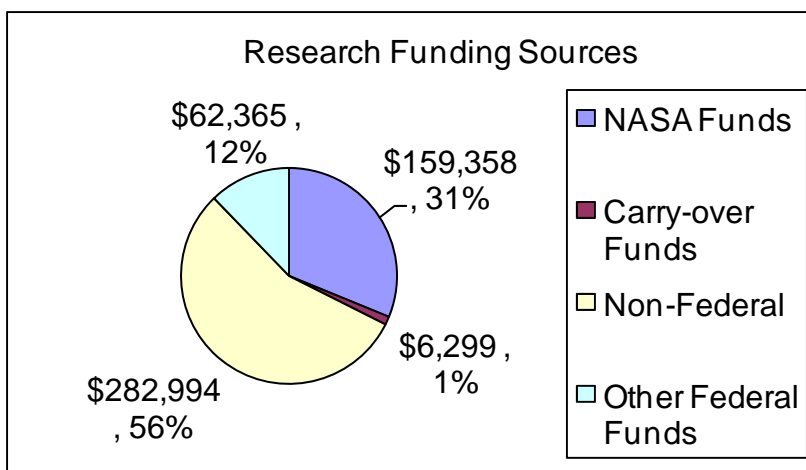
5.3 Research Infrastructure

5.3.1 SMART Goals

- Support research through education-research activities;
- Support KSC programs and supply students and faculty for internships;
- Foster collaboration among KSC engineers, university faculty and industry partners; and
- Use the proximity of the Zero-G flight opportunities to sponsor flights for researchers, students, and teachers.

5.3.2 Purpose and Progress

FSGC’s Research and Education Grants Program is intended to support the expansion and diversification of Florida’s aerospace industry by increasing statewide academic involvement in space research, technology development, engineering, education and training programs that are consistent with the state’s space industry priorities.



Funding is intended to support research that will: a) compete for larger sponsored research awards; b) attract and leverage other federal or industry funding; c) produce technologies that lead to commercial opportunities; d) promote Florida leadership in emerging aerospace technologies; and/or e) in other ways enhance the technological competitiveness of Florida universities and space industry.

Panels of industrial and academic reviewers, chosen by FSGC and contributing sponsors, evaluate the proposals. Each proposal is judged and scored on its own merits using the following criteria; scientific/technical merit of the proposed project; relevance to the expansion and diversification of Florida’s aerospace industry; potential for continued project development, including commercial or government support; qualifications of the project team; and soundness of proposed work plan, budget, and schedule.

Other issues are considered in the award of grants when evaluations based on the five above-listed criteria indicate substantially equal merit. These other issues include: amount and qual-

ity of matching contributions; geographic diversity; racial and gender diversity of project participants; and level of collaboration between industry and academia.

Each year, FSGC funds 14-18 awards for a total of \$300K-\$350K. The funding sources are NASA through FSGC, University of Central Florida through FSI, and the State of Florida through Space Florida. The chart on

page 15 shows the allocations from different funding sources for FSGC’s research infrastructure programs.

5.3.3 Impacts and Results

Alignment with NASA and State Priorities

— FSGC’s research grants solicitation is structured annually to align primarily with NASA priorities (with foremost consideration given to those of KSC), and also with those of our state government partners. By aligning solicitation topics with KSC’s interests we open up the research program to more applied, technical areas. Grants are awarded within three broad categories, with the first category defined by research and

Category	Project Examples
Spaceport & Range Technology Development	<ul style="list-style-type: none"> - Integrated Health Management for Spacecraft Processing - Range Systems Development and Evaluation - Advanced Cryogenics and Other Propellants - Automated Planning, Scheduling & Asset Allocation - Modeling Vehicle/Spacecraft Flows and Processes - Thermal Protection Systems - Simulation - Life Sciences
Space-Based Research and Payload Development	<ul style="list-style-type: none"> - Narrow-Band and Laser Communications - Remote Sensing - Biotechnology & Life Sciences - Micro Satellites - Space Station Utilization
Space Education & Training Programs	<ul style="list-style-type: none"> - Projects That Align NASA & Florida Education Resources (K-20) - Workforce Training Programs - Curriculum Development

UNIVERSITY	AWARDS	AMOUNT
Florida Institute of Technology	13	\$240,158.58
Florida State University	4	\$80,691.08
University of Central Florida	21	\$486,637.00
Embry Riddle University	11	\$157,825.00
University of Florida	15	\$314,994.00
FAMU	1	\$26,450.00
Florida Gulf Coast University	3	\$43,515.66
University of Miami	2	\$41,556.00
University of South Florida	2	\$36,392.00
Sub-Total	72	\$1,428,219.32
OTHER RECIPIENTS		
Kennedy Space Center/NASA	4	\$115,000.00
Orlando Science Center	1	\$14,477.00
Tekna-Theos	2	\$33,640.00
Zero-Gravity	1	\$12,500.00
Florida Space Authority	1	\$12,325.00
Space-Tec (BCC)	1	\$9,944.00
Others	2	\$57,000.00
Sub-Total	12	\$254,886.00
TOTAL	84	\$1,683,105.32

development priorities identified by KSC. The categories are Spaceport & Range Technology Development; Space-Based Research and Payload Development, and Space Education & Training Programs.

The solicitation includes a list of specific thrust areas identified by KSC and the contact person for those areas. Proposers are encouraged to contact these thrust area researchers if they plan to submit a proposal under the Spaceport Technology Category. Proposers submitting under the Space Education and Training Category usually collaborate with a K-12 educator or a faculty member in their university's College of Education.

The table on page 16 shows the cumulative awards to each grantee.

Over 80 projects have been funded under this program over the years by FSGC and its partners. Some examples from over the past five years are listed below:

- Ultra-Wide-Band Communication for Space Missions (UCF)
- Modeling Fuel Slosh in Spinning Spacecraft (ERAU)
- Radiation Effects on Human Neuronal Progenitor Cells (USF)
- Miniaturized Heat Transfer Device for Space Flight (UF)
- Multiple Degree-of-Freedom Teleoperation (FSU)
- High Performance Airfoil for Mars Airplane (UM)
- Hyperspectral Ground-Based Optical Imaging at the Diffraction Limit (UF and UCF)
- Effect of Microgravity on Arteriolar Function (FIT, NASA, Bionetics)

Below are details of our grant program's participation and outcomes for the last 5 years (refer to 2003-2007 CMIS Table V. RESEARCH REPORT):

- Received proposals - 286
- Seven industry and private organizations, one Community College, and 11 universities were involved in 85 awarded projects
- Other participants - 33 ; Faculty involved - 120
- Graduate students involved - 59 and Total Graduate student support – \$434,992
- Undergraduate students involved - 48 and total undergraduate support - \$109,643
- NASA-Space Grant Funds awarded - \$828,284
- State, Industry and University Matching (in-kind and cash) - \$1,414,972
- Other Federal Funds - \$311,825
- Outside Proposals submitted by awardees to other agencies - 38
- Outside Proposals funded and total amount - 7 (\$1,223,647)
- Number of Publications - 38

The strength of the program is its close connection to KSC's technology resources and needs. This can also represent a weakness, because only four of our affiliate universities are substantially engaged in research and technology programs in collaboration with KSC. To address that concern, we have two other categories (Space Based Research and Space Education and Training) that are not directly connected with KSC priorities. This enables other universities and institutions to apply for grants as shown in the table on page 16.

5.4 Higher Education

5.4.1 SMART Goals

- Provide students with hands-on experiences for understanding STEM; and
- Enable undergraduate students to participate in student launch activities and student payload development programs.

5.4.2 Purpose and Progress

The purpose of our Higher Education Program is to provide opportunities for students from throughout Florida to become actively involved in ongoing research programs. Sponsored projects are intended to promote student interest in aerospace graduate study and careers. There is an underlying workforce development theme with our Higher Education programs. We target freshman and sophomores for the Undergraduate Academy program so that they have the opportunity to be actively involved in exciting science and engineering projects. These students then apply for the internship and NASA Academy programs. The students targeted for the FUNSAT and Hybrid Rocket competition programs are seniors who would benefit from a final push in their last year of college.

FSGC allocates about 14.2% of its total budget for its Higher Education Program. We have placed a very high priority on this activity, allocating more than \$750,000 over the past five years. Projects fall under two categories; internships and student collaborative projects.

5.4.3 Internships

Summer Internship at KSC — Under a partnership with NASA KSC and Space Florida, FSGC sponsors a summer program in which undergraduates from all over the state attend a 10-week summer internship to experience real world research and on-the-job training. Initiated in 2007, 11 interns were placed at KSC labs. This program will be continued.

ESMD Internships — FSGC supports NASA's Exploration Systems Mission Directorate (ESMD) goals by placing graduates and undergraduates at 4Frontiers Corp., a unique Florida-based start-up. 4Frontiers that manages a network of academics and entrepreneurs who support the design of future Mars colonies. Participants support real world research and receive on-the-job training. Three students interned with 4Frontiers in 2008 and two more will be placed there in 2009.

Undergraduate Space Research Program — FSGC provides scholarships to undergraduate students in Florida universities. The scholarships are tied to a summer research project with a faculty mentor. This program was discontinued in 2007. From 2003-2006, 44 students participated in the program

NASA Academy — The NASA Academy is a research internship for exceptional undergraduate (entering juniors and seniors) and first-year (entering) graduate students. Selected students spend nine weeks either at the Goddard Space Flight Center or at the Ames Research Center working with principal investigators on their projects which are supported by the Center Director's Discretionary Fund. The intent of NASA Space Academy is to infuse in the participants a working knowledge of NASA's programs and experience research as a part of a NASA team. From 2003-2007, 20 students were sponsored by FSGC.

5.4.4 Student Collaborative Projects

According to the Final Report of the NASA Program Definition Team for Student Collaborations, student collaborations represent an excellent value to NASA. They allow the agency to harness the resources of universities around the country to support the space industry's workforce pipeline, and provide undergraduate students hands-on experiences that give them important skills before they enter the space industry. FSGC has restructured its higher-education portfolio to include the following projects.

Hybrid Rocket Competition — The objective of this competition is for student teams to design and build a hybrid powered rocket. There are two categories of competition to choose from; the first would be to reach the maximum altitude and the second would be to fly the rocket closest to 2000 feet in altitude. Since it began in 2006, this program has supported 116 students from three universities.

FUNSAT Design Competition — The FUNSAT (Florida UNiversity SATellite) program provides students the opportunity to design and fabricate their own small, lightweight satellites, giving students valuable experience with spaceflight hardware. This project also exposes students to the interdisciplinary relationships between systems engineering and cutting edge technologies like MicroElectroMechanical systems (MEMS). FSGC is working with Space Florida to allow the winners of the next FUNSAT competition to have their satellite launched into space. Initiated in 2004, this program has supported 167 students from five universities.

Florida Space Academy — Under a partnership with Space Florida, FSGC sponsors the Florida Space Academy to provide a weeklong interdisciplinary summer learning environment at KSC for groups of qualified undergraduate university and college students. It is designed to prepare them for a future in a space related field by 'bridging gaps between engineering and science' that exist in the educational and workforce marketplace. During the various Academy programs, the students work on hands-on inter-disciplinary projects (building a payload that is launched in a weather balloon, or building a robot, or building a rocket) that are designed to help them become 'problem-solvers' and experience real-life space and science based challenges. This program began in 2005 and has supported 85 students from nine universities.

5.4.5 Impacts and Results

Our three Student Collaboration programs allow students from freshman to seniors to take part in hands-on activities. Freshman and sophomores usually participate in the Academy program. Juniors and seniors participate in the Hybrid Rocket Competition while seniors participate in the Satellite Design Competition.

The Academy program has been very successful in connecting students to potential employers. On the last day of the program, representatives from industry such as Boeing, Lockheed Martin, SAIC, etc., attend a luncheon with the students. These representatives talk to the students about writing resumes, interview tips etc. We have had a number of "senior" students who have landed jobs in Boeing and at KSC as a result of their interaction with these industry and KSC representatives. Some of the Academy students are successful in obtaining internships at KSC and at other NASA centers

Based on limited tracking from the most recent FUNSAT competition, most of the UCF students who participated have landed jobs in the space industry with companies like Boeing. We believe this competition provides a last-push opportunity for students in their final year of college, often serving as an element in their senior design classes. Below are some other Internship Program success stories:

Helium Research — Intern Nathaniel Ambler (UCF) worked with the NASA / Shuttle Processing Division / Fluids & Liquid Propulsion Division with his mentor, Ms. Janira Ramos. Mr. Ambler performed research on a proposal that could allow KSC to save millions of dollars each year on helium waste. Their research results have created a plan to re-bottle 90% of the helium for reuse. KSC currently spends \$9 million each year on helium for the Space Shuttle program. Mr. Ambler and Ms. Ramon were awarded a \$100,000 grant to continue their work.

Ozone Research — Ten KSC interns sponsored by FSGC and Space Florida launched a true scientific balloon on August 8. The balloon carried a payload consisting of a live camera and GPS navigation system. Also on board was an ozone sensor, made possible by a recent purchase by Space Florida. The balloon project included collaborators from FSGC, UCF and the University of North Florida (UNF). The project demonstrated a novel sensor developed by UNF researchers, giving the students a unique opportunity to observe and assist the scientific process.

Life Sciences and Medical Research — Space Florida and FSGC sponsored six internships at the KSC-based Space Life Sciences Lab. They worked under accomplished scientists from the Florida Institute of Technology on cutting edge space-related research that has implications on Alzheimer's Disease and Bone Density Loss.

NASA Education Outcome 1: National Program Emphases

5.5 Diversity of Participants

According to the 2005 Digest of Education Statistics, enrollment at Florida-based degree-granting institutions included 39.6% minorities, compared to only 30.4% nationwide. From the Florida State University System Fall 2007 enrollment numbers in physical sciences and engineering fields 28% are underrepresented minorities, and 23.3% are female. For graduate students, the proportion remains significant at 12.1% minorities and 25.9% female.

Despite sustained efforts to encourage participation in FSGC programs among minority and underrepresented students and faculty, our success has been limited. We have reached out and visited repeatedly with representatives from minority institutions, but we continue to receive too few applicants for our various competitive programs. In some cases, minority students selected for our programs end up accepting higher paying fellowships and scholarships elsewhere.

FSGC has discussed this issue with national Space Grant staff and we have decided to focus on high school minority students and teachers. Working with our affiliates and other partners, we will develop and sponsor various hands-on projects for these students at the Kennedy Space Center.

The following is a list summarizing FSGC's ongoing and planned diversity initiatives...

- One of our affiliates, Space Florida, has recently partnered with the Florida African American Education Alliance (FAAEA) by providing a total of \$100,000 to support minority student achievement and participation in STEM programs. FSGC has been in contact with FAAEA to pursue membership in the not-for-profit organization. FAAEA is focused on disseminating information on education programs, and encouraging the active involvement and partnership of African American students, parents, and communities toward the continued improvement of education in our state. FSGC believes that this partnership can do much to advance our minority participation goals.
- FSGC has also reached out to Florida International University, the largest producer of Hispanic undergraduate and master level engineers in the U.S., to advertise the Internship Program. In addition to being a Hispanic-serving institution, FIU's student body is 12.9% African American, 3.6% Asian/Pacific Islander, and 0.2% are American Indian. Dr. Gustavo Roig, Director of FIU's Center for Diversity has agreed to provide information on all of FSGC's programs to FIU faculty and students. In 2006, FSGC worked very closely with Florida International University (Hispanic-Serving Institution) in submitting a proposal to NASA. This proposal was based on creating a partnership among FIU, Intellica Corporation, and the Florida Space Grant Consortium to implement the Cooperative Agreement Notice for NASA to implement the Motivating Undergraduates in Science and Technology (MUST) program. Unfortunately, we were not successful. However, this partnership enabled us to talk about student participation from FIU
- FSGC is working with the Florida High School/High Tech (HS/HT) program, which is designed to provide high school students with all types of disabilities the opportunity to explore jobs or postsecondary education leading to technology-related careers. FSGC intends to provide the graduates of the program, who are now undergraduates in Florida universities, an opportunity to participate in the Internship Program. There currently are 33 HS/HT sites across Florida.
- After years of trying to involve Bethune Cookman University (another minority serving institution) to participate in our programs, we have been successful in establishing a relationship with the chair of the university's Physics Department. He hosted FSGC's Spring meeting and has promised to disseminate information to students and actively participate in our programs. He was also selected for a KIPS- FaSt faculty project at KSC for the summer of 2008.
- FSGC and UCF are looking at the possibility of partnering with SECME (Southeastern Consortium for Minorities in Engineering) by bringing the ISTF program to SECME. SECME's goal is to increase the pool of historically under-represented, geographically under-served, and differently abled students who will be prepared to enter and complete post-secondary studies in science, technology, engineering and mathematics (STEM), thus creating a diverse and globally competitive workforce. By combining FSGC and UCF's resources we plan to extend the ISTF program to the under-represented, geographically under-served, and differently abled students.

2007 Awards	Fellowship/ Scholarship	Higher Education	Research	Total Awards
Number of Students	22	—	2	24
Awards to Female Students	8	—	2	10
Awards to Male Students	14	—	—	14
Awards to Underrepresented Minorities	3	—	1	4
Awards to Undergraduate Students	17	—	2	19
Awards to Graduate Students (Master's)	2	—	—	2
Awards to PhD Students	3	—	—	3

2006 and 2007 Award Summary	2007	2006
Total Number of Students	24	29
Percentage to Females	45.8%	38%
Percentage to Males	54.2%	62%
Percentage to Underrepresented Minorities	16.7%	18%

Fellowship & Scholarship Awards	2007	2006	2005	2004	2003
Percentage to Underrepresented Minorities	14.8%	14.8%	17.6%	12.5%	12.5%
Percentage to Females	37%	37%	58.8%	37.5%	37.5%

After our discussion with Space Grant staff at the recent Southeast Regional Meeting, FSGC has been actively trying to reach out to high school students to quantifiably improve our diversity and increase our involvement with under-represented students. With this collection of programs and partnerships, we believe FSGC's diversity metrics will improve in 2008-09.

The tables above provide a tally of student awards for 2006 and 2007, broken down to show the number and percentage of awards to underrepresented minority and female recipients. This data is the same data as the longitudinal tracking excel sheet data provided to NASA HQ the last 2 years. As the data shows, FSGC has been falling short in its goals for supporting minority students. However, as discussed above, we are attracting more minority students after discontinuing our undergraduate scholarship programs at the affiliate universities and replacing it by the internship program at KSC.

In 2006, FSGC teamed up with the Florida High/tech program. The Florida High School/High Tech (HS/HT) is designed to provide high school students with all types of disabilities the opportunity to explore jobs or postsecondary education leading to technology-related careers. HS/HT is an initiative of the US Department of Labor Office of Disability Employment Policy.

In Florida, it is a program of The Able Trust, also known as the Florida Governor's Alliance for the Employment of Citizens with Disabilities. This partnership, along with NASA's Kennedy Space Center, provides technical and logistical support to HS/HT programs. **FSGC also serves as the Florida HS/HT Education Program headquarters.** The FSGC field trips allow students to meet top scientists and engineers at space operational clean rooms and Life Sciences Laboratories at Kennedy Space Center. Contractors at NASA's Kennedy Space Center have also provided summer internships and field trips since the program began in 1995. In addition, they have offered field trips with behind-the-scene tours to several HS/HT project sites and take an active role in hosting Brevard County HS/HT students during Disability Mentoring Day.

One HS/HT success story:

This is a story of two students with sensory disabilities. Together they were primary members of the "Pirates of Palm Bay" FIRST robotics team, an FSGC co-sponsored project comprised of all HS/HT students. One is hearing impaired and the other is sight impaired. Their relationship is symbiotic, with one seeing for the other when needed, and the other hearing and explaining for his partner. Their team advanced to the final playoffs and placed 6th in the state of Florida, winning an engineering-focused "Amaze" award from FIRST in recognition of their success in overcoming barriers.

5.6 Workforce Development

The FSGC is well positioned to influence workforce preparation programs in all levels of the pipeline. Although SG is primarily a higher education program, the post-graduate training of classroom teachers is important. The products of their classroom are the undergraduate and graduate students who populate our state universities. The better-prepared these students are when they enter the university, the further they can go – the better they are able to take advantage of the resources available for their learning experiences. The Final report of the Commission on the Future of Space and Aerospace in Florida identifies education and research as two key components for a healthy space/aerospace industry

Florida's future workforce needs related to aerospace will require certified technicians as well as personnel with Bachelor's, Master's, or more advanced degrees. We look at workforce development as helping individuals, in this case students, develop their potential & achieve success. Florida's competitiveness in space and aeronautics depends not only on its natural resources or physical infrastructure, but also on its intellectual talent. FSGC needs to develop and retain critical **workforce** skills most relevant to space and aeronautics companies, by integrating industry needs into FSGC's workforce development programs. We try to do this by engaging these students in hands-on activities so that the students get a chance to experience and learn about the aerospace industry.

To develop the future STEM workforce, students have the opportunity to participate in programs like the Space Academy (balloon launches), Hybrid Rocket Competition and Nanosatellite design competition. Also, students have the opportunity to intern at NASA KSC and other NASA contractors. In addition, our Fellowship program and research programs target technology that is important to KSC and the Florida space industry.

We try to measure the success of our students by looking at the retention rate in STEM fields and employment in STEM fields. For students significantly supported by FSGC during the 2006 & 2007 fiscal years whom have taken the next step in their education or career and gone on to their next step in their career, all have gone on to either pursue advanced STEM degrees or to be employed in STEM disciplines. FSGC is looking at a retention rate of 90% in STEM fields and 80% employment rate in STEM fields over the next 5 years. If the rates drop, we need to address our programs and make the necessary changes. Given the small amount of funding and therefore the small number of students that we can support, our retention rate and employment rate in STEM fields should at least be at a 90% level. We should have this high goal because we are choosing students who are showing a great interest in STEM careers.

5.7 Longitudinal Tracking

For longitudinal tracking in 2005, FSGC used the old fashioned method of contacting recipients of “significant support” via email and phone calls. Students were classified as having received significant support from FSGC if they received a single award of \$4000 or more.

In 2006, the “significant support” definition was expanded to include a single award from FSGC of \$4000 or more, or spent greater than 160 hours participating in an FSGC program. In 2006 FSGC also enhanced its longitudinal tracking system to track former recipients of fellowship and scholarship awards and participants in its Higher Education and Research programs through the National Space Grant Foundation Tracking Program. This web-based, automated system allows self-reporting of post award educational history, employment history, anecdotal, and other information by former recipients. Participants involved in Space Grant programs during each program year are added to the system before the end of the spring semester to ensure contact by the system prior to graduation

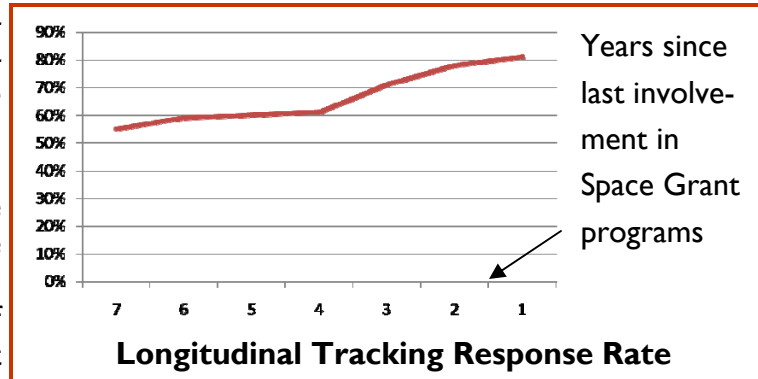
The system contacts recipients at regular intervals to report on their educational and career progress as well as how their participation impacted their lives. It is our goal to have 90% of significantly supported students complete the tracking survey after they have obtained their intended degrees. This integrated tracking system is continually being adjusted in response to lessons learned each cycle. For example, the frequency and timing of survey delivery has been adjusted to reduce surveys while the participant is still in school and to ensure polling immediately preceding their graduation. Also, non university-based email addresses are now requested from participants to reduce the “loss” rate upon graduation.

For students significantly supported by FSGC during the 2006 & 2007 fiscal years, and who have taken the next step in their education or career, 100% have responded to the survey. Of those who have taken their next step all of them have gone on to either pursue advanced STEM degrees or to be employed in STEM disciplines. For all students who are 5 years or less into their next step 88% of them have responded to the surveys sent by the tracking system.

When asked how participation in Space Grant programs impacted his education and career,

James Radomski a 1999-01 Space Grant participant currently employed at the Gemini Observatory as a Science Fellow, replied: *“It was critical to my continuing education and later graduation as an astronomer and laid the foundation for my current research and on-going career. I play a key role in the support and research associated with one of the largest telescopes in the world, the 8m Gemini Observatory. I also play a key role in the next generation of research with the Gran Telescopio Canarias (GTC) which at 10.4m will be the largest telescope on Earth”*

The chart illustrates the percentage of awardees that responded to the longitudinal tracking survey based upon the maximum number of years since their last Space Grant involvement as a student. For example,



of those students who participated in their last Space Grant program award within the last six years, 58% have responded to the survey. As a result of the lessons learned from the longitudinal tracking of the students, we decided to change our Undergraduate Space Research Program to an internship program at KSC. The USRP program was looked at as just summer support for students in universities and did not result in students trying to take the next leap to graduate studies or jobs at industry. The internship program at KSC (jointly sponsored by Space Florida) allows students to have a very close look at the inner workings of a NASA facility and contractors. As a result of the program, the interns have made contacts with potential employers in the space industry and we will be closely tracking these students to determine the success of the program

5.8 Minority Serving Institutions

Smart Goals:

- Work with minority institutions in collaborative project.
 - ⇒ Our goal is 1 project with a minority institute each year. We have partnered with FIU in 2006 and with SECME in 2007
- Concentrate on reaching minority high school students and teachers

As mentioned earlier, FSGC has been trying with limited success to increase participation and grant awards among minority university students. Although we have contacted and visited with representatives from minority institutions, we have not seen a corresponding increase in minority applicants. And when minority students are selected for FSGC fellowships and scholarships, those students typically are awarded other higher paying fellowships and scholarships and opt out of FSGC's programs. Section 5.5 of this document describes FSGC's ongoing diversity programs, including recent progress with Florida International University (FIU) and Bethune Cookman University. Last year, we were successful in attracting students from FIU to participate in FSGC's satellite design competition. This was a result of a couple of students from FIU who participated in FSGC's and Space Florida Undergraduate Academy. These students then became FSGC's ambassador at FIU and recruited students for the satel-

lite design competition.. In addition, Bethune Cookman University hosted the 2008 Spring Advisory Board meeting in April. Several students attended the meeting and had discussions with the FSGC staff regarding our programs. One of these students was selected for the internship program at KSC for the summer of 2008. Since the student was awarded with 2008 funds, it is not reflected in CMIS. Space Florida personnel have also visited Florida State University and FAMU to talk about joint programs sponsored by Space Florida and FSGC.

5.9 Pre-College Education

5.9.1 SMART Goals

Contribute space-related resources and training to help increase the number of teachers who

- Are highly qualified in the fields of math and science;
- Use space-related curricula resources to motivate more students to take advanced math and science courses in high school; and
- Increase the number of high school students who go on to major in science and/or engineering disciplines.

5.9.2 Purpose and Progress

Since 1998, FSGC has worked in partnership with the Coalition for Improving Math and Science Literacy in Florida (CIMS) to leverage state, federal, and private resources to positively impact STEM education. FSGC has supported CIMS primarily through our Associate Administrator Penny Haskins, Ph.D., who also serves on the CIMS board. The CIMS approach has been a systemic one, with the assumption that this is the best way to achieve lasting results.

To achieve the SMART goals we supported the following efforts:

- Support teachers;
- Elevate the importance of STEM education in the Florida Department of Education (FLDOE);
- Establish a center for research into STEM education;
- Rewrite the Florida Science Standards to improve clarity and content; and
- Support efforts to improve diversity in STEM fields

5.9.2.1 Support Teachers

Support for the professional development of teachers is an important element of FSGC's Precollege programs. We teamed with the Florida Space Research Institute (FSRI) to develop a program similar to NASA's AESP program. The goal was to fund regional aerospace education specialists around the state who could provide the link between NASA's education resources and schools within the regions. The program included two weeks of content-based professional development during the summers, including tours of KSC and information-sharing sessions. The original funding came from the state, with additional support from the US Department of Labor, as well as private foundations. At its height, the program sponsored five regional "Aerospace Education Specialists" that served five different regions of the state. Hundreds of teachers and thousands of students benefited. This program ended when the state dissolved FSRI.

FSGC has supported Florida's Explorer schools through visits, an NES Partnership grant, and attendance at the Partnerships for Sustainability meetings in Huntsville, Alabama. We provide classroom resources for teachers through our aerospace education mini-grants (67 have been awarded since 2003). And our annual grant program designates a percentage of its awards each year to education and training programs. Over the past five years, 10 of these awards totaling \$127,000 have gone to precollege projects.

FSGC received a \$46K grant from the US State Department in 2007 to conduct a workshop for 30 teachers from US overseas schools in other countries. This workshop was held in the Summer of 2008. FSGC also received a \$100K grant from GE foundation for teacher workshops at the Exploration Station at KSC.

5.9.2.2 Elevate the Importance of STEM Education

A Florida statewide Summit on Math and Science Education was held in February, 2005. FSGC was represented by Dr. Haskins, who is also a member of the CIMS Board. Although a Summit recommendation to establish a government-sponsored STEM education commission failed, the FLDOE instead created an Office of Mathematics and Science that answers directly to the state's K-12 Chancellor. This met the goal of elevating the importance of STEM at FLDOE.

5.9.2.3 Create a Center for Research in STEM Education

In late 2005, Florida's Governor convened a Commission on the Future of Space and Aeronautics in Florida, and appointed Dr. Haskins to serve as a member, representing FSGC. An essential element of the task force's recommendations was the establishment of a Florida Center for Research in STEM (FCR-STEM). This recommendation was implemented and the center is now operating at FSU.

5.9.2.4 Rewrite the Science Education Standards

Florida's science education standards, first drafted in 1996, were widely criticized for their lack of clarity, overabundance of benchmarks, and lack of year-to-year continuity. The re-writing process was carefully orchestrated to assure input from science professionals, science educators, and the public. Dr. Haskins was a member of the Framers group that formulated top-level instructions for the writers of the Science Content Standards. She participated in the group that addressed the 9-12th grade physical science bodies of knowledge. The standards were approved by the FLDOE in February 2008.

5.9.2.5 Increase diversity in STEM Fields

When the FCR-STEM (see Goal 2) convened a group of advisors to help develop a plan to increase the number of women and minorities in the STEM pipeline, Dr. Haskins was invited to participate. The conversations were lively, with all participants engaged. The plan will be published in the next few months. It is expected the FLDOE will implement this plan and that FSGC will actively support it. Again, the statewide effort will have a greater overall impact than anything the FSGC could do locally. The goal here is to decrease the performance gaps between minority and white students in the state.

5.9.3 Student and Teacher Programs

To attract and retain students in STEM disciplines, FSGC has taken both top-down and bottom-up approaches. The top-down approach as described above has the broadest impact, but the bottom-up approach tends to provide the greatest satisfaction. Dr. Mukherjee and Dr. Haskins enjoy spending time with students and teachers in individual classrooms. These activities include such things as rocket launches for elementary school career days and working with the 5th grade science club (a SECME group) in an after-school program.

FSGC believes it is best to foster a passion for science early in a child’s educational journey. Below are descriptions of our other pre-college programs:

Middle school academy for teachers and students — Space Florida and FSGC hold programs for Middle School students and teachers. These Workshops provide opportunities for students to be engaged in stimulating science and math activities. In addition, they offer students the opportunity to be an aerospace engineer for a week and build an instrument package that will be launched on a weather balloon to a height of 100,000 feet (20 miles). Since it started in 2007, this program has supported 14 students and 28 teachers.

Aerospace Education Program

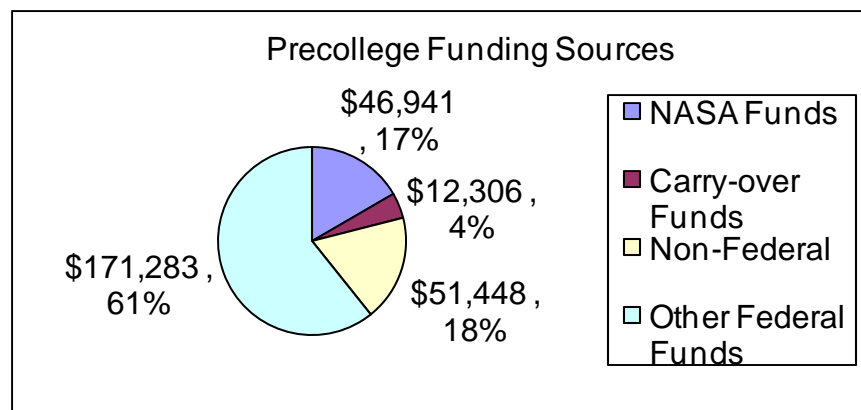
The Aerospace Education Program is designed to provide aerospace education experiences for students that will motivate them to become engaged in the study of science, mathematics, engineering, and/or technology. This program provides supplementary funds for equipment and supplies to enable teachers to implement aerospace education projects in their school. From 2003, 58 Teachers from 55 Schools were awarded these mini-grants.

Florida High School/High Tech (HS/HT) — FSGC also serves as the headquarters for HS/HT in Florida, and provides technical and logistical support to HS/HT programs. FSGC HS/HT field trips allow disabled students to meet top scientists and engineers at KSC laboratories and facilities.

Exploration Station and Educator Resource Center at KSC — In 2006, the UCF College of Education and FSGC entered into a 5-year agreement (\$2M) with NASA KSC to manage the Educator Resource Center (ERC) and Exploration Station at the KSC Visitor Complex. At the ERC, educators can access an outstanding collection of NASA classroom resources to integrate with their standards-based curricula. At the Exploration Station, students and other visitors participate in a variety of hands-on activities. In the last 2 years more than 59,000 teachers, students, and the general public visited the ERC and Exploration Station either as workshop participants or as visitors.

5.9.4 Impacts and Results

These concerted efforts to improve student performance in STEM has touched every school in the state. Certainly FSGC cannot take credit



for the accomplishment of these goals, but we were intimately involved in the processes and deliberations that led to those successes. During the past five years, we have participated in various statewide education conferences, task forces, and advisory committees covering topics such as school improvement and education partnerships, and developing accountability tests for the state's science education program. FSGC has become a valued partner in the state's STEM education community. Prior to 2005, FSGC concentrated on both student and teacher programs. After 2005, from the directive given by NASA HQ to concentrate of teacher programs, FSGC has discontinued with student programs such as Space Explorers and Protein Crystals In Space. This is reflected in the number of participants dropping from over 10,000 in 2004 to 188 in 2005. (See CMIS table VII. PRECOLLEGE REPORT – Participants).

5.10 Public Service and External Relations

FSGC conducts various Public Service, External Relations and Informal Education programs and is dedicated to inspiring scientific thought and inquiry among Floridians and the national audience that visits KSC every year. The following are some examples of these programs:

Radio JOVE — The Radio JOVE project is a hands-on inquiry-based educational project that allows students, teachers and the general public to learn about radio astronomy by building their own radio telescope from an inexpensive kit and/or using remote radio telescopes through the Internet. The Radio JOVE project began in 1998 and has grown to more than 800 teams of students and interested individuals who have purchased the kits.

UFRO Online — UFRO Online is a JOVE-related project that brings the radio emissions (including sounds) of Jupiter and the Sun to students, teachers, and the general public via the Internet and the University of Florida's Radio Observatory. It is a joint effort of NASA's Space Science Data Operations Office, the University of Florida, and FSGC.

Workshop for Informal Education Specialists — KSC, partnered with other NASA centers and FSGC to host a workshop focusing on returning the space shuttle to flight in November 2004. Attendees included 78 informal education specialists from 54 museums, planetariums, science centers, and other venues from 25 states and Puerto Rico.

Newsletters and Publications — FSGC has been added as a sponsor of three popular and widely distributed weekly and monthly email newsletters produced by one of our affiliates, Embry-Riddle Aeronautical University. These include nationally distributed weekly reports on space industry news and grant/contract opportunities, and a monthly report on defense contract awards in the state. The newsletters include an FSGC logo and link, and are sent directly to over 2,000 recipients.

Leadership Appointments — Another success story has been the involvement of FSGC representatives on state-sponsored boards and commissions. Dr. Haskins and Ms. Peggy Evanich (FSGC Advisory Board member) were both appointed to the Governors Commission on the Future of Space and Aeronautics in Florida. And Dr. Michael Hickey (FSGC Advisory Board member) currently serves as a governor-appointed member of the Space Florida board of directors.

Events — In addition to sponsoring or hosting the events mentioned earlier in this report, FSGC was also very well represented at NASA's Future Forum in Miami in April 2008. FSGC's Dr. Haskins chaired a panel discussion on "inspiration" and 17 FSGC student

awardees, from five universities across the state, presented posters of their research during the event to a panel of KSC engineers along with Univ. of Miami students.

5.10.1 Changes in “Public Outreach”

In 2003 and 2004, under the old definition of Public Outreach, then-FSGC Director Dr. Sam Durrance, a former astronaut, made regular public appearances at the KSC Visitor Complex, which boosted FSGC’s participation numbers. FSGC also sponsored a popular daily public radio broadcast of “Stardate.” Thus the very large numbers for indirect participants. However, after the definition was changed, FSGC’s emphasis shifted toward programs that align with NASA’s push for Informal Education programs like the Aerospace Day in 2006 and sponsoring middle school balloon launches during the World Expo Day in 2007. Overall, the shift resulted in fewer indirect participants in FSGC’s programs and larger numbers for direct participants, as indicated in the CMIS Table VIII. PUBLIC SERVICE: GENERAL PUBLIC AND EXTERNAL RELATIONS REPORT-Participants.

Over the past five years, on average, FSGC’s allocation of funds for Public Service was only 2.8% of its NASA and matching funds, while External Relations funding was only 0.9%. (See CMIS table VIII. PUBLIC SERVICE: GENERAL PUBLIC AND EXTERNAL RELATIONS REPORT-Funding Sources)

5.10.2 Impacts and Results

FSGC’s ERC and Exploration Station activities reach a significant number of NASA’s target audience. In 2006, this included 6,600 teachers, 20,400 students, and 6,700 public visitors. 2007 visitors included 8,248 teachers, 18,328 students, and 8,698 from the general public. The partnership supported 1,800 teacher workshop participants. FSGC did not include these figures in CMIS as we were told that NASA reports these numbers through a different reporting system. We include the numbers in this report because the staff of the ERC and Exploration station are FSGC employees working under a grant from KSC.

During the World Expo Day on November 1 and 2, 2007, at the KSC Visitor Complex, 78 middle school kids from 5 Florida schools along with 12 teachers and chaperones, launched weather balloons from that carried a video camera as a payload. This payload was built by the students prior to this event. FSGC Engineer, Bob Eppig, traveled to these schools to help the students build the payload for the launches. In addition, 350 students from Stewart Magnet Middle school in Tampa attended the Expo and got a chance to meet with the other Florida middle school students and NASA engineers and contractors

Because most of FSGC’s External Relations and Public Service activities rely on the Internet and on public visitation to the KSC Visitor Complex, our ability to influence and measure participation by women and minorities is hampered. Wherever possible, on our website and in brochures and presentations, we include photos and representations of minorities and women involved in aerospace programs.