

Louisiana Space Consortium
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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 Louisiana Space Consortium (LaSPACE) is a Designated Consortium funded at a level of \$845,000 for fiscal year 2010.

PROGRAM GOALS

The LaSPACE Strategic Goals are formulated into five areas, consistent with the Outcomes in the NASA Education Strategic Coordination Framework. Objectives follow directly from the Goals.

LaSPACE Strategic Goal 1: Foster aerospace related, interdisciplinary, science, technology and engineering research and education at Louisiana colleges and universities (NASA Outcome 1).

This goal involves (1) enhancing student and faculty research, (2) training graduate and undergraduate students, (3) providing hands-on flight opportunities, and (4) supporting student internships, competitions and design projects.

LaSPACE Strategic Goal 2: Encourage aerospace related industries in Louisiana for economic development and diversification (NASA Outcome 1).

Implementation includes working with the Michoud Assembly Facility, developing interactions between industry, students and faculty and making information available to students.

LaSPACE Strategic Goal 3: Promote and contribute to science, technology, engineering and mathematics pre-college education excellence (NASA Outcome 2).

Targeted programs for middle and high school educator training and school district programs are the main tools to achieve this goal.

LaSPACE Strategic Goal 4: Engage and educate the general public in NASA's space exploration projects, benefits and opportunities as well as Louisiana's role in the NASA program (NASA Outcome 3).

Informal education plus public outreach events contribute to this goal.

LaSPACE Strategic Goal 5: Maintain a cooperative, effective and inclusive consortium of Louisiana institutions to promote aerospace related research, education and economic development.

This requires effective program management, communication and increasing stakeholder involvement.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, OR 3)

Jacoby Hudson and Rodney Aguirre completed a research project with mentor Dr. Hua Mei at Xavier University of Louisiana to synthesize a new perfluoroalkyl(aryl) sulfonimide diazonium monomer. This monomer can be polymerized and directly attached to a carbon electrode in order to achieve high conductivity and stability in a Proton Exchange Membrane Fuel Cell. The students learned hands-on chemical research during the development and presented their scientific findings at Carnegie Mellon University, the American Chemical Society Southwest Meeting and the LaSPACE annual meeting. Both will be graduating in Spring 2011 and are currently applying to graduate programs. (Benefit to Outcome 1)

An experiment developed by a student team from Copper Mill Elementary School in the Zachary Community School District (ZCSD) in Louisiana was selected by the "Student Spaceflight Experiment Program (SSEP)" for flight on STS-134 during April, 2011. Developed by grade 5 students, Alexis Albert, Grace Dry, Madison Russell and Leanne Sorrel, with assistance by local scientists Tyler Jackson and Jake O'Brien and support from LaSPACE, the investigation will study the effects of microgravity on the growth rate of murine myoblasts. The students' experiment was reviewed by NASA for science content and the correct application of the scientific method. Copper Mill Elementary was one of only 16 teams, nationwide, selected for flight. In addition, ZCSD used the SSEP competition to augment teaching about science and the scientific method throughout their elementary, middle and high schools, and involved the community in the project. (Benefit to Outcome 2)

During AY 2010-11, LaSPACE helped the Maine Space Grant Consortium improve their capacity for student-based aerospace experiments as part of the Maine Student High Altitude Platform (MeSHAP) consortium development project. LaSPACE assistance involved detailed transfer of knowledge and technology about how to conduct a university level student sounding balloon research program, including a 5 day technical

workshop in January 2011 for nine Maine Instructor/Leaders that involved the construction of balloon payloads to measure temperature, pressure and humidity as a function of altitude, training in how to assemble and fly a balloon vehicle, licensing as an amateur radio technician and a balloon flight of the team payloads. Follow-on assistance includes technical advice during the bi-weekly MeSHAP teleconferences, as well as constructing radio tracking beacons and GPS controlled cut-down devices for the Maine balloon flights. (Benefit to Outcome 1 and 3)

Lorenzo Evans, a Junior in Electrical and Computer Engineering (ECE) at the University of Louisiana at Lafayette (ULL), supported in part by the LaSPACE Minority Research Scholars (MRS) program, was instrumental in designing and helping to get a student-built communications satellite, called the Cajun Advanced Pico-satellite Experiment (CAPE), downlisted for a NASA launch early in 2012 -- the second satellite built by students at ULL. "The second satellite is going to be more advanced. We're testing experimental technologies, such as a software defined radio and peak power tracking," said Chase Savoy, a Junior in ECE (partially supported by the LaSPACE CSG program). The second generation CAPE satellite will also test the use of deployable solar panels, and have a significant K-12 education and public outreach component. (Major benefit to Outcome 1, plus ancillary benefits to Outcomes 2 and 3)

Sci-Port (Shreveport, LA) hosted an educator workshop designed to give teachers confidence in using NASA resources in their classrooms. "To the Stars: Moon, Mars & Beyond Educator Workshop" engaged fourth through eighth grade teachers to explore such questions as: Are we going to live on Mars someday? How about the Moon? How are we going to be able to stay there? What things can we learn from other planets in our solar system? These questions and multiple classroom activities, materials and resources were provided. Keynote educational speaker Elaine Scott, author of "When is a Planet not a Planet?" and "Mars and the Search for Life," kicked off the day. Educators participated in various workshop sessions, including resources and activities available from Louisiana's NASA ERCN and using the NASA DLN network; Mercury and the MESSENGER program; and how to integrate science and language arts. (Benefit to Education Outcome 2)

Undergraduate chemistry major Leah Garber and Prof. Chadwick Young at Nicholls State University completed a NASA LaSPACE project to determine the distances to low-mass star-forming cores using archival data from the Naval Observatory, the 2 Micron All-Sky Survey, and the NASA Spitzer Space Telescope. Further, with the Harvard's Center for Astrophysics, a star-forming core has been observed at the Multiple Mirror Telescope with a multi-fiber spectrograph to supplement the work of Ms. Garber and in preparation for a 3-year proposal submitted to the NSF. In addition, Dr. Young will soon begin to visit high school science classes in the Bayou region to share these exciting results and describe what it means to be an astronomer in Louisiana. (Benefit to Outcome 1, and soon Outcome 2)

PROGRAM ACCOMPLISHMENTS

LaSPACE Strategic Goal 5: LaSPACE was cited “As one of the Top Supporters by the ABET-accredited HBCU Engineering Schools” by *US Black Engineer & Information Technology Magazine*. A certificate was presented to LaSPACE in July, 2010 in Baltimore, MD at the magazine’s annual conference, and now hangs in the LaSPACE office.

LaSPACE Strategic Goal 1: Graduate Students: Twenty three students received some direct support as Fellows or GSRA awardees, exceeding our goals both numerically (30%) and in diversity (39% female; 17% minority). Two students left the program, one for industry and the other for the US Naval Surface Weapons Center in Virginia while five additional students will be completing in Spring or Summer, 2011. In addition, eight other graduate students were involved through R & D or education projects.

Undergraduate Students: Between our LURA and MRS programs, we provided awards to 12 students, three of which were minority research scholars. This achieved or exceeded our goal for significant undergraduate student awards in these programs.

Through the “Scholars” efforts at Xavier and Southern Universities, we involved eight new, minority students in STEM studies, as well as five students working on LaSPACE projects on other campuses. Here we have 38% female and 57% minority students, again exceeding our projections. One student graduated and went on to advanced higher education, while the others are continuing.

Finally, we had four Louisiana students selected for summer, 2010 internships, plus we supported our first “Fall semester” intern at JSC, well exceeding our goals for the internship component.

Research Infrastructure: In this arena we met or exceeded our planned goals through a combination of four new REA grants and a like number of URP awards. Projects are all on-going and involve researchers at four research institutions (SU, LaTech, ULL, LSU) ranging from Earth Science using remote sensing, to new aerospace materials, to Astronautics and to a sub-orbital investigation on the *Blue Origin Co.* vehicle. Additional students are involved through these projects.

Higher Education: A major accomplishment in this area was achieving our objective of establishing an Aerospace Degree Program in Louisiana. The Department of Mechanical Engineering at LSU received approval to offer an “Aerospace Concentration” as part of its degree program!

The LaACES student ballooning project continued training students. We had a successful launch trip for the LaACES (09-10) students in May, 2010. For LaACES (10-11), we have exposed 17 new students to the program from three different universities. Payloads are being constructed by the students for the launch trip in May, 2011.

The HASP program was not as lucky. Due to the NASA imposed moratorium on all balloon launches, HASP-10 was cancelled with a possibility of re-scheduling for spring/summer, 2011. Meanwhile the HASP-11 payloads were selected and proceeded to development. Unfortunately, NASA refused a spring 2011 launch for HASP-10, so now we plan to launch both HASP-10 and HASP-11 in September, 2011. This will be a new “first” for HASP.

The PACER program continued with one new MSI group – Knoxville College – combined with a returning team – Inter-American University of Puerto Rico. The returning team developed an advanced payload while also helping/mentoring the new team. This model worked well, and the summer group had a successful launch campaign hosted by Aerostar Corporation at their balloon production facility in Texas. Aerostar also provided a small zero pressure balloon for use by the student teams.

A further effort involved inter-consortium cooperation with Louisiana mentoring Maine in their development of a new ballooning program for Maine students (see highlight in previous section). This culminated in an intense week long workshop here at LSU in January, 2011 during which nine Instructor/Leaders from Maine undertook the entire ballooning course, culminating in a short balloon flight for the payloads they constructed. Combined with this hands-on experience, LaSPACE provided the Student Ballooning course materials, parts and supplies, schematics, plus training/testing to become amateur radio technicians and receive licenses.

LaSPACE Strategic Goal 2: LaSPACE has solidified its new relationship with Jacobs Engineering, the support contractor for the Michoud Assembly Facility in New Orleans. Jacobs now supports the LaSPACE-Michoud Education Fellows program as well as working with our summer students program. Additional joint projects are under discussion.

An aerospace “jobs” section has been added to the LaSPACE website from which students can learn about the types of openings that are available. LaSPACE also works with the state committee that is producing a new framework for economic development in the state.

LaSPACE Strategic Goal 3: We continued work with the pre-engineering program at Scotlandville Magnet High School (SMHS) and their feeder program at Scotlandville Middle School. This year SMHS achieved full national certification from *Project Lead the Way* (PLTW). From the review team report *“It was very evident that Scotlandville Magnet High School has accomplished the implementation of a very successful engineering academy model, implementing PLTW to meet all certification requirements and the entire certification team would like to congratulate the school leadership on their accomplishments.”*

The LaSPACE/NASA Michoud Education Fellows (MEF) program provided new results. The MEF-2 teachers from St. Tammany Parish presented their academic year classroom experiences at a ‘graduation’ program in May, 2010 at the Michoud Facility. In summer,

2010 the MEF-3 educators began the next phase of the program which has expanded to include both St. Tammany Parish and the Zachary Consolidated School District. The MEF-3 cadre has been using the materials this school year and will report on their outcomes at the MEF-3 'graduation' in May, 2011. The results in terms of student interest/learning achieved by the MEF-2 teachers demonstrates that the program is working.

Partnering with the Texas Space Grant Program, four Louisiana teachers were able to take advantage of LiftOff-2010, receiving NASA classroom materials and advanced training. Further, LaSPACE helped the IDEAS Place, Experiment Gallery, Activity Station facility in Ruston, LA. Annually, over 100 teachers and 1,000 – 2,000 students are exposed to hands-on STEM content through the Activity Station.

A new partnership opportunity presented itself this past year with the conclusion of arrangements between Nano-Racks, LLC and the National Center for Space Science Education to establish the Student Space Experiments Program (SSEP) to allow K-12 school districts to propose to fly a student experiment on STS-134. LaSPACE partnered with the Zachary Community School District (ZCSD), with Lead Educator/Coordinator Tammy Woods, to bring this opportunity to Louisiana. ZCSD conducted a district-wide competition with over 75 students working in teams to define an experiment for SSEP. Each team wrote a proposal and these were reviewed by faculty at LSU and SU. The winning middle school team then moved on to develop the technical details of the experiment, which was reviewed and tested for toxicity by NASA before being approved for flight. The education experience for students, teachers and parents is ~80% complete, which included exceptional community involvement. A team will travel to KSC for the STS-134 launch, then recover the samples and analyze the results during the remainder of this school year. That will be the culmination for this unique educational experience for ZCSD.

As part of our thrust to reach out to military families in the vicinity of Barksdale AFB in Shreveport, LA, we partnered with Sci-Port: Louisiana's Science Center to serve, each summer, ~20 north Louisiana middle school teachers from the parishes around Barksdale. The Barksdale Sci-Botics Teacher Education Program enhances the educator's ability to embrace robotics as a technique for STEM education and for exciting the students. The program includes a visit to the Barksdale robotic bombs division, instruction in using their LEGO NXT robot educator kit, and ideas for lesson plans. Following the academic year, the educators and their student teams participate in a 'robotic competition' which demonstrates the skills that the students have mastered. Sci-Botics-1 and 2 used pre- and post-tests to assess the gain in the teacher's knowledge, and the Sci-Botics-1 competition demonstrated that this was being implemented in the classroom. The Sci-Botics-2 competition will be held in the next 4 – 6 weeks following the state's spring testing week.

LaSPACE Strategic Goal 4: Many of the projects discussed above involve informal education, particularly parental involvement, through the derived activities connected to the projects. For example, the SSEP project with Zachary drew in parents, community volunteers and even school board members to become actively involved in this student

space science effort. Our formal program involves the Mobile Astronomy Resource System (MARS), a panel truck outfitted with telescopes and display systems, along with science demonstrations. The goal is for MARS to reach underserved communities, public venues (e.g. Earth Day), public nights at schools, science expos, the Sally Ride program for girls and other such opportunities. MARS has made over a dozen visits this past year, after some needed repairs were completed. We hope to expand the reach of the MARS program in subsequent years.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking: During FY10, ~65 new students were impacted by LaSPACE programs. These are on top of the continuing students who are moving from one program to another or moving along in their studies. About half of these new students reach the threshold required for tracking. Adding these to the 63 students that were still enrolled last year, we have nearly 100 students in the longitudinal tracking matrix. While final tracking numbers are still being worked, it is clear that we should come close to meeting our goals. Among the new students, ~35% are female and ~40% are minority, continuing the progress we made in the diversity area from last year. Of the students that have graduated, most are pursuing advanced STEM education.

As part of our FY10 proposal, we estimated that (1) 60% of the higher education program students would be moving to aerospace or educational employment, (2) 50% of undergraduates would move on to aerospace related higher education, (3) we would have ~30 underrepresented students in the program and (4) would involve at least 12 institutions (EPSCoR state). From our preliminary tracking data, we are confident that these targets will be met or exceeded.

Moreover, in the K-12 area we estimated that (1) 70% of educators in our training programs use NASA resources, and (2) 65% of educators in short duration training would use NASA materials. Both of these targets were met.

- Course Development: No full courses were developed during FY10. However, a related development is the certification of an Aerospace Concentration within the degree program of the LSU Mechanical Engineering department.
- Matching Funds: LaSPACE achieved its matching fund commitment for FY10, according to our preliminary financial report. The consortium institutions continue, even in these tough financial times, to support the LaSPACE offerings.
- Minority-Serving Institutions: LaSPACE includes Dillard University, Grambling State University, Southern University – Baton Rouge, Southern University – New Orleans and Xavier University of Louisiana which are the major MSI = HBCU institutions in the state. All participated actively in recent LaSPACE council meetings. Moreover, LaSPACE has awards on each of these campuses to involve students in research/training projects, thereby furthering the outreach of the consortium to MSI's. Many of the students presented posters at the September, 2010

LaSPACE Council Meeting at Dillard University and showed very nice results, as well as networking with the other students.

IMPROVEMENTS MADE IN THE PAST YEAR

LaSPACE Strategic Goal 5:

- One new affiliate joined the consortium. We welcome the Louisiana Arts and Science Museum, home to the I. B. Pennington Planetarium.
- LaSPACE Council Meetings moved to a regular fall meeting schedule. Shreveport will host the fall, 2011 meeting. Each meeting will also include a student poster session providing the students an opportunity for networking and the institutional representatives a chance to see the quality of the student research.
- The LaSPACE Newsletter, “The Space Porter” – Space OpPORTunities for Educators and Researchers – was re-launched this past year with the Fall, 2010 edition. We hope to make this an annual or semi-annual publication.
- The application process to select a new LaSPACE Program Coordinator was underway with candidate interviews. The new Coordinator will start in May, 2011.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Consortium members include colleges/universities [Research Intensive (RIU); Research Active (RAU); Four year institutions (4YI)], HBCU's, business/industry partners (B/I), state education boards (Ed), and non profit organizations (NPO), structured as Active Members (AM), and Inactive Members (IM). The LaSPACE Council, composed of the institutional representatives from each affiliate, provides advice and direction to LaSPACE management. In fall, 2010 the LaSPACE Council meeting was hosted by Dillard University in New Orleans.

Dillard University (Dillard)	AM, HBCU,4YI
Grambling State University (GSU)	AM, HBCU, 4YI
Jacobs Technology, Inc. at Michoud (Jacobs)	AM, B/I
Louisiana Arts and Science Museum (LASM)	AM, NPO
Louisiana Board of Elementary & Secondary Education (BESE)	AM, Ed
Louisiana Board of Regents (BOR)	(Co-founding Institution) AM, Ed
Louisiana Business and Technology Center (LBTC)	AM, B/I
Louisiana State University and A&M College (LSU)	(Lead Institution) AM, RIU
Louisiana State University of Shreveport (LSU-S)	AM, 4YI
Louisiana State University Agricultural Center (LSU-Ag)	(Research and Extension) AM, RIU
Louisiana Tech University (LaTech)	AM, RAU
Loyola University (Loyola)	AM, 4YI
McNeese State University (McNeese)	IM, 4YI
Nicholls State University (Nicholls)	AM, RAU
Northwestern State University of Louisiana (NWSU)	AM, 4YI
Recreation & Park Commission for the Parish of East Baton Rouge (BREC)	AM, NPO

Sci-Port Discovery Center (Sci-Port)	AM, NPO
Southeastern Louisiana University (SELU)	AM, 4YI
Southern University and A & M College (SU)	(Co-founding Institution) AM, HBCU, RAU
Southern University of New Orleans (SUNO)	AM, HBCU, 4YI
Tulane University (Tulane)	AM, RIU
University of Louisiana at Lafayette (ULL)	AM, RAU
University of Louisiana at Monroe (ULM)	AM, 4YI
University of New Orleans (UNO)	AM, RAU
Xavier University of Louisiana (Xavier)	AM, HBCU, RAU