

Louisiana Space Consortium
Louisiana State University
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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 \$575,000 for federal fiscal year 2012.

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 (NASA Outcomes 1, 2 and 3).

This requires effective program management and communication plus increasing stakeholder involvement, e.g. through Consortium Sustaining Grants.

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

LaSPACE Fellowship student Carla Guzzardo received her Ph.D. in Mechanical Engineering, the first advanced degree in her family. She was active in the AIAA student chapter at LSU and is now working at Stennis Space Center on the Lockheed Martin Test Operations contract. The Greater New Orleans section of AIAA is sponsoring a rocketry workshop/launch event for high schools, and LaSPACE nominated Scotlandville Magnet High School (SMHS) and their 'Academy of Engineering' pre-engineering program as participants in the rocketry event. Little did we know that Carla had graduated from SMHS and she has now volunteered weekend time to mentor the high school students on principles/practice of rocketry as well as sharing her experiences as an engineer with the students. 'What goes around, comes around.' (Benefit to Outcomes 1 and 2.)

Louisiana researcher, Dr. Niel Crews of LaTech, was trained as a LaACES mentor and has led a LaTech student team. Niel has now taken it one step further and partnered with the Department of Education's Louisiana GEAR UP (Gaining Early Awareness and Readiness for Undergraduate Programs). He turned the LaACES ballooning experience into a one week summer camp experience that taught elementary, component oriented, electronics, soldering, basic atmospheric science, buoyancy and basic GPS and RF communications to high school sophomores and juniors. The program, for 30 underserved high school students, culminated in a sounding balloon payload launch. With enormously positive feedback, Dr. Crews is looking forward to a repeat performance in the next summer session. (Benefit to Outcome 2.)

Undergraduate student Katherine Blackburn received her BS in electrical engineering this past year. As an undergraduate she led a LaACES student team, then joined the NASA EPSCoR MARSLIFE team and attended the Robotics Academy at MSFC. In her senior year she mentored the Zachary High School balloon team. After a semester as a graduate student, she decided to return to Louisiana and work for an engineering firm. In her spare

time, she is, again, working with the Zachary High School LaACES ballooning team. (Benefit to Outcomes 1 and 2.)

PROGRAM ACCOMPLISHMENTS

LaSPACE Strategic Goal 1: Fellowship and Scholarship (NASA Outcome 1)

Graduate Students: Fourteen students received some support as Fellows or GSRA awardees during the past year. Five Fellows continued through the academic year and we added two new fellowship students. Three GSRA students continued with one graduating and going on to a postdoctoral position. In addition, four new awards were made, thereby achieving the metric in our base budget. Longitudinal tracking for these students is underway.

Undergraduate Students: Between our LURA and MRS programs, we had 15 students involved in major awards, ten from FY12 awards. This achieved or exceeded our goal for significant undergraduate student awards in these programs. Two students graduated and moved on to graduate education. Through the “Scholars” efforts at Xavier and Southern University, we involved 25 minority students in STEM studies, exceeding our proposed metrics. Of these, seven graduated and moved on to graduate school or STEM employment, four left school for financial reasons and are seeking employment, and 14 remain in school. At least three graduations are ‘projected’ for next year.

LaSPACE Strategic Goal 1: Research Development (NASA Outcome 1)

REA and URP: No URP awards could be offered in FY12, but nine new REA grants were awarded and six on-going REA projects reached completion. New projects involved researchers at six institutions (SU, LaTech, ULL, LSU, Loyola, McNeese) ranging from Earth Science using remote sensing, to new aerospace materials, to propulsion, to ‘flapping wing’ Aerodynamics. Additional graduate and undergraduate students are involved through these projects.

RIG: We received our first Research Initiation Grant (RIG) proposal in FY11, and the project completed successfully this past year, involving one undergraduate student researcher. The PI at Loyola has now ‘moved up’ by proposing for, and winning, a full REA award. This experience underscores the importance of finding, and engaging, the research interested faculty members at predominately undergraduate institutions.

LaSPACE Strategic Goal 1: Higher Education (NASA Outcomes 1 and 2)

Internships: We had only one (actually 50%) intern for summer, 2012 at the robotics academy at MSFC. LaSPACE and MSFC shared the cost of this internship.

Student Ballooning: The LaACES student ballooning project continued training students and had a successful launch trip in May, 2012. For the FY 12-13 academic year we have

student programs at LaTech, LSU, SU, UNO and GSU. Payloads are now being constructed/tested for a May, 2013 launch campaign.

The PACER program continued with providing advanced experiences for four returning teams from MSIs Albany State University, Central State University, Knoxville College and Norfolk State University. These teams worked with a balloon systems kit and developed techniques for actually launching and flying a sounding balloon system.

The HASP program had a successful year first renewing our agreement with the NASA Balloon Program Office to support HASP for another three year period and second with a flight on September 1, 2012. Launch was at 8:19 am and after a two hour climb-out to float, reached an altitude of about 122,000 feet. The flight lasted close to nine hours and was terminated just west of Phoenix, AZ at 7:17 pm. During this flight, HASP carried 11 payloads to the edge of space involving 93 students from 12 higher education institutions in 12 states in a hands-on flight project. The renewed agreement with NASA extends HASP flights through at least 2014.

As part of an activity organized by the SE Regional group, LaSPACE sent three undergraduate students plus a mentor to Huntsville, AL for the “Starting a Space Hardware Club” student workshop. This experience may lead to a future endeavor for Louisiana, possibly in conjunction with the new Aerospace Concentration in the ME curriculum at LSU.

Senior Design: LaSPACE is assisting two Senior Design teams for the SAE-AERO Competition. Both are at LSU in Mechanical Engineering led by Professor Martin. Twelve engineering students are involved, including several junior level students who will continue the project next year. These projects will complete in May 2013 prior to spring graduation.

USIP: During 2012 the LaSPACE Assistant Director served on a committee to develop the Undergraduate Student Instrument Project (USIP) for NASA. This project is supported by the NASA Science Mission Directorate (SMD) and is designed to fund about 20 undergraduate student teams to develop a science payload to be flown on a sub-orbital flight vehicle in order to provide the students with a hands-on experience that promotes technical and project management skills. In addition to sounding rockets and aircraft, HASP will be one of the suborbital vehicles. During 2012 an Educational Flight Opportunity (EFO) announcement document was developed, approved by NASA and released to the public. Student payload proposals are due in April 2013.

LaSPACE Strategic Goal 2: Aerospace Industry Involvement

LaSPACE has solidified its new relationship with Jacobs Engineering, the support contractor for the Michoud Assembly Facility in New Orleans. Jacobs supports the LaSPACE-Michoud Education Fellows program as well as working with our summer students program. Our Jacobs/Michoud institutional representative gave a summary presentation at the October, 2012 LaSPACE Council Meeting. In addition, we maintain

an aerospace “jobs” section on the LaSPACE website, from which students can learn about the types of openings that are available.

LaSPACE Strategic Goal 5: Maintain an Effective, Inclusive Consortium (Outcomes 1, 2 and 3)

After several years of inactive status McNeese State University has identified a new institutional representative and returned to active status. In addition, during 2012 we welcomed the Gordon A. Cain Center for STEM Literacy as a new active member of the consortium. Our Consortium Sustaining Grants (CSG) program has been successful this past year with participation by LaTech, Xavier, ULL, SUNO, and McNeese. Each of these grants includes one or more undergraduate research students and also involves some level of outreach to the local community. We anticipate several additional institutions will join the CSG program this coming year.

LaSPACE Strategic Goal 3: Pre-College Education Excellence (NASA Outcome 2)

The NASA Wallops Flight Facility and the Balloon Program Office proposed a summer, 2011 course for high school teachers which LaSPACE developed, coordinated, and taught. Our LaACES team, aided by the folks at the Columbia Scientific Balloon Facility (the venue for the summer event) managed to consolidate the essence of the Student Ballooning Course into an intensive week long, hands-on program for the teachers. This “Wallops Ballooning Experiences for Educators (WBEE)” was repeated during Summer 2012 for 24 educators. Feed-back from the teachers was, again, very positive.

We continued work with the pre-engineering program at Scotlandville Magnet High School (SMHS) and their feeder program at Scotlandville Middle School. SMHS achieved full national certification from *Project Lead the Way* (PLTW) and was awarded an Academy of Engineering (NACME) grant for program development. LaSPACE supported training for two teachers at the VEX Robotics Center, since VEX materials are being added to the curriculum. LaSPACE also serves on the Advisory Committee for the program.

A new expansion of the LaACES program to high school students with a team of students from Zachary High School, led by physics teacher Mark Arseneault, successfully built a BalloonSat payload for the May 2012 campaign. Some of these students are participating again this year, looking to the May, 2013 launch.

The LaSPACE/NASA Michoud Education Fellows (MEF) program graduated its final cadre of teachers in FY12. The MEF program is going into ‘hibernation’ due to a lack of teachers/school districts willing to participate.

Partnering with the Texas Space Grant Program, three Louisiana teachers were able to take advantage of LiftOff-2012, receiving NASA classroom materials and advanced training.

The Sci-Botics Teacher Education Program is being offered by LaSPACE affiliate Sci-Port, Louisiana's Science Center, to educators in Bossier Parish, in partnership with Barksdale Air Force Base. Teachers are trained in Robotics for use in the classroom, learn about the Air Force's applied robotics and related aeronautics activities, work with their classes to develop robotics programming skills, and enter a competition with other classes in the area. Approximately 20 teachers are involved.

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.

LaSPACE Strategic Goal 4: Enhance and Educate the General Public (NASA Outcome 3)

Our formal program involves the Mobile Astronomy Resource System (MARS), a panel truck outfitted with telescopes and display systems, along with science demonstrations. MARS reaches 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 is being re-furbished and new 'science kits' are being developed to expand the reach of the MARS program.

Other projects discussed above involve some aspect of informal education, particularly parental involvement, through the derived activities connected to the projects. For example, the SMHS project drew in parents and community volunteers to become actively involved in this engineering education effort.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Student Data and Longitudinal Tracking:**

LaSPACE programming served nearly 150 undergraduate and graduate students during FY12. We funded 64 students with fellowships/scholarships, and the remaining 80+ students were involved through our higher education programs or research infrastructure grants. For FY12, 68 new students received support of some kind, with 22 new students receiving significant awards, bringing the current total of tracked students to 90. Of these 90, 37 students are female, 43 are African-American, and 4 are Hispanic. Twenty-two (22) of the 90 have graduated in FY12: 1 student is in medical school, 2 are in pharmacy school, 2 are actively seeking STEM employment, 2 are currently applying to graduate programs, 5 are actively working in STEM fields, and 10 are pursuing advanced STEM degrees. The remaining 68 students are still enrolled in undergraduate or graduate programs at our affiliate institutions.

As part of our FY10 proposal, we estimated that (1) 60% of the higher education program students would be moving to aerospace or STEM educational employment, (2) 50% of undergraduates would move on to STEM 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, it appears that these targets will be met for FY12.

- **Minority-Serving Institution Collaborations:**

All five MSI (all HBCU) affiliates are engaged in various collaborative efforts with LaSPACE. Xavier University, Grambling State University, and Southern University Baton Rouge are supporting about 10 students developing balloon payloads for the LaACES balloon launch. Further, Xavier University and Southern University Baton Rouge participated in the LURA program as well as the Scholars program. Southern University New Orleans and Xavier University also hold Consortium Sustaining Grants. Our Research Enhancement Award (REA) program encourages development of multi-institution proposals involving collaborative research projects between majority and minority institutions. This led to a joint research project between Southern University Baton Rouge and LSU which completed this year. In addition, Prof. Meng at Southern University Baton Rouge won an REA award in the FY12 competition.

Dillard University continues to work with LaSPACE on student involvement (and was a partner in the proposal submitted to the ‘Innovative Pilot CAN’ – NNH12CH0004C). Currently, we have no active award with Dillard at their request.

Finally, LaSPACE collaborates with the predominantly minority Academy of Engineering program at Scotlandville Magnet High School in Baton Rouge, as discussed in the previous “Benefit” Section of this report.

- **NASA Education Priorities:**

Student Experiences: The LaSPACE program continues to be centered upon student involvement in research, especially at the undergraduate level. (Graduate students, by definition, must be involved in hands-on, aerospace relevant research projects.) Our undergraduate LURA and MRS programs are both mentored research experiences during which students and faculty work together on an approved project. All of our Scholars students also are involved with faculty research plus summer internships at a variety of laboratories.

Our three main hands-on building projects are Senior Design, LaACES BalloonSat, and the HASP project. The former involves engineering student teams, this year in aeronautics, designing and developing a micro-air-vehicle for the SAE Aero Design Competition. One team is focusing on the ‘Regular’ class competition and the other is entering the ‘Micro’ class UAV design field. The latter two are the student ballooning research programs that were discussed earlier in this report. There were ~ three dozen students involved in ballooning this past year.

One of our base-program metrics in this area was to increase the number of institutions regularly participating in LaACES. Last year we added LaTech and Loyola to the

program. Xavier has joined LaACES, but Loyola has had to drop the program due to a conflict.

The HASP program had a successful flight of the platform during the September 2012 balloon operations in Ft. Sumner, NM. This was described in a previous section. Over the past year, one Louisiana student team, not supported by LaSPACE funds, flew a microbe sampling payload on HASP 2012 and is preparing a similar payload for HASP 2013. In addition, a second Louisiana student team is developing an attitude determination system based upon a sun camera for HASP 2013.

Finally, a Louisiana State University student team recently developed and submitted a payload proposal for the USIP program. This group, advised by the same faculty member responsible for the Senior Design projects mentioned above (and the LaSPACE institutional representative), is planning to develop a microbiology sampling payload for use on aircraft.

Diversity is a goal for all LaSPACE activities. The consortium involves all of the state's MSIs (HBCUs) playing active roles as discussed above. Our base proposal's goal was to increase minority and female student participation by 5% per year (over the FY09 base) until the Louisiana NCES targets were reached. Subsequently, we would strive to maintain or exceed those targets. Using the link to the NCES site provided by NASA, we find that, for Louisiana students, the all minority ratio is 36%. We achieved this NCES "target" last year. Similarly, for female participants, the NCES site gives a ratio in the Louisiana student population of 40%. Using the significant awards discussed under longitudinal tracking, for all students involved during FY12, we show ~ 50% minority and 43% female, meeting our targets.

An interesting fact is that FY12 showed three Hispanic students, a major increase. Whether this is due to better program 'advertising,' or new interest in aerospace in this community, or to a statistical fluctuation is impossible to determine.

The LaSPACE Council (all institutional representatives) is composed of 25 members with one current vacancy. Of those 24 active members, five are female and 3 are minority. This composition remains unchanged from last year. Similarly, LaSPACE management includes two females and one African-American among the five principal staff (one of which is advisory).

Middle school teachers were involved in hands-on curriculum enhancement through the MEF (Michoud Education Fellows) program as well as the Texas Lift-Off training sessions. Further, through our Sci-Botics program run by Sci-Port, the teachers obtain hands-on robotic training. This is then turned into a classroom project with the classes competing in a local robotics competition in the Shreveport, LA area.

Summer Opportunities for enrolling freshmen are provided as part of our Scholars program at Southern University Baton Rouge. Generally, all of the Science and many of the Engineering departments at LSU and other institutions offer their own summer

preparation programs to acquaint potential students with the rigors and expectations of the university experience. These are not space grant sponsored efforts even though LaSPACE personnel are often involved.

Community College (CC) involvement is one of the goals for the Consortium Sustaining Grants program. We are trying to identify community college personnel with whom to collaborate. While we have no funded programs at CCs this past year, such are a goal for the future.

Aeronautics Research was part of LaSPACE activity this past year, even though it is normally covered by the EPSCoR program. In addition, to the UAV work by the senior design students, we funded an REA award at McNeese State University for a “Numerical Investigation of Flapping Wing Aerodynamics” with the goal to provide the analytical framework to develop micro-air vehicles that mimic the flying motions of birds or insects.

Environmental Science and Global Climate Change projects are only considered by LaSPACE if they utilize NASA unique capabilities such as satellite remote sensing or global change modeling. One project that completed this year utilized NASA remote sensing data to try to predict outbreaks of the Norovirus in oysters, one of the leading causes of gastrointestinal illness in the United States, using MODIS data from the Aqua and Terra Satellites. A project new in FY12 is using NASA and NOAA satellite data to monitor rainfall on a global basis and develop a model to predict rainfall (or lack of it) for under-developed parts of the world that may suffer severe water stress accompanying climate change.

Early Career Faculty are called out as one of the target groups for LaSPACE research awards as well as for student support awards, with a goal to help young faculty get started.

IMPROVEMENTS MADE IN THE PAST YEAR

- Our Program Coordinator, Ernesia Guidry moved on to other pursuits. After a detailed search, Colleen Fava was hired as the new LaSPACE Manager and attended the fall 2012 and spring 2013 national meetings.
- The LaSPACE Newsletter, “The Space Porter” – Space OpPORTunities for Educators and Researchers – continued with a Fall, 2011 edition and a spring/summer, 2012 publication. The newsletter is now under the direction of our new Manager.
- McNeese State University returned to active status with the appointment of N. Zhang as the new institutional representative. He has already led McNeese into two new LaSPACE supported projects.

- LaSPACE welcomed its newest member, the Gordon A. Cain Center for Scientific and Technological Literacy. Brenda Nixon is the institutional representative for the Cain Center.

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 nonprofit 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 October, 2012 the LaSPACE Council meeting was hosted by Sci-Port: Louisiana's Science Center in Shreveport. In addition, McNeese State University has appointed a new institutional representative and returned to active status. Finally, during 2012 we added the Gordon A. Cain Center for STEM Literacy as a new consortium member.

Dillard University (Dillard)	AM, HBCU, 4YI
Gordon A. Cain Center for STEM Literacy	AM, NPO
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) (Co-founding & 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)	AM, 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

The National Space Grant Office requires two annual reports, this Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.