

Alabama Space Grant Consortium
Lead Institution: The University of Alabama in Huntsville
Director: Dr. John C. Gregory
Telephone Number: (256) 824-6800
Consortium URL: www.uah.edu/ASGC/
Grant Number: NNX10AJ80H

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 Alabama Space Grant Consortium is a Designated Consortium funded at a level of \$575,000 for fiscal year 2012.

PROGRAM GOALS

The Strategic Plan and Goals of the ASGC contains the following Vision and Mission Statements. Our specific goals are aligned with the ASGC strategic plan, with NASA's Education Enterprise Strategy and Human Capital Management Plans, and with the recommendation of the President's Commission on Implementation of U.S. Space Exploration.

Our Mission is: to inspire, enable and educate a diverse group of Alabama students to take up careers in space science, aerospace technology and allied fields; to play our part in assuring U.S. leadership in space exploration and aerospace technology in the future; to inspire the next generation of space explorers; to bring increased realization of the value of space science and technology to the people of Alabama; and to insure that our message and our programs reach all constituencies in the population of Alabama, especially those traditionally under-represented in the science and engineering professions.

Our Vision is: an increased level of appreciation, participation and leadership by all the people of Alabama in the national and international space exploration and aerospace engineering enterprises. The ASGC program has, over the years, selected components in each of the NASA Space Grant national emphasis areas that also fit well with Alabama interests in one, and usually both, of the following senses: 1) there is a clear existing need and interest shown by an Alabama faculty member, a teacher, a group

of students, school system, university, industry, museum, etc.; and 2) there is evident willingness of an Alabama stakeholder to provide matching resources to achieve common objectives with NASA (the ASGC program shows match, or co-funding, mostly from non-federal sources of a ratio of 1:1 for every NASA dollar). *This 'buy-in' by our Alabama partners assures their enthusiasm and commitment to our joint goals.*

Outcome 1 (Employ and Educate) Consortium Fellowship/Scholarship, Research Infrastructure, and Higher Education Program Goals and SMART Objectives.

Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals, through a portfolio of investments.

ASGC Program Goals: Fellowship & Scholarship

- 1) Support and maintain our fellowship and scholarship program with high-caliber students;
- 2) Recruit fellows and scholars at all 7 member Ph.D.-granting institutions;
- 3) Each fellowship will be matched by another of equal value using local funds; and
- 4) Actively recruit and support students in STEM fields from traditionally underrepresented groups at a rate consistent with NCES for Alabama.

SMART Objectives: Fellowship & Scholarship

- Objective 1: All 7 member Ph.D.-granting institutions will have recruited a minimum of 3 fellows/scholars per university in FY2012.
- Objective 2: In FY2012, each affiliate will continue to match each fellowship it receives with a second fellowship to be administered by ASGC at the same value and will maintain the \$37,000 stipend level to remain competitive with other Federal agencies. *(This brings an additional \$222K of non-Federal funds into the ASGC fellowship program).*
- Objective 3: All recruited fellow and scholar awardees in FY2012 will have a diversity level of 25% minority and 40% female participants.

ASGC Program Goals: Research Infrastructure Development

- 1) Support a significant number of motivated students and mentors encompassing a wide range of experiences in internships at NASA centers and collaborating industry;
- 2) Recruit a diverse cadre of students to work on mentored research projects at our established REU Programs at Alabama universities;
- 3) Ensure all REU projects funded with NASA funds shall be aerospace science and technology or STEM focused;
- 4) Support underrepresented faculty or faculty from our MSI members at research opportunities at NASA field centers; and
- 5) Actively recruit and support students and faculty in STEM fields from traditionally underrepresented groups at a rate consistent with NCES for Alabama.

SMART Objectives: Research Infrastructure Development

- Objective 1: A diverse group of 8 students from Alabama Universities will be placed as interns at NASA centers and collaborating industry in FY2012.
- Objective 2: A diverse group of 24 students will be recruited to work on mentored research projects at 3-4 Alabama universities via our Research Experience for

Undergraduates Programs in FY2012.

- Objective 3: 1 underrepresented faculty or 1 faculty from our MSI members will be placed at a research opportunity at a NASA field center in FY2012.
- Objective 4: All recruited research infrastructure participants in FY2012 will be 25% minority and 40% female.

ASGC Program Goals: Higher Education

- 1) Support special courses in Space Hardware Building and Project Management;
- 2) Maintain and grow student *Building Space Hardware* programs throughout the State of Alabama; and
- 3) Actively recruit and support students and faculty in STEM fields from traditionally underrepresented groups at a rate consistent with NCES for Alabama.

SMART Objectives: Higher Education

- Objective 1: 3 special courses in Space Hardware Building and Project-Management will be supported at 3 of Alabama universities in FY2012.
- Objective 2: Maintain 15 student building space hardware programs at 6 universities in FY12, including 4 programs at 2 HBCUs.
- Objective 3: Initiate 1 new student building space hardware program at 1 university or 1 community college in FY2012.
- Objective 3: All recruited higher education participants in FY2012 will be 25% minority and 40% female.

Outcome 2 (Educate and Engage): Consortium Precollege Programs Goals and SMART Objectives.

Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers and faculty.

ASGC Program Goals: Precollege Education

- 1) Support a select set of projects and events that emphasize the development of K-12 teachers, particularly in pre-service and in-service program areas, which encourage young students to prepare for STEM careers;
- 2) Leverage funds with larger contributions from other sources;
- 3) Focus on in-service and/or pre-service teacher training that results in deeper content understanding and/or competence and confidence in teaching STEM disciplines;
- 4) Support NASA Education programs;
- 5) Evaluate programs to insure continuous improvement; and
- 6) Direct programs to underrepresented and underserved populations.

SMART Objectives: Precollege Education

- Objective 1: 3 in-service and/or pre-service teacher educators will attend teacher educator workshops in FY2012.
- Objective 2: In FY2012, 2 state Regional Science Olympiad and Science Fairs that are supported by the ASGC and held annually at the lead-institution will have over 1,500 participants (*Objective 2 moved from Informal Ed to better reflect categories in FY2012*).

Outcome 3 (Engage and Inspire): Informal Education Program Goals and SMART

Objectives.

Build strategic partnerships and linkages with STEM formal and informal education provides that promote STEM literacy and awareness of NASA's mission.

ASGC Program Goals: Informal Education

- 1). Actively engage members of the public from traditionally underrepresented groups;
- 2) Bridge the gap between Land and Earth Grant research and geospatial technology and societal needs in Alabama;
- 3) Leverage funding to extend the reach of SG beyond direct investment;
- 4) Support science education needs in underserved schools;
- 5) Engage students in informal education initiatives; and
- 6) Track impacts and evaluate programs success via quantitative and qualitative methods to insure continuous process improvement.

SMART Objectives: Informal Education

- Objective 1: 1 training workshop on satellite remote sensing and Geographic Information Systems (GIS) technology will be offered in FY2012 by 1 Alabama University.
- Objective 2: In FY2012, support 1 Alabama science center/museum with outreach and teacher education projects.

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

We provide some anecdotal examples and consortium highlights of how we are contributing to the 3 outcomes. All comments come from students and/or educators who were supported by the ASGC in FY2012.

NASA Education Outcome 1:

The Space Grant has had a tremendous impact on my education and life. For the past four years the Space Grant has helped me chase my dreams and expand my horizons. I feel a deep sense of gratitude towards the Space Grant program. For the rest of my life I will remember the Space Grant as catalyst that fueled the start of my career. (Justin Headley - on 10/03/12, 2010 Space Grant Fellow, The University of Alabama 2012 Space Grant Fellow).

The Space Grant Program inspired me to take Aerospace Propulsion to consider if I would like to pursue aerospace engineering as a career. The funding from the program also made a huge impact on my life. Without the need to take on extra jobs, I was able to put more time and effort into my studies. As a result of interviewing various researchers, I feel much more informed about NASA and the aerospace field. I was unaware of the variety of projects available within this discipline. Also, the funding from the program allowed me to dedicate more focus to my own research and classes. (Sarah Naylor - on 05/22/12, 2010 REU - Research Experiences for Undergraduates, 2011 Space Grant Scholar, 2012 Space Grant Scholar, University of South Alabama - REU - Undergraduate Researcher).

My association with Space Grant and NASA has opened many doors through collaborations and contacts, which may have otherwise been missed. In addition, the ASGC fellowship allowed me to focus on my research full time with adequate funding for both travel and stipend related expenses. (Timothy Shirey - on 09/21/12, The University of Alabama 2010, 2011 and 2012 Space Grant Fellow).

In April 2012, ASGC graduate fellowship awardee, David Branscomb, and his faculty advisor, Dr. Royal M. Broughton, filed two Auburn University Invention and U.S. Patent Applications for work they have done in composite materials: “Robust Pre-Impregnated Yarn for Manufacturing Textile Composites,” and “Minimal Weight Braided Composite Using an Open Architecture”.

Dr. Christina R. Richey, NASA ASGC Fellow 2005-2007, graduated from UAB and received a NASA Postdoctoral Program Fellowship position at GSFC within the Observational Cosmology Group. In February 2013 she accepted a position as a Senior Scientist for the Planetary Science Division at NASA HQ in D.C.

The University of Alabama (UA) won the Joe Kosmo Award for Excellence at the 2012 Lunabotics Mining Competition at KSC and was invited to present their Lunabot at the 2012 PISCES Conference in Hawaii in November. They attended the conference and were given the opportunity to perform an analog mission and field test their Lunabot at the Mauna Kea volcano site in Hawaii, where the terrain, rock distribution, soil materials and permafrost provide an ideal setting for testing hardware and operations not available in laboratories or NASA centers. This team also won launch tickets and VIP passes to attend the Atlas Rocket Launch at Kennedy Space Center in August, 2012. The team is advised by Dr. Kenneth Ricks, UA Dept. of Electrical and Computer Engineering. This UA team includes a NASA ASGC FY2012 fellowship awardee, Justin Headley.

The UAH Space Hardware Club’s ChargerSat I (CubeSat) team had their proposal approved for microgravity testing in FY2012. They performed their microgravity test in Houston, TX at Ellington Field on August 25, 2012 going through 140 parabolas. The team’s test was used to observe and measure the forces on their satellite through each of the satellite’s 5 mechanical deployments and movements. The UAH ChargerSat I team was selected to launch their CubeSat at Wallops Flight Facility in the Fall of 2013. This team submitted a second proposal to build a ChargerSat II. via the CubeSat Launch Initiative to Mr. Jason Crusan, Director, Advanced Exploration Systems Division, at NASA GSFC. The Space Hardware Club is advised by Dr. Francis Wessling, UAH Dept of Mechanical and Aerospace Engineering.

NASA Education Outcome 2:

120 students from 3 North Alabama middle schools got the experience of a lifetime on March 21, 2013 when they asked questions to an astronaut flying more than 200 miles above the Earth. 20 eighth-grade students from Discovery, Ed White and Liberty middle schools talked to Tom Marshburn, an astronaut and medical doctor aboard the International Space Station, as the station orbited over Huntsville. More

than 100 of the children's classmates listened in from a hallway outside the Space Communications Laboratory at UAH's College of Engineering Building. The students' chat was part of the UAH Space Hardware Club's *Amateur Radio on the International Space Station* (ARISS) program, which gives engineering students an opportunity to teach middle school students about amateur or ham radio. This was a cooperative venture with NASA JSC, NASA MSFC, the Amateur Radio Relay League, AMSAT and radio clubs worldwide. In collaboration with the NASA's Teach From Space, NASA's Aerospace Education Specialist Program, and the ASGC, the UAH Space Hardware Club engaged these middle school students and their teachers in multiple space and amateur radio activities for 6 weeks leading up to the ARISS contact.

All ASGC scholarship awardees are required to complete a required outreach project during the year with which they received their funding. This is a guiding principle of our Alabama Program. In FY2012, UAH scholar Brittani Searcy decided to not do the traditional easy activities, but instead, she teamed up with teachers and the principal at a middle school and professors at UAH to create a Middle School STEM Outreach Program for underserved and underrepresented students. Brookhaven Middle School in Decatur, AL was selected because it is a Title 1 school and the majority of its student body is underrepresented and underserved. For the past 2 years, Brookhaven has not achieved adequate yearly progress according to state test results. The goal of this program was to inspire one classroom of 8th grade students by introducing STEM subjects and activities at a once a week afterschool event. Subject areas that were covered included Chemistry, Biology, Forensic Science, Mathematics, Astronomy, Meteorology, Aerospace Engineering, Civil Engineering, Propulsion and Physics. 35 minority students participated in the outreach program along with 3 UAH instructors and professors and 2 teachers and 1 principal. This program is advised by Dr. Carol Strong, UAH Dept of Physics.

I would just like to thank you for everything you have done. I took a special interest in the science fair competition in an attempt to solve some of the problems that haunt the world today, and you are helping guide young scientists to those solutions. (Darlene Castelin – on 4/5/13. Clark-Shaw Magnet School, Mobile, AL, Science Teacher).

NASA Education Outcome 3:

ASGC had 4 Summer of Innovation Mini-Grants awarded to Alabama organizations in FY2012: Excalibur Christian School in Madison, AL, Grace Lutheran School Robotics Club in Huntsville, AL, Tuscaloosa Magnet Middle Robotics Club in Tuscaloosa, AL and Winchester LEGO Explorers in New Market, AL.

Due to the success of the Space Hardware Club at UAH and other clubs/programs within the state, the ASGC and the UAH Space Hardware Club were nominated by the Southeastern Region of Space Grant Directors to run a student conference on "How to Build and Sustain Student Hardware Organizations". This conference concentrated on how to start and sustain active student clubs and was student lead and

interactive. We had breakout focus groups with experienced moderators on various subject matters (BalloonSats, Satellites, Rockets & Robotics). Members of industry provided presentations on documentation and why it is important. Tours of NASA MSFC and UAH facilities and we offered our models of how UAH, AU and others within our state run their programs. The NASA MSFC Center Director, Mr. Patrick Scheuermann welcomed all of the participants and others from NASA MSFC presented Higher Education Opportunities that were available to students. This student conference took place on the campus of UAH on Feb. 7-9, 2013. 79 professors, students, industrial members and guest speakers were in attendance. *This conference on How to Build and Sustain Hardware Organizations that I and my student team were able to attend in Huntsville provided insight into how other organizations are operated. It was interesting to see how other groups lead their groups and as a result, it will help better organize and streamline student interactions and mentor support. (Audrey Webb – on 2/8/13, Gadsden State Community College, Anniston, AL, Electronics Advisor and Instructor).*

PROGRAM ACCOMPLISHMENTS

The majority of ASGC programs include fellowship (required research component with faculty mentor) and scholarships (required outreach component), Higher Education projects (space hardware building special courses and project management), Research Infrastructure projects (REU's, student internships), Precollege, and Informal Education projects.

NASA Education Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals (Employ and Educate). ASGC FY2012 goals in alignment to Outcome 1 were met except we fell short by 2 student intern positions. This is due to the absence of Augmentation funding.

Fellowship & Scholarship

- Awarded 46 Fellowships and Scholarships (all direct student participants).

Higher Education

- Provided support for 280 student participants in Higher Education programs.

Research Infrastructure

- Provided support for 57 student participants (32 of those being direct student participants) in Research Infrastructure programs.

Achievements and Progress

Fellowship & Scholarship

- Awarded 45 Fellowships and Scholarships:
 - All 7 member Ph.D.-granting institutions recruited and awarded fellows and scholars in FY2012 (AAMU, 7 students, AU, 8 students, UA, 7 students, UAB, 4 students, UAH, 6 students, USA, 7 students & TU, 6 students).
 - A total of 45 fellowships and scholarships were awarded and directly funded in FY2012.

- 12 Research Fellowships for Graduate Students (9 Doctoral; 3 Master's).
- 32 STEM Undergraduate Scholarships (16 seniors; 16 juniors).
- 1 Scholarship for Pre-Service Teachers in Science & Mathematics (1 senior).
- Each member matched each fellowship it received at the same value. This brought an additional \$222K of non-Federal funds into the ASGC Fellowship program.
- Of the 45 awards, 14 were made to underrepresented minority students (31%).
- Of the 45 awards, 19 were made to female students (42%).
- 23rd Annual Scholarship and Fellowship Awards Ceremony was held at NASA MSFC's Propulsion Research Laboratory on November 5, 2012. MSFC's Center Director, Mr. Patrick Scheuermann, welcomed the Scholars and Fellows and Mr. Chris Singer, Director of the Engineering Directorate was the Guest Speaker for the event. Tours of MSFC's F1 Engine, Rocket Park and the Nuclear Thermal and Electrical Propulsion Division were provided for the awardees.

Higher Education

- Supported 280 Higher Education students in space hardware building special courses and project management.
 - Provided support for 3 special courses in Space Hardware Building and Project Management.
 - AAMU – EE 470/471: Dr. V. Trent Montgomery, “A Comparative Analysis of Balloon Payload Stabilization Methods”. This course is a required senior design course for students majoring in Electrical Engineering at AAMU. The students were divided into two groups to develop projects that would do a comparative analysis of several methods of stabilizing the payload of a high altitude weather balloon. The students were able to enhance their ability to work in a team, learn the salient components of project management to include time management, organization and partitioning of the project, and the need to set milestones, experiment with test and evaluation techniques, learn the principles of systems engineering and demonstrate a knowledge of cost analysis and engineering trade-offs.
 - UAH – EE 494: Dr. Charles Corsetti, “Capstone Engineering Design Course – ECE BalloonSat”). This course is a required senior design course for students majoring in Electrical Engineering (seniors) before graduating at UAH. The course required students to work as teams under the direction of a faculty member to design, fabricate and test their projects. Students were evaluated on their research abilities, problem-solving and decision-making skills, their technical and design skills, and their oral and written communications abilities. This course emphasized the engineering design process as well as the professional development of future engineers. The program had the benefit of enhancing the students experience to address engineering design problems and provide the student with “real world” experience desired by the engineering community. UAH participated in joint BalloonSat launches with AAMU, an HBCU.
 - UAH – MAE 490/493: Dr. Robert Frederick & Dr. David Lineberry, “Investigation of a Dielectrophoresis Propellant Management System for Low

Gravity Applications”. This course is a senior design course for Mechanical and Aerospace Engineering (MAE) seniors before graduating at UAH. Students from the MAE department designed, built and flew the rocket and payload as part of a two-semester senior design course. The rocket built during this course was used as part of the NASA USLI competition. In addition to building the rocket, students were able to use public relation resources to provide outreach STEM activities for local middle school students which to encourage them to pursue science, technology, engineering and mathematics fields of study.

- Provided support for 22 *Students Building Space Hardware Programs, or SSPs*. These SSPs were in the following areas: BalloonSat, CanSat, CubeSat, Design/Build/Fly, Hovercraft, Lunabotics, Moonbuggy, and USLI at 6 universities (AAMU, AU, UA, UAH, USA, and TU) and 2 Community Colleges (Bevill State and Shelton State). This included 4 programs at 2 HBCUs (Moonbuggy, BalloonSat and USLI at AAMU, and CubeSat at TU).
- ASGC continues to support SSPs at **community colleges**. Bevill State and Shelton State both have SSPs and we are currently working with Gadsden State Community College (GSCC) on developing a new SSP and to support them with their NASA’s Reduced Gravity Student Flight Opportunities Program (Microgravity University) in collaboration with the Jet Propulsion Lab (JPL). Their team was selected to participate in a new partnership with the ISS National Lab. They will be completing work with NASA PI, Murray Darrach from JPL on his experiment “Behavior of Organic Solvents in Water Under Zero-G”. Audrey Webb in the Electronics Department at Gadsden State advises them and the student lead is Mr. Steven Martinez, an ASGC scholarship awardee at Auburn University in 2007 and 2008.

Research Infrastructure

- Supported 32 Research Infrastructure students as direct participants in the Research Experiences for Undergraduates programs (REUs) or as student research interns.
 - In January 2013, ASGC received notice that 3 Alabama students were selected in cohort V. to be NASA Student Ambassadors as part of the NASA Student Ambassador Virtual Community due to a result of their past student internship participation at NASA centers. The students selected were Roderick Gray, AAMU, Lamont Henderson, TU, and Tyler Maddox, UAH.
 - Provided support for 6 student interns (2 females, 2 underrepresented minorities) in the summer of 2012 at NASA centers (Ames, Langley & MSFC). We missed our target objective of 8 student interns due to budget cuts.
 - Provided support to 10 ASGC students from AU, UA and UAH to attend the Advanced Rocketry Workshop in Huntsville, AL on July 18-21, 2012.
 - Provided support to a diverse group of 26 direct funded students to work on mentored research projects at 3 Alabama universities (UAB, UAH & USA) via our Research Experience for Undergraduates Programs in FY2012.
 - Provided support to 1 faculty member from 1 of our MSI members (TU) to attend a NASA field center (MSFC) in the summer of 2012 to do field research.
 - Provided support for 3 UAH students to attend the SmallSat Conference in Logan,

- UT in August of 2012. They are currently on a CubeSat team selected to launch in the Fall of 2013 at Wallops.
- Provided support for 6 students (2 females, 4 males from UAH) to present at the Southeastern regional meeting in Little Rock, AR on September 15, 2012. They presented on how they developed and sustain their Space Hardware Club at UAH and on their CubeSat program.
 - Provided support for 2 students (1 female, Brittani Searcy, 1 male, Eric Becnel, from UAH) to present at the National Council of Space Grant Directors' Spring Meeting in Washington, D.C. They presented on their approach to student development of space hardware. Their presentation was broadcasted as a live webcast on NASA's DLIInfo Channel. ASGC advertised this opportunity on our website, our Facebook social media site and via email list-servs. The two students were able to have their picture taken with NASA's Associate Administrator for Education, Leland Melvin, and Diane DeTroye, NASA's Director of STEM Engagement.

NASA Education Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers and faculty. (Educate and Engage). ASGC FY2012 goals in alignment to Outcome 2 were met.

Achievements and Progress

Precollege

- Provided support to 35 underserved and underrepresented students of an 8th grade class at a Title 1 School (Brookhaven Middle School) for a Middle School STEM Outreach Program administered by 3 UAH students, 3 UAH instructors, 2 in-service teachers and 1 principal for a 10-week period in FY2012.
- Provided support for 8 pre- and in-service teachers to attend the Alabama Science Teacher Association (ASTA) Mission: iSTEM Conference on February 14-16, 2013 at the U.S. Space and Rocket Center in Huntsville, AL.
- Provided support for a 1-week summer program in FY2012 that targeted underrepresented, underserved female high school students (36 students) from the greater Mobile area through an outreach program involving Bioengineering and Chemical Engineering (BEACHES) at the University of South Alabama (USA). The students were provided with opportunities to interact with scientists and engineers at USA with intentions of getting these students into the STEM pipeline and go onto pursue degrees in STEM fields once they graduate high school.
- Provided support for a yearlong program that uses problem solving to educate students in FY2012. The Mobile Mathematics Circle specifically targeted underrepresented, underserved middle and high school students from Mobile County (120 students from 17 schools). This program also organized a Mobile Mathematics Olympiad whose goals were to increase the knowledge and conceptual understanding of students, to help them develop analytical thinking skills, and to educate students to pursue further study and careers in mathematics and science fields.
- Provided support for 450 middle and high school students to participate in the Alabama Science Olympiad held on February 20, 2013 held at UAH.
- Provided support for 350 elementary, middle, and high school student projects from

the public and private schools in 9 counties in North Alabama to compete in the North Alabama Regional Science and Engineering Fair (NARSEF) on March 6-8, 2012 at UAH.

- Provided support for 220 student projects (first and second place winners of their regional fairs) in various categories of science and engineering projects from middle and high schools from all 67 counties from the state of AL to participate in the 2013 Alabama Science and Engineering Fair (ASEF) on April 4-6, 2013 at UAH. Guest speakers and judges included Dr. Travis Taylor and Dr. Pete Erbach from the *National Geographic* television show “Rocket City Rednecks”. These events are venues to attract students in informal education initiatives and allow us to leverage our funding with co-sponsors. Members of the public from the entire State of Alabama are present at these events.
- 120 students from 3 North Alabama middle schools got the experience of a lifetime on March 21, 2013 when they asked questions of an astronaut flying more than 200 miles above the Earth. 20 eighth-grade students from Discovery, Ed White and Liberty middle schools talked to Tom Marshburn, an astronaut and medical doctor aboard the International Space Station, as the station orbited over Huntsville. The students’ chat was part of the UAH Space Hardware Club’s *Amateur Radio on the International Space Station* (ARISS) program, which gives engineering students an opportunity to teach middle school students about amateur or ham radio. This was a cooperative venture with NASA JSC, NASA MSFC, the Amateur Radio Relay League, AMSAT and radio clubs worldwide. In collaboration with the NASA’s Teach From Space, NASA’s Aerospace Education Specialist Program, and the ASGC, the UAH Space Hardware Club engaged these middle school students and their teachers in multiple space and amateur radio activities for 6 weeks leading up to the ARISS contact.

NASA Education Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA’s mission (Engage and Inspire). ASGC FY2012 goals in alignment to Outcome 3 were met.

Achievements and Progress

Informal Education

- Due to the success of the Space Hardware Club at UAH and other clubs/programs within the state, the ASGC and the UAH Space Hardware Club were nominated by the Southeastern Region of Space Grant Directors to run a student conference on "How to Build and Sustain Student Hardware Organizations". This conference concentrated on how to start and sustain active student clubs and was student lead and interactive. We had breakout focus groups with experienced moderators on various subject matters (BalloonSats, Satellites, Rockets & Robotics). Members of industry provided presentations on documentation and why it is important. Tours of NASA MSFC and UAH facilities and we offered our models of how UAH, AU and others within our state run their programs. The NASA MSFC Center Director, Mr. Patrick Scheuermann welcomed all of the participants and others from NASA MSFC presented Higher Education Opportunities that were available to students. This

student conference took place on the campus of UAH on Feb. 7-9, 2013. 79 professors, students, industrial members and guest speakers were in attendance.

- Provided support to the U.S. Space and Rocket Center and the Alabama Mathematics, Science, Technology and Engineering Coalition for Education (AMSTEC) for the pre- and in-service teacher Alabama Science Teacher Association (ASTA) Mission: iSTEM Conference on February 14-16, 2013 at the U.S. Space and Rocket Center in Huntsville, AL. The STEM disciplines are strategically important for employment and for our economy.
- 1 training workshop on Geosciences and Remote Sensing was hosted by AAMU in FY2012 with 79 participants in attendance from AL, TN and MS.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

Student Data and Longitudinal Tracking:

- Total awards = 78; Fellowship/Scholarship = 45, Higher Education/Research Infrastructure = 33; 15 of the total award represent underrepresented minority F/S funding. During the FY2012 program year, 99 students took next step in FY2012 (SG participation supported from FY2006-FY2012 funds). 30 students are pursuing advanced degrees in STEM disciplines, 2 accepted STEM positions at NASA contractors, 50 accepted STEM positions in industry, 4 accepted STEM positions in academia, and 13 went on to positions in non-STEM disciplines. The remaining students have not yet received the degree that they were pursuing while they received their Space Grant award.
Longitudinally Tracked Total Underrepresented = 25.6% (20 students). Meets 25% target.
Longitudinally Tracked Total Females = 39.7% (31 students). Meets 40% target.

Minority Serving Institution Collaborations:

- The ASGC currently has 2 universities, Alabama A&M University (AAMU) and Tuskegee University (TU) and 1 community college, Shelton State (SSCC) designated as Minority Serving Institutions that we supported in FY2012. Both AAMU and TU are federally recognized as Historically Black Colleges and Universities (HBCUs). ASGC's Associate Director, Dr. Teresa Merriweather Orok, is from AAMU along with our Campus Director, Dr. V. Trent Montgomery. Our Campus Director, Dr. Gregory Murphy, represents TU. AAMU is a charter affiliate member of the ASGC and TU became an affiliate member of the ASGC in 2003. Both of these universities are research, Ph.D.-granting institutions. The Campus Director for SSCC is Ms. Renea Randle. Both AAMU and TU have members on the ASGC's Policy Advisory Council. ASGC's collaborative interactions and programs with MSIs include:
 - Fellowship and Scholarship programs at AAMU (7 students - 1 fellow, 6 scholars) and TU 6 students – 1 fellow, 5 scholars). A new fellowship program was created at TU in FY2012.
 - Sounding BalloonSat program at AAMU, Dr. Montgomery and Dr. Massey.
 - Moonbuggy Program at AAMU, Dr. Mobasher.
 - High powered rocketry program (USLI) at AAMU, Dr. Seif.

- Geoscience and remote sensing workshop at AAMU, Dr. Heidary.
- CubeSat Program (development phase) at TU, Dr. Khan.
- Faculty travel support to NASA Centers at TU, Dr. Khan.
- Bridge Program to place students on the University of Alabama (UA) Lunabotics and USLI teams at SSCC, Ms. Randle and Dr. Baker.
- Engineering Day at SSCC (April 18, 2013), Ms. Randle.
- TU instructors attended our "How to Build and Sustain Student Hardware Organizations" student conference at UAH on Feb. 7-9, 2013.

- **NASA Education Priorities:**

- *Authentic, hands-on student experiences in science and engineering disciplines – the incorporation of active participation by students in hands-on learning or practice with experiences rooted in NASA-related, STEM-focused questions and issues; the incorporation of real-life problem-solving and needs as the context for activities* – ASGC provided support to 6 interns as participants in a hands-on experience at NASA Centers in FY2012. All of our REU programs and SSPs the ASGC supported in FY2012 are authentic hands-on student experiences in STEM fields. Additionally, the ASGC worked with its members and affiliated to submit two proposals for the NASA Space Grant Innovative Pilot in STEM Education in both categories in December 2012. The proposal from the lead institution, UAH, was entitled “Space Grant Innovative Pilot in STEM Education: Focus on Retention, Alabama Space Hardware Academy”. We proposed for a program at Alabama’s Space Grant universities to recruit and retain a diverse group of students in STEM faculties. We planned to recruit them in their early years and engage them in practical experiences building space hardware at NASA and at our universities. We planned to provide them with support and mentoring in three areas: from their peers, from specialists in study and life management areas, and also in technical areas related to their projects. To do this we shall not invent new programs and processes, but use and adapt existing models that have demonstrated effectiveness over several years at NASA and at our Space Grant institutions. Our objective was to bring together, in an adaptive way, several proven training systems to stimulate and reward enthusiasm for STEM study in a targeted group of young people. A second objective was to demonstrate, with objective data, that this approach is effective, sustainable and easily exported to other states or educational locations. The other proposal was targeted at effective K-12 STEM Teacher Education.
- *Diversity of institutions, faculty, and student participants (gender, underrepresented, underserved)* - The ASGC currently has 2 universities, Alabama A&M University (AAMU) and Tuskegee University (TU) and 1 community college, Shelton State (SSCC) designated as Minority Serving Institutions that we supported in FY2012. Both AAMU and TU are federally recognized as Historically Black Colleges and Universities (HBCUs). ASGC’s Associate Director, Dr. Teresa Merriweather Orok, is from AAMU along with our Campus Director, Dr. V. Trent Montgomery. Our Campus Director, Dr. Gregory Murphy, represents TU. AAMU is a charter affiliate member of the ASGC and TU became an affiliate member of the ASGC in 2003. Both of these universities

are research, Ph.D.-granting institutions. The Campus Director for SSCC is Ms. Renea Randle. Both AAMU and TU have members on the ASGC's Policy Advisory Council. ASGC's collaborative interactions and programs with diversity of institutions, faculty and student participants include:

- Fellowship and Scholarship programs at AAMU (7 students - 1 fellow, 6 scholars) and TU 6 students – 1 fellow, 5 scholars). A new fellowship program was created at TU in FY2012. Fellowship awardee, Mr. Chinedu Okoro, is a Master's student in Materials Science Engineering.
 - Sounding BalloonSat program at AAMU, Dr. Montgomery and Dr. Massey.
 - Moonbuggy Program at AAMU, Dr. Mobasher.
 - High powered rocketry program (USLI) at AAMU, Dr. Seif.
 - Geoscience and remote sensing workshop at AAMU, Dr. Heidary.
 - CubeSat Program (development phase) at TU, Dr. Khan.
 - Faculty travel support to NASA Centers at TU, Dr. Khan.
 - Bridge Program to place students on the University of Alabama (UA) Lunabotics and USLI teams at SSCC, Ms. Randle and Dr. Baker.
 - Engineering Day at SSCC (April 18, 2013), Ms. Randle.
 - TU instructors attended our "How to Build and Sustain Student Hardware Organizations" student conference at UAH.
 - ARISS Program included underrepresented and underserved middle school students and educators from Ed White Middle School in Huntsville, AL.
 - Outreach Program at Title 1 School set up to target unrepresented and underserved students at Brookhaven Middle School in Decatur, AL.
- *Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. Capabilities for teachers to provide authentic, hands-on middle school student experiences in science and engineering disciplines - We are continuing our work with the UAH Institute for Science Education and the Alabama Mathematics, Science, Technology and Engineering Coalition for Education to provide new BalloonSat opportunities for Middle School Students and K-12 educators. Middle school students will be provided with an exciting introduction into the engineering process in the aerospace world of 'design, build, fly and evaluate.' The classroom curriculum will track the BalloonSat experience and the intention is to use this project as a pilot for a feeder-system into the established Alabama Engineering Academy Initiative in area high schools. This opportunity will target schools having high minority participation and they hope to see increased SAT scores in physical science.*
- *Community Colleges – ASGC continues to support *Students Building Space Hardware Programs, or SSPs* at community colleges. Beville State (BSCC) and Shelton State (SSCC), a minority serving institution, both have SSPs and we are currently working with Gadsden State Community College (GSCC) on developing a new SSP and to support them with their NASA's Reduced Gravity Student Flight Opportunities Program (Microgravity University) in collaboration with the Jet Propulsion Lab (JPL). Their team was selected to participate in a new partnership with the ISS National Lab. GSCC also has expressed interest in starting a new American Institute of Aeronautics and Astronautics (AIAA)*

student chapter on their campus. The ASGC Assistant Director, members of the UAH Space Hardware Club, and members from AIAA plan to visit GSCC to help forge new relationships in FY2013. ASGC programs that develop new relationships and sustain existing relationships with community colleges include:

- Bridge Program to place students on the University of Alabama (UA) Lunabotics and USLI teams at SSCC which measurably increases the participation between community college students and universities, Ms. Renea Randle and Dr. John Baker
- Engineering Day at SSCC (April 18, 2013), Ms. Renea Randle
- Moonbuggy Program at BSCC, Ms. Maurice Ingle
- Microgravity University at GSCC, Ms. Audrey Webb
- GSCC instructors and students attended our "How to Build and Sustain Student Hardware Organizations" student conference at UAH on Feb. 7-9, 2013.

IMPROVEMENTS MADE IN THE PAST YEAR

- Fellowship Program Created at MSI - ASGC created a new fellowship program at Tuskegee University, an MSI and HBCU, in FY2012. Fellowship awardee, Mr. Chinedu Okoro, is a Master's student in Materials Science Engineering and is the first ASGC supported fellow from TU.
- Increased Engagement with Community Colleges - ASGC continues to support *Students Building Space Hardware Programs, or SSPs* at community colleges. Bevill State (BSCC) and Shelton State (SSCC), a minority serving institution, both have SSPs and we are currently working with Gadsden State Community College (GSCC) on developing a new SSP and to support them with their NASA's Reduced Gravity Student Flight Opportunities Program (Microgravity University) in collaboration with the Jet Propulsion Lab (JPL). GSCC also has expressed interest in starting a new American Institute of Aeronautics and Astronautics (AIAA) student chapter on their campus. The ASGC Assistant Director, members of the UAH Space Hardware Club, and members from AIAA plan to visit GSCC to help forge new relationships in FY2013. Additionally, GSCC instructors and students attended our "How to Build and Sustain Student Hardware Organizations" student conference at UAH on Feb. 7-9, 2013.
- New Industrial Partnership Funding and Relationships - ASGC received new direct industry funding from ATK Aerospace Group Manager, Mr. Gordon Russell, as a result of our participation with NASA MSFC's Student Launch Programs. ASGC also created new relationships with the Space Systems Division at Teledyne Brown Engineering. We have newly established contacts with the Vice President for Space Systems, Dr. John M. Horack, Mr. Dan Jett, Senior Systems Integration Engineer, and with Ms. Chrystal Morgan, Communications and Business Development Manager.
- Created LinkedIn Social Media Site – ASGC joined LinkedIn, the social media site, in an effort to assist the ASGC with its longitudinal tracking processes and to become more engaged with other professional networks, students, faculty and other professionals in the aerospace community. LinkedIn is an extremely helpful tool in

finding current and past student career paths. We encourage all of our students to “join” our ASGC LinkedIn page as well as “like” our ASGC Facebook page.

- New Space Grant Leadership Role – ASGC Director was voted in as ‘Vice Chair’ of the National Space Grant Alliance in FY2011 and became ‘Chair’ in FY2012. This allows for the Director to seek out ways to develop mutually beneficial relationships among private sector organizations, government agencies, colleges and universities and within the Alliance’s membership.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

The ASGC collaborates with many institutions across the state in the execution of its programs. We have a closely-knit management team consisting of the campus directors of all the 7 Research Universities across the state (2 of which are HBCU's), the CEO of the U.S. Space and Rocket Center and the University Affairs Officer at NASA’s MSFC. We call the home institutions of the Management Council "**Members**" of ASGC and all other partners we call "**Affiliates**". The affiliates tend to come and go, that is they may not participate each year; they may come in for a special opportunity. The provision of these affiliate resources, while very real and valuable, does not mean that these partners have any inclination to participate in the management of the overall program, and in fact most simply do not have the time to spend finding out about all the other programs in ASGC. **All our “members”** actively participate in management and are interested in what the other members are doing.

The ASGC currently has 9 members (from Alabama colleges, universities, and community colleges). Diversity for the ASGC affiliate membership includes 2 female members (22%) and 2 underrepresented members (22%). Seven (7) universities (Members) comprise the ASGC Management Team. Diversity for the ASGC Management Team includes 4 female members (33%) and 3 underrepresented members (25%). The ASGC Associate and Assistant Directors are both females. All of our leaders at our Community College affiliates (Bevill State, Shelton State, and Gadsden State) are female.

Affiliate and Management Team Members (7):

- **The University of Alabama in Huntsville** (UAH) – (Public, research, Ph.D. degree granting university). Drs. Gerald R. Karr and Kader Frendi, Professors, Department of Mechanical and Aerospace Engineering serve as the Campus Directors and are Members of the Management Team. UAH is also the **lead institution** located in Huntsville and is an active participating member providing financial and supplementary support as part of the required match. UAH is part of the University of Alabama System. UAH was founded as part of the University of Alabama in 1950 and became an autonomous campus with the UA Systems in 1969. Total enrollment is 7,700, including 1600 graduate students; approximately 50% male, 50% female.
- **Alabama A&M University** (AAMU) – (Public, research, Historically Black, minority serving, Ph.D. degree-granting university). Dr. V. Trent Montgomery, Professor, Department of Electrical Engineering and Computer Science serves as the

Campus Director and is a Member of the Management Team. AAMU is a land-grant institution founded by a former slave, William Hooper Councill. The campus has the unique distinction of being laid out by Frederick Law Olmsted, Sr. designer of New York's Central Park. Total enrollment is 4,285 including 874 graduate students; approximately 48% male, 52% female.

- **Auburn University (AU)** – (Public, research, Ph.D. degree-granting university). Dr. David G. Beale, Professor, Department of Mechanical Engineering serves as the Campus Director and is a Member of the Management Team. Established in 1856 became the first land-grant college in the South in 1873 under the Morrill Act. AU is one of the few universities to carry the torch as a land, sea and space grant university. Total enrollment at AU is 25,134; approximately 51% male, 49% female.
- **The University of Alabama (UA)**. (Public, research, Ph.D. degree-granting university). Dr. John Baker, Professor and Department Head, Department of Aerospace Engineering and Mechanics serves as the Campus Director and is a Member of the Management Team. Founded in 1831 as Alabama's first public college, is one of the top five public flagship universities in the nation in the enrollment of African-American students. For the 2011-2012 academic year, African-Americans represented 12% of the student body. UA has a total enrollment of 33,602; 47% male, 53% female.
- **The University of Alabama at Birmingham (UAB)**. (Public, research, Ph.D. degree-granting university). Dr. Yogesh K. Vohra, Professor and University Scholar, Department of Physics serves as the Campus Director and is a Member of the Management Team. UAB is a world-renowned research university and medical center. Total enrollment is 17,575 including 5,402 graduate students; approximately 42% male, 58% female.
- **University of South Alabama (USA)**. (Public, research, Ph.D. degree-granting university). Dr. John W. Steadman, Professor and Dean, College of Engineering, serves as the Campus Director and is a Member of the Management Team. USA is the only major public institution of higher learning on the upper Gulf Coast and also has a medical center. Total enrollment is 15,000; approximately 44% male, 56% female.
- **Tuskegee University (TU)**. (Private, research, Historically Black, minority serving, Ph.D. degree-granting university). It is an independent and state-related institution of higher education. TU is the only HBCU in the nation to be designated a National Historic Site by the U.S. Congress. Dr. Gregory V. Murphy, Professor and Department Head, Electrical and Computer Engineering, serves as the Campus Director and is a member of the Management Team. Total enrollment is 2,684; approximately 43% male, 57% female.

Minority Serving Institutions (3):

- **Alabama A&M University (AAMU)** and **Tuskegee University (TU)** are Minority

Serving Institutions (as well as HBCUs). **Shelton State Community College** (SSCC) is also an MSI.

Community Colleges (2):

- **Bevill State Community College** (BSCC). (Public, 2-year, associate degree-granting community college). Ms. Maurice Ingle, Instructor, Drafting Design Engineering Technology Department, serves as Campus Director.
- **Shelton State Community College** (SSCC). (Public, 2-year, minority serving institution, associate degree-granting community college). Ms. Renea Randle, Instructor, Mathematics Department, serves as Campus Director.

Government affiliates include the NASA Centers (especially Marshall Space Flight Center (MSFC) who is an ex-officio member of ASGC Management Team, the Alabama Mathematics, Science, Technology and Engineering Coalition for Education (AMSTEC) and the Von Braun Center for Science and Innovation, Inc. (VCSI). All the government affiliate representatives are very involved with the ASGC, attend meetings regularly, and work well with the Director, Assistant Director and other members of the ASGC Management Team. We collaborate with all NASA centers to place student interns and faculty fellows, but due to proximity, we closely have ties with **MSFC**. We partner with them on various projects and programs such as running 2 Advanced Rocketry Workshops that are preparing student teams to participate in the NASA University Student Launch Initiative. We also manage the NASA Academy, the NASA Propulsion Academy and the NASA Robotics Academies during the summer for MSFC. Our contact at MSFC is Dr. Frank Six, University Affairs Officer. **Alabama Mathematics, Science, Technology and Engineering Coalition for Education** (AMSTEC). Non-Profit/State. We partner with AMSTEC on various K-12 educator programs, workshops and summits. AMSTEC works closely with the State Department of Education to improve math and science teaching statewide and to make efforts for systematic change of STEM education. Their mission is to provide all students in Grades K-12 with the knowledge and skills needed for success in the workforce and/or postsecondary studies. Our contact person at AMSTEC is Ms. Brenda Terry, Executive Director. **Von Braun Center for Science and Innovation** (VCSI). Non-Profit/Local. The mission of VCSI is to provide innovative engineering solutions and science applications for NASA, DoD, and other government agencies. Our contact person at VCSI is Mr. Marty Kress, Executive Director.

Industrial partnerships include **The Boeing Company, Dynetics, Inc., Wyle Laboratories, STI Electronics, Inc., ADTRAN, Teledyne Brown Engineering and ATK Aerospace Group**. Several industries allow our students to use their facilities for CubeSat testing and training. ASGC received new industry funding from ATK Aerospace Group as a result of our participation with NASA MSFC's Student Launch Programs. Teledyne Brown Engineering **and High Altitude Research Corporation (HARC)** provided industrial speakers and moderators for our Student Conference on "How to Build and Sustain Space Hardware Organizations". ASGC continues to improve membership in this area and is working with the lead institution to continuously look for additional partnerships that make sense to improve strengthened student

experiences.

Outreach partnerships include the **U.S. Space and Rocket Center** and **Sci-Quest Hands-on Science Center**. We partner with the USSRC and Sci-Quest on various K-12 teacher training and informal education projects. Our contact person at the U.S. Space and Rocket Center is Dr. Deborah Barnhart, Chief Operating Officer. Dr. Barnhart is a member of the ASGC Policy Advisory Council and an ex-officio non-voting member of the ASGC Management Team. Our contact person at Sci-Quest is Ms. Angela Giles, Education Director. ASGC is currently talking with Mel Blake, Director of the **University of North Alabama's (UNA) Planetarium and Observatory** to see if we can form a partnership. The Planetarium and Observatory is operated by the Department of Physics and Earth Science at UNA. We also partnered with NASA JSC, NASA MSFC, the Amateur Radio Relay League, AMSAT, radio clubs worldwide, NASA's Teach From Space, NASA's Aerospace Education Specialist Program in FY2012 for the ARISS outreach program.

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.