CaSGC Affiliate Workforce Development Proposals Awarded

2009-2010 Award Period

1. Azusa Pacific University (Leslie Wickman)
2. CSU Pomona (Don Edberg)
3. Cal Poly San Luis Obispo (William Durgin)
4. Cal Poly San Luis Obispo (Bill Murray)
5. CSU Fresno (Ram Nunna)
6. Cal State Los Angeles (Darrell Guillaume)
7. Cal State Sacramento (Jose Granda)
8. CSU San Bernardino (Tim Usher)
9. Santa Clara University (Chris Kitts)
10. San Diego Supercomputer Center (Ange Mason)
11. UC Davis (Susan Ustin)
12. UC Los Angeles, MAE (Richard Wirz) and IGPP (Vassilis Angelopoulos)
13. UC Santa Barbara (Phil Lubin)
14. University of Southern California (Joe Kunc)
Azusa Pacific University

Project Title: “Aerospace Workforce Development Program”

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Project Summary: The specific elements of our proposed Aerospace Workforce Development Program are as follows:

1) Conduct an on-going series of evening seminars for students and faculty mentors geared toward the exploration of job search strategies, interviewing techniques, and career opportunities.
2) Upgrade and maintain a searchable database of “STEM” internship opportunities with contacts at government agencies, public and private companies, schools, colleges and universities, specifically tailored to the aptitudes and abilities of our Math and Science students.
3) Encourage the participation of under-represented and disadvantaged individuals (including females and minorities) in our programs. We propose to visit at least two schools with underrepresented minorities within the next academic year to promote science and technology. We will expand on our track record of giving science lectures at local schools with large numbers of minority students (e.g., Ontario Center Elementary School in Rancho Cucamonga). With this additional funding we will be able to take some APU education students with us to other schools to train them in working with primary and secondary students. We also plan to invest a modest amount of funds to develop some science demonstrations on topics such as climate and weather.
4) With student involvement, design, develop and maintain a set of visually engaging (possibly interactive) science displays for our new science building to attract the interest of new students and visitors to the sciences.
5) Work with APU’s School of Education as well as the Western Science Education Consortium in developing partnerships to help train future science teachers and involve student teachers in our science training and research programs.
6) Fund student internships/scholarships to work with a mentor on any of several aerospace-related research projects.
CSU Pomona

Project Title: “Aerospace Vehicle Flight Test Laboratory Operations for Workforce Development”

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Abstract: Through this program, California State Polytechnic University Pomona (Cal Poly Pomona, or CPP) proposes to extend its current Uninhabited Aerospace Vehicle Laboratory (UAV Lab) program in order to expand our workforce development programs involving education, research, hands-on training and outreach activities. This program will be conducted in CPP facilities on campus except for student-run flight-testing operations at suitable off-site locations. The program will benefit engineering students at CPP and eventually regional K-12 schools. Funds from this award will go to student interns in developing flight testing capabilities and peer advising, as well as continuing to adapt our existing UAV Lab operations in order to support these workforce development activities.
Cal Poly San Luis Obispo #1

Project Title: “Support for the Cal Poly e-Plane Project”

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Abstract: Cal Poly has undertaken the design and development of an aircraft that can achieve very high “mileage” in terms of range achieved for specific energy consumption. Preliminary analyses indicate that an electric propulsion system provides significant advantages but presents challenges with regard to integration into the aerodynamic and airframe configurations. This project addresses the systems design challenge by utilizing an interdisciplinary team approach. The project will be conducted as the senior project for approximately six students drawn from aerospace engineering, mechanical engineering, electrical engineering, and computer science. The project will be under the guidance of faculty members from these disciplines and will be guided on a day to day basis by a graduate assistant who will utilize the project as the master’s thesis project.
Cal Poly San Luis Obispo #2

Project Title: “Design, Construction, and Flight Test of a Hybrid Rocket with a Cooled Aerospike Nozzle”

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Summary: We anticipate that our hybrid rocket motor for conducting flight research on aerospike nozzles will use an inert gas for pressurization of the supply N₂O to operate the rocket motor at a chamber pressure of 650 psi and to generate a thrust of 1200 lbf. To attempt to go from our current laboratory-scale rocket motor directly to the design and testing of that motor would be a mistake. Accordingly, this request seeks support only for our next incremental step: to design, build, and static fire an N₂O-HTPB hybrid rocket motor of intermediate size — chamber pressure of 450 - 500 psi with a thrust of 600 - 700 lbf. This rocket motor will be significantly larger than we can accommodate safely in our test cell, and therefore will be tested outdoors on our recently completed, instrumented launch trailer that also serves as a static test stand. The rocket motor will employ a conventional converging-diverging nozzle. Under the supervision of Profs. Murray, Mello, and Lemieux, this project would be carried out by an ME senior project team of three to four students and by one graduate student, whose thesis research topic is advanced fuel grain design. In the year-long senior project, the undergraduate senior project team would design and build the rocket motor, integrate a portable data acquisition system into the launch trailer that will be used for the static motor test, and conduct one or more static-fire tests of the rocket motor. The MS student would design and build the fuel grains and analyze the results of the overall system as part of his/her thesis research. This work would accomplish the next logical step in getting our rocket motors and advanced nozzles out of the lab and into the air. In addition, data from the static-fire test of this motor will be used as a case study in our graduate-level course in advanced thermodynamics.
CSU Fresno

Project Title: “Workforce Development in Mechatronics”

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Summary: The Lyles College of Engineering (LCOE) at California State University, Fresno (Fresno State) requests support for students and faculty associated with two multi-disciplinary workforce development projects in mechatronics currently in progress:

1. The Unmanned Aerial Vehicle Project

The operational goals for Phase II include upgrading the UAV to fly along a preprogrammed flight path using waypoints and tracking targets autonomously, and the upgrading of the realtime video streaming of laser’s, pilot’s view, and Google maps overlay. Data and video would be sent back to a base station. New students are being recruited for the second phase as some students have graduated and moved on to permanent jobs.

2. The Lowell Neighborhood Project Fresno State is partnering with the City of Fresno and numerous community based organizations to help revitalize the Lowell neighborhood in Fresno. The Lowell community is an ‘extreme poverty neighborhood’ with almost 50% of its residents living below the poverty line. In this proposal, we are seeking funds to support activities that we will engage directly with the Lowell Elementary School teachers and students. The primary objective is to motivate Lowell Elementary students to aspire for a possible career in STEM fields. The planned activities for 2010 are: a. Professional development for two Lowell Elementary teachers in Lego NXT Robotics and Fundamentals of Engineering. b. Assisting Lowell Elementary teachers in the development of and management of a junior engineering / robotics club at Lowell Elementary. c. Providing Lowell Elementary teachers with age/grade appropriate learning modules that illustrate principles of engineering. d. To help form and mentor Lowell Elementary student teams who will participate for the first time in the Central California Lego Robotics Tournament. LCOE students, faculty and staff will be involved in these activities which will be coordinated by the Pathways: Student Services Program in LCOE.
Cal State Los Angeles

Project Title: “Scholarship for Socio-economically Disadvantaged Students for STEM Collaborative Learning Development and Information Dissemination”

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Summary: The NASA SPACE Center at California State University, Los Angeles, seeks seed funding for student scholarship through the California Space Grant Consortium (CaSGC) Aerospace Workforce Development Program. The proposed work, if funded, will support two graduate socioeconomically disadvantaged students who are both U.S. citizens to conduct research in the SPACE Center. The designated research areas include vibration induced during combustion and uninhabited air vehicles (UAVs).

In the proposed program, the training of the students will be conducted mainly under the technical supports from the Structures, Propulsion And Control Engineering (SPACE) Center. The SPACE Center is a NASA sponsored University Research Center (URC) since 2003. For the past six years, the SPACE URC focuses on research related to NASA’s current and future missions. The URC has also created extensive collaboration with other universities, community colleges, high schools, NASA centers, and leading aerospace industrial partners including the Boeing Company and the Northrop Grumman Corporation.

The participating students will be sponsored through this program to focus on the research related to the focuses of their graduate program (i.e. Master of Science in Mechanical Engineering). The SPACE Center Co-PIs will serve as the faculty advisors for the students. The students will benefit from the research facilities provided and be given the exposure of technical knowledge and skills required for the research. They will be working in an environment to promote their engagement of teamwork and development of leadership. The proposers will guide the students to report their research outcomes as needed by the CaSGC. The students’ research work will also be published to conferences or journals.
Cal State Sacramento

Project Title: “CSUS Mentored Projects in Space Exploration and Aeronautics”

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Summary: We have the following objectives for this proposal.

- Development of an Unmanned Aerial Vehicle as a senior project being built from scratch by students. This past year, this project attracted the support of Composite Engineering, a contractor for the Air Force. The university has begun working together with Beale Air Force Base in their unmanned aerial vehicle.

- Continue the development of the three dimensional Computer Models and Simulation of the International Space Station to par its completion in 2010. Support from the Space Grant allowed two graduate students complete their computer models of the STS-124 and STS-132 missions. It also supported another project for the study of the rescue mission of STS-400, a contingency plan for STS-125 mission to the Hubble Telescope.

-- Initiate a project using modeling and simulation of time dependent motion of space payloads can change the Space Shuttle attitude with no additional fuel. These projects are being conducted in collaboration with engineers in the Guidance, Design Analysis Branch at the Johnson Space Center.

- Expansion of these projects to motivate students in SHEPE (Society of Hispanic Professional Engineers) in order to incorporate Hispanic engineers to the workforce.

- Research on the causes of low enrolment of minorities in aerospace careers. Work closely with space grant and with our students to discover what we can do to improve the participation of Hispanic students in aerospace careers.
CSU San Bernardino

Project Title: “STEM workforce development at an HSI”

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Summary: The primary goal of this proposal is to increase the number of U.S. students, including underrepresented minorities, that earn science, technology, engineering, and math (STEM) degrees. This will be accomplished, in part, by providing financial support for students in ongoing interdisciplinary research at CSUSB. The research opportunities span the disciplines of physics and chemistry. Primary funding for the project is provided through a grant from the CSUSB Leonard Transportation Center. The funds requested in this proposal will leverage these existing resources.
Abstract: – Santa Clara University’s Robotic Systems Lab proposes to develop a low-cost network of automated, receive-only, amateur radio beacon stations for use in monitoring NASA and University-class small spacecraft. The work to be performed will extend Santa Clara’s existing satellite operations system and will capitalize on successful station prototyping efforts in order to field several operationally-ready stations at multiple geographically distributed locations. SCU has both external NASA funds as well as internal university/lab funds to support equipment acquisition, travel, facilities costs, and other costs; CaSGC funds will be used to support student interns in the development and use of this network. Once operational, the network will be used to support multiple small spacecraft missions to include control of the NASA GeneSat-1, PharmaSat, O/OREOS and NanoSail-D spacecraft as well as the IRIS university-class spacecraft. In executing this project, outstanding workforce training and student education opportunities will be provided with respect to systems engineering and design, system operation, engineering analysis/development/test, etc. Because the communication stations will be used to support NASA missions, student experiences will be enhanced through professional mentoring relationships with leading engineers and scientists in government and industry.
San Diego Supercomputer Center

Project Title: “2009 Aerospace Workforce Development Program”

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Summary: We propose to offer an intensive one-week TeacherTECH Science Series workshop in the summer of 2010 for middle and high school educators in San Diego County focused on astronomy and space science. The workshop will involve a collaboration with Grossmont College in the presentation of hands-on, standards based astronomy and space science curriculum and lesson plans for the classroom. Also, included will be the presentation of cutting edge data and space science visualizations created by SDSC researchers. Teachers will be shown how to access these visualizations and how to incorporate them into their classroom lessons. There will also be a workshop segment that focuses on easily accessible, but little known online educational resources that can help teachers transform how space science is taught in the classroom- a great benefit for students who excel with visual learning. A sampling of such resources would include the Sloan Digital Sky Survey the National Virtual Observatory and the CaSGC’s MarsQuest Online program. Finally, the workshop will involve an instructor within San Diego Unified School District who is immersed in NASA education programs, fully understanding its mission and vision, and whose passion for space science will also help teachers to see what is possible in teaching space science within the boundaries of the California state standards.
UC Davis

Project Title: “Workforce Development Program in Online Web-based Aerospace Education and Outreach”

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Project Summary: New avenues for workforce education and retraining are needed to reduce chronic un/under/employment in California and to provide access to advanced training in technical fields. Among areas of projected job growth over the next decade are geospatial technologies – GIS, remote sensing and GPS. However, there is little access to technical training in rural California, where unemployment is 4% to 18% above the state average of 12.3% (October 2009). UC Davis has initiated development of an interactive self-pacing remote sensing tutorial leading to certificates in remote sensing image analysis for environmental applications. The web design and initial development on the tutorials were completed in 2009, including partial completion of an initial 11 unit baseline tutorial, with hands-on GIS and remote sensing modules and data. We would like support to continue expansion of these modules to complete the baseline job-entry course and start development of the intermediate level course. Funding will be used to support student interns to develop the web materials and test the modules.
UC Los Angeles (MAE and IGPP)

Project Title: “Workforce Development on CubeSats with High Science Return”

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Project Summary

This proposal requests funding for workforce development of students in two UCLA departments, MAE and ESS, in the areas of spacecraft development and space physics instrumentation. The proposal benefits significantly from existing non-NASA resources at IGPP, specifically internal funding for development of new instrumentation capabilities and CubeSats, as well as the recent arrival of Prof. Richard Wirz at MAE with experience in flight projects from JPL. Recently the PI and Co-I agreed to collaborate on teaching of two parallel courses on mission design (taught in MAE) and on instrumentation (taught in ESS), as well as on CubeSat development. The specific project at hand, called "ELFIN", for "EElectron and Fields Investigation" involves the development and launch of a microsatellite to conduct measurements of particle precipitation in the ionosphere from Earth's radiation belts. MAE and ESS students are currently contributing small amounts of time - out or interest - on spacecraft and instrument development. This proposal requests funding for a more substantial student participation in this development effort.
UC Santa Barbara

Project Title: “Adaptive Optical Systems for Space Applications”

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Abstract – We propose a multi-disciplinary approach with students from the Physics and Engineering Departments of UCSB and Santa Barbara City College (SBCC) to develop an adaptable optical system using servoed actuators with a laser interferometer feedback system. The Las Cumbres Observatory will donate significant amounts of machining time in a 4 and 5 axis CNC and ATK, an aerospace company in Santa Barbara will allow us to test with their metrology system. Students will work as a team on this program which will involve the design and finite element analysis of the optical system (a 10 meter telescope) using ALGOR and COSMOS FEA packages, learn 3D CAD design using Solidworks and AutoCAD, learn 3-5 axis CNC machining design using MasterCAM, learn on the UCSB student CNC machines and then with the CNC operators at LCO, learn servo system design and electronic servo amplifier design and implement a closed loop servo software loop with a laser interferometer as the feedback sensor. As part of the UCSB Mechanical Engineering senior design program there will be a team of 5 seniors working again this year with us. These students work for 9 months on a program known as the Capstone program. These UCSB ME students will work with the Physics undergrads as well as the SBCC students. We have tried this approach for several years and it has worked very well. Students meet weekly in formal sessions and have two critical design reviews and one final review, a final full day presentation and poster competition. By combining students at UCSB and SBCC we will forge new alliances that will encourage cross fertilization of ideas and personnel. We will also have the ability to reach greater numbers of underrepresented minorities by teaming with SBCC. Through participation with professional industry in town we will give student access to potential future jobs and professional experience.
University of Southern California

Project Title: “Astronautical Engineering Undergraduate Programs at the University of Southern California”

***PI: Joseph A. Kunc***
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**Summary:** Five fellowships from CaSGC will be distributed to students working in the USC Lunar Lander, Microsatellite, and Rocket Laboratories in a highly competitive way based on students performance in class-based courses, laboratories, and through personal interviews with the Astronautical Engineering faculty and industrial experts working on the projects.

CaSGS support will be matched by already promised financial support from the USC Provost Undergraduate Fund, Rose Hills and Lord Foundations, Boeing and Northrop Grumman Corporations.