

Dryden Flight Research Center (DFRC)
FY2010 Visitor Center Performance Report
Cooperative Agreement Number NNX10AI62A
AERO INSTITUTE
Period of Performance March 24, 2010 to March 23, 2013
Title: Education, Research and Operations
Proposal Award Amount \$444,025
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PROJECT DESCRIPTION

The Dryden Flight Research Center (DFRC) is NASA's primary center for atmospheric flight research and operations. Located at Edwards, California, in the western Mojave Desert, Dryden is uniquely situated to take advantage of the excellent year-round flying weather, remote location, and good visibility to test some of the nation's most exciting air vehicles. Dryden plays a vital role in advancing technology and science through flight.

The Dryden Education team oversees all of Southern California and Arizona. Therefore, in addition to the development of STEM-stimulating exhibits established for the Dryden Visitor Center (VC), we take into consideration that development of educational activities is not restricted to a single location. All educational tools that we purchase must be mobile, either to be utilized in an educational setting by Education staff or to be available for educator use when needed to enhance education programs.

The NASA DFRC operates two visitor centers. The on-site NASA DFRC Visitor Center is located at the center's compound on Edwards Air Force Base; it is managed by the Dryden Public Affairs group and emphasizes historical NASA projects and current Dryden technologies. In FY 2011 we will be adding additional educational components, including a Magic Planet. The off-site Visitor Center is located at the Palmdale, CA, Aerospace, Education, Research, and Operations (AERO) Institute. It is referred to as the Aerospace Exploration Gallery (AEG) and is managed by the Informal Education group. The AEG reflects a greater emphasis on education than the on-site Visitor Center, while including some historical components.

The NASA DFRC Informal Ed group collaborated with the DFRC Exhibits Office, Speaker's Bureau, and non-profit AERO Institute to develop NASA-related STEM educational activities, exhibits, events, and materials that address one or more of the NASA Education Outcomes and align with NASA Education principles.

The general public recognizes the on-site DFRC Visitor Center as the primary Visitor Center; however, the off-site VC located at the AERO Institute offers a more accessible location for learning about NASA and engaging students in hands-on STEM activities.

PROJECT GOALS

1. Update or support NASA ERC and Visitor Center
2. Support NASA-wide activities: final shuttle flights, shuttle transition, Summer of Innovation and Univision
3. Collaboration among NASA center-VC partnerships
4. International Space Station activities
5. Support high-profile NASA events: Hubble anniversary, Lunar Reconnaissance Orbiter launch, climate change, Exploration's robotic and human Next-Generation, Mars science lab
6. Sustain and expand existing partnerships
7. Collaboration to create NASA-wide Visitor Center learning network and exhibit standards

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

Outcome 2 and 3; Items were used to simulate various meteorites found on the moon, helping students correlate how scientists categorize and name meteorites. The project expects to increase the percentage of elementary and secondary educators using NASA content-based STEM resources in the classroom; increase the percentage of both formal and informal educators who participate in NASA training programs and activities; increase student participation in NASA activities; increase student participation in the STEM employment pipeline.

PROJECT ACCOMPLISHMENTS

1. NASA ERC AND VISITOR CENTER UPDATE

The Dryden Educator Resource Center and off-site Visitor Center (the AEG) were rededicated during a May 19, 2010, ribbon-cutting ceremony. Local formal and informal educators were invited to attend. Approximately 100 guests were in attendance, including Andre Hollings, field representative for U.S. Rep. Howard P. "Buck" McKeon; Palmdale City Manager Steve Williams; Josh Mann, Executive Director of the Antelope Valley Board of Trade; Palmdale Mayor Jim Ledford; Susan Miller, AERO Institute Executive Director; and Chamber of Commerce representatives from cities throughout the Antelope Valley.

The ERC offers a monthly professional development workshop to both informal and formal educators. Open Monday through Friday from 8 a.m. to 4:30 p.m., the ERC is

where educators may obtain education materials on a variety of topics. During FY2010, 23 workshops were presented with 219 educators and 316 students in attendance.

The Dryden Aerospace Exploration Gallery is open on Tuesdays and the first Saturday of each month from 10 a.m. to 3:00 p.m. On other days, it provides a location for scheduled workshops and tours by local informal and formal groups. Interactive exhibits such as the stargazer and the Magic Planet have been established at the AEG. Newly developed signage for all exhibits and video clips with supporting historical information have been made available on iPods, allowing for independent self-tours. Through coordination with the Jet Propulsion Laboratory, a Mars model on loan is on exhibit and is partnered with Dryden's local robotics program.

During Thursday evenings from July through August, the AEG was open to the general public during the City of Palmdale weekly Thursday Nights on the Square (TNOTS) events. The AEG was staffed with well-versed Dryden historians and public affairs personnel able to share the center's history and current NASA information. Dryden employees spoke on various topics from careers to X-planes.

Two staff members were funded in FY10 via the Visitor Center initiative; one assisted with educational activities in the DFRC Visitor Center and the other staffed the ERC. These staff members also lent support to 2010 Summer of Innovation activities.

2. SUPPORT FOR NASA-WIDE ACTIVITIES

Shuttle Transition – On April 20, 2010, more than 100 people turned out to be part of a space shuttle First Flight commemoration at Joe Davies Heritage Airpark in Palmdale. DFRC Education personnel were key supporters of the event. In addition to support lent to various activities, the DFRC Education staff wore flight suits and shuttle suits that are a part of the Visitor Center educational toolbox, to showcase various shuttle mission-support positions. Air Force Plant 42, Site 1, is the "home" of all six shuttles. For many years, Site 1 was the shuttles' maintenance site.

A shuttle exhibit has been developed in the AEG with signage explaining orbiter components. The exhibit contains a shuttle tire, tile, model, simulator, and historical data. Also, historical shuttle video clips are available on DVD or on VC iPods. During one TNOTS evening, the DFRC shuttle manager provided insight on Dryden's role in the shuttle program, NASA's direction in regard to the program, and Dryden's continued support of the International Space Station. He also brought many other personally owned models and documents. An informal educational activity was developed for students that provided their ticket to landing the shuttle on the simulator in the AEG.

Summer of Innovation – The VC was a key component of the successful implementation of Summer of Innovation activities at DFRC. TNOTS activities were designed to stimulate interest in STEM disciplines among the entire family. Families were encouraged to attend educational workshops presented in the ERC. They were asked to attend at least 4 of 8 workshops held over the course of 8 weeks. Each week, a locally developed passport booklet was stamped to reflect attendance. Upon completion, a small ceremony was held to celebrate their accomplishment. DFRC historian and author Peter Merlin gave a featured talk on X-planes. At the culminating event, families were photographed with the NASA logo, honored with a Summer of Innovation certificate, and given a NASA bag containing educational materials. The 18 families who completed the program smiled proudly when receiving the NASA materials.

A 40-hour robotics workshop was conducted for 38 local middle school students. The morning portion of the workshop included educational activities such as one presentation highlighting aeronautics, another by the DFRC Distance Learning Network coordinator, and usage of the Discovery Dome. Afternoons were devoted to building robots. At the end of the week parents and members of the community came to view the robots in a competition. These students were then participants in a Dryden Summer of Innovation culminating event at DFRC. At the event, DFRC pilots and crew chiefs demonstrated from beginning to end the process of a flight project.

At the ERC, 16 local students participated in a weeklong program on the topic of aeronautics. The workshop, part of Summer of Innovation activity, was titled the Bohn-Meyer Math and Science Odyssey-Summer Event. It encompassed design challenges and illuminated the engineering design process as a means of helping students understand the importance of STEM disciplines and how various engineers work together on projects to complete a successful product. Students were exposed to various career options by Dryden engineers and project managers and others working in STEM fields. They were also taken on a tour of Dryden that highlighted the important role Dryden plays in aeronautics and center accomplishments past and present as well as those planned for the future.

3. COLLABORATION AMONG NASA CENTERS

Through a partnership between Dryden and Ames Research Center with the AERO Institute additional opportunities for collaboration among centers have been identified. The Dryden Discovery Dome was utilized and staffed at the April Yuri Science Night at Ames. The videos “Dawn of the Space Age” and “Earth’s Wild Ride” were presented to an audience of 420.

4. INTERNATIONAL SPACE STATION

With the close of the space shuttle program looming, the VC has shifted focus to the International Space Station. Workshops focused on the station have been conducted and packets and giveaways distributed to educators and VC attendees. Additional activities will be developed in FY2011 for broader emphasis.

5. NASA HIGH-PROFILE EVENTS

Lunar Reconnaissance Orbiter launch, Exploration's robotic and human Next-Generation, Mars science lab – In collaboration with Ames Research Center, local high school robotics students met at the AEG to complete “missions” attempting to navigate a robot from Southern California that was located at Ames, in Northern California. They were provided specific parameters and required to document their lessons. Students were able to glean the significance of robots on Mars and how mathematics and science play a significant role in completing a daunting mission between Earth and Mars.

The ERC promoted NASA's LRO/LCROSS mission through a collaborative online educator workshop with the regional ERC in Prescott, Ariz., held at Embry-Riddle University and titled *On the Moon with NASA*. The workshop, held October 10, 2009, involved 30 educators from around the U.S. and was promoted from within the ERCN (Educator Resource Center Network). It highlighted the new Constellation program along with NASA's LRO/LCROSS mission to find water on the moon that would facilitate a lunar return and exploration beyond.

NASA's Robotics and Next-Generation activity was promoted in the ERC through workshops on April 22 and September 9, 2010. The events were designed around an STS-131 robotics kit and mission objectives for the launch. Fourteen educators participating in the workshops are now able to check out the robotics kit for their classroom or their own workshop events after attending the training. The workshop highlighted NASA's work to advance the STS-131 mission using robotics such as Robonaut.

Climate Change – Various ERC workshops promoted the study of climate change. The first workshop was held February 17, 2010, and attended by six educators. The workshop highlighted the usage of S'COOL, a web-based program about climate change which promotes understanding of the important role played by students in data collection for NASA. The second workshop promoted Sun-Earth Day. It was held on March 27, 2010, and attended by six educators. The workshop theme for Sun-Earth Day focused on magnetic storms and the connections among our sun, the Earth, other planets, and the galaxies in relation to Earth's climate. The third workshop was for the

YELC (Youth Environmental Leadership Conference). The workshop was held twice for educators, on April 10 and 17, 2010. Twenty-seven educators attended. The workshop highlighted NASA resources and the projects through which NASA is contributing to the study of global climate change.

Hubble – The AEG contains an exhibit on astronomy that showcases the Hubble telescope. It features a model and large pictures taken via the Hubble provided by the agency’s Hubble group. Visitors to the AEG are amazed by the clarity and beauty of the images captured by the telescope.

6. SUSTAIN AND EXPAND EXISTING PARTNERS

The AERO Institute continues to provide collaborative efforts aimed at increasing student interest in STEM disciplines and professional development for educators. During the summer of 2010 an intern was hired under the VC initiative to begin assessing project parameters for a new library initiative. This initiative is to set to launch in FY2011 and will establish a more formalized partnership between NASA Dryden and libraries throughout Southern California and Arizona. The Dryden ERC will work with librarians to provide them with up-to-date materials corresponding to current NASA events such as launch of STS-133 and to keep them apprised of educator workshops – some of which will take place in the libraries – to provide access for educators to NASA materials and educator kits. VC funds were used toward this initiative, to support implementation.

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Element 3.2.4 Informal Education	
VC-Educator Outreach	
Year 1 Category 3 staff member FT	126,373.00
Year 2 Category 3 staff member FT	
VC-Informal Education	
Year 1 Category 3 staff member FT	126,373.00
Year 2 Category 3 staff member FT	
VC-Education Museum/Design	87,368.00
VC-Exhibit Design and Development	93,441.00
VC-Interns	20,470.00
Robotics	20,001.00

On-site visits to local Southern California museums were made both as part of formalizing partnerships aimed at engaging museums in the Dryden VC and to ascertain whether there is an opportunity for students to learn more about them and incorporate

museums into Summer of Innovation activities. These visits provide innovative ideas for interactive exhibits at the Dryden VC.

The Scouts of America organization has had a long-standing partnership with DFRC. In FY2010, as a result of the Visitor Center initiative, the local Girl Scout organization has been able to award badges via workshops presented by VC support staff and scout leaders also are offered professional-development opportunities. In FY10 there were 18 workshops presented to 517 scouts and 30 scout leaders. We continue to sustain and expand our relationship with both Girl Scout and Boy Scouts. Badge workshops presented include: Brownie Movers Try-It Badge, Juniors Aerospace Badge, and Older Girls' Space Explorer IP Badge.

7. COLLABORATION TO CREATE NASA-WIDE VISITOR CENTER LEARNING NETWORK AND EXHIBIT STANDARDS

Planetarium Dome – The Dome was purchased with VC funds and has proven to be a very valuable tool that reaches a large number of students. Its portability allows for VC staff to offer workshops either at the Education office or at external educational venues. In FY10 there were 133 Dome usages reaching 5,535 students, 283 educators, and 912 members of the general public. In FY2011 we are planning to develop a professional-development workshop for educators focused on the Dome so they may evaluate it for classroom usage.

Plans to Expand Scope of AEG

Because VC funds have allowed the AEG to be organized in a more engaging atmosphere, it has become more appealing to all age groups. Plans call for the AEG to be utilized to showcase all NASA mission directorates, highlighting Dryden's accomplishments and current technology while integrating educational activities to each.

- **Exploration System Management Directorate** – Initially was going to showcase the Orion; not sure of its status at this time.
- **Science Mission Directorate** – The SOFIA (Stratospheric Observatory for Infrared Astronomy) airborne observatory provides astronomers with an unprecedented infrared window on the universe. The DFRC VC showcases a model of the SOFIA along with a kiosk explaining infrared technology. Pictures of the DFRC Airborne Science program platforms are showcased in the AEG, including the DC-8, ER-2, and Global Hawk aircraft. A stargazer exhibit was developed that shows the various constellations that appeared in the sky on July 20, 1969. An astronomy corner was developed in the AEG to showcase the Dryden SOFIA project, Hubble, and these constellations. A San Diego State University student funded through the VC budget

developed a booklet explaining the constellations to encourage learning through the exhibit. The Magic Planet provides a globe on which visitors may visualize Earth's climatological features, such as hurricanes.

- **Space Operations Mission Directorate** - The Dryden Exhibits office assisted in development of a shuttle exhibit that includes three stand-up panels explaining the complementary aeronautics technology developed at Dryden for the shuttle and the role that Dryden has played in the shuttle program. A shuttle tire, tile, model, and simulator are also featured. The exhibit is popular with all ages. In FY2011 the exhibit will be expanded to showcase the International Space Station.
- **Aeronautics Research Mission Directorate** – Because the basic DFRC mission is that of aeronautics, the exhibit for this area will be changed regularly to showcase current technologies being developed while continuing to provide historical information. One exhibit showcases the center's origins as part of the NACA, with a female mannequin sitting at an antiquated keyboard machine capturing flight data. A Harrier cockpit provides a great photo opportunity for all age groups. A Dryden pilot painted clouds on the staircase leading to the cockpit. Throughout the AEG various aircraft and airfoils are showcased. A functional model wind tunnel has been added that allows students to test fully developed airplane models.

PROJECT CONTRIBUTIONS TO PART MEASURES

VC staff support allows for conducting educational workshops at the Education site or at various educational venues. In FY2010, 27 workshops were presented reaching 838 students, 56 educators, and 3,947 members of the general public.

On July 29, 2010, the City of Palmdale showcased NASA. Former shuttle astronaut Vance Brand presented the mayor with a space flight kit and a flag flown on shuttle mission STS-131. These events generated public enthusiasm for the ERC and AEG; approximately 300 to 700 people attended each Thursday evening.

IMPROVEMENTS MADE IN THE PAST YEAR/PROBLEMS ENCOUNTERED

VC funds have enabled substantial investment in educating the general public about NASA and DFRC, providing NASA materials and professional development for educators, and creating a Visitor Center that showcases NASA and engages students in STEM disciplines. Through the VC

initiative, DFRC has been able to dramatically increase the number of educators and students reached. DFRC is finding that, through the AEG, we not only have the job of inspiring students and providing professional development to educators, but that adults are more open to learning and engaging in STEM fields and become more comfortable with STEM-based learning when interacting with the kinds of educational exhibits available in the AEG, making learning a “family” experience.

PROJECT PARTNERS TECHNICAL POINT OF CONTACT INFORMATION AND ROLE OF PARTNERS IN PROJECT EXECUTION

In collaboration with the Dryden Technology Transfer Office, an exhibit was developed to showcase technologies originating through NASA research and now in use either in home or office. A dedicated laptop allows people to access a “NASA City” to peruse various rooms of a house or office featuring NASA-originated technology.

The AEG was the site of a DLN event in which local robotics students communicated with Indonesian students through a Department of Education initiative. Before students began interacting, the DLN coordinator panned the camera throughout the AEG to provide Indonesian counterparts with a virtual tour. The LifeSize equipment used for the event was purchased with VC funds, making this White House-supported event possible. To assist AEG volunteers in understanding the history of each exhibit and their educational components, a booklet was developed for quick reference.