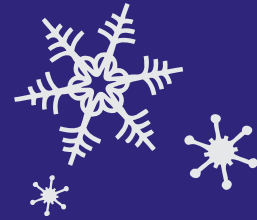


The Launch



Winter 2010

Nevada NASA Space Grant Consortium & Nevada EPSCoR

Up, Up and Away



Truckee Meadows Community College team (left balloon), University of Nevada Reno team (middle balloon) and the Davidson Academy team (right balloon).
Photo courtesy of Leone Thierman

Students from Truckee Meadows Community College, the University of Nevada, Reno, and the Davidson Academy launched three high altitude balloons from the UNR campus on November 11, 2010, setting a new high altitude record in the process – 112,820 feet, the highest altitude a Nevada BalloonSat has reached.



Dr. Dan Loranz (black cap and sunglasses) assists the students from his Physics 117 class prepare their payload for launch.
Photo courtesy of Leone Thierman

“It really did go to space” said one of the TMCC students when viewing pictures taken with the camera which flew as part of the payload for that team’s balloon. “Science and engineering for non-science majors” is how Dr. Daniel Loranz (Department of Physical Sciences, TMCC) described his Physics 117 class, adding, “it really

builds meta cognitive problem solving and thinking, which are skills needed regardless of the individual’s major.” The 17 students in his class designed and built the payload for their balloon during class time. It included a data logger programmed to measure airspeed, temperature and pressure, along with the camera.

A camera was also included in the payload built by the Davidson Academy’s Robots, Rockets and Radio Club. Colleen Harsin (Director, Davidson Academy of Nevada) explained the club is led by two parents, and membership for these 11 to 14-year-olds is contingent upon making a commitment to attend meetings. The club did some fundraising for this project, including the raffling of LEGO® mini-figures, which then flew in the team’s balloon payload.



A Davidson Academy team member explains how one of the payload chambers will release the Lego® soldiers after 90 minutes of flight. *Photo courtesy of Leone Thierman*

The 11 club members constructed a Styrofoam enclosure comprised of two chambers. One chamber contained a Mindstorms NXT controller brick, a number of sensors to collect data, a heating element, seed packets and, of course, the LEGO® mini-figures. Seed packets were also carried on the outside of the payload. A control group of seeds stayed on the ground to be planted at the same time as the payload seeds to test whether cold and radiation would have an effect on their growth.

The other chamber contained about 60 toy soldiers, each with parachutes, except for one lone soldier without a parachute.



Photo courtesy of Leone Thierman

Up Up and Away continued

A release mechanism, scheduled to open the bottom of the chamber after 90 minutes, allowed the mini-parachutists to drop from the payload as a mechanism to study wind dispersal.

Setting altitude records, recording wind speed, temperature and humidity, taking pictures and comparing seed reactions, all result in data to analyze. In order to



The three teams' balloons heading to space with their payloads below.
Photo courtesy of Leone Thierman

do that, the payloads must be retrieved intact from their landing point, which can be quite an undertaking. The UNR Nevada BalloonSat team's balloon carried a two-pound laptop, which tracked current location and made a prediction where landing would occur.

"The software is still in development" explained Dr. Eric Wang (Department of Mechanical Engineering, UNR), "ultimately we are working on controlled landing, which we think could be of use to NASA, the military and the private sector. It would certainly help if we could land these balloons close to a road." The three balloons launched on November 11 landed within a 10-mile radius of each other in rural Nevada, in proximity to Spanish Springs, about 12 to 15 miles north of Reno.

"The high altitude balloon projects have been ongoing for 10 years in Nevada," said Jeff LaCombe (College of Engineering, UNR). "Although TMCC and UNR are the most active teams at the moment, Western Nevada College and Nevada State College still participate."

Students who take part in these launches are well placed for internships, scholarships and fellowships with the Nevada NASA Space Grant Consortium, which provided funding for the program.



From Particles to Propulsion – Profiles of our Industry Affiliates

Why do companies seek to affiliate themselves with the Nevada NASA Space Grant Consortium? "To be able to attract undergraduate interns," was the instant answer from Dr. Rajan Chakrabarty (Sierra Particle Technologies and Desert Research Institute), adding, "Space Grant interns have helped so much with programming."

"The NASA intern program is vital for start-up businesses," says Wayne Sawka (Founder and Director, Digital Solid State Propulsion). "We've had five so far, and will be looking for another in the spring."

Currently NVSGC has six industry affiliates:

- Sierra Particle Technologies
- Equipment Links
- Summit Products Corporation
- Digital Solid State Propulsion
- Challenger Learning Center of Northern Nevada
- Alexander Energy Resources International

These companies produce a range of goods and services for industry, aerospace, defense, government and the public sector, and one is devoted to education.

From particles to propulsion, the Nevada NASA Space Grant Consortium industry affiliates provide a variety of services to a range of clients. Many share concerns about staffing the aerospace industry as baby boomers retire.

Sierra Particle Technologies

Sierra Particle Technologies (SPT) based in Reno, is a small, start-up company, which researches aerosol and combustion science and particle technology. Developing software to analyze fractal aerosol anatomy (FracMAP) is one of the aspects of SPT's work, which Chakrabarty finds most exciting. "FracMAP provides corrections for what has been missed in aerosol agglomerate research during the past two decades, so those mistakes are not made again," he explains, crediting the combination of benefits associated with being an NVSGC partner and the



Dr. Hans Moosmuller (left) and Dr. Rajan Chakrabarty (both DRI) discuss sample simulation results generated by FracMAP.
Photo courtesy of Judith Lancaster

entrepreneurial spirit at DRI as being the two main factors which helped get the company off the ground.

Characterizing particle morphology is only one facet of SPT's activities. The company also provides chemical and organic analysis, as well as optics and acoustics measurements. Particle formation software development is a major focus, as is production of a carbon black aerosol, as well as oxide and carbon powers using a flame synthesis process. There is a pending patent for technique of particle separation, which would potentially be useful for pharmaceutical industry, as well as nanopowder synthesis and carbon nanotube production.

Dr. Hans Moosmuller (Desert Research Institute) explained, "The interns' work has helped make our team more competitive." Moosmuller and Chakrabarty are likely to be looking for an intern with a strong programming background for the spring semester.

Equipment Links

Equipment Links, in Henderson, Nevada, provides solutions to maintenance program issues – improving reliability, availability and quality using a strategy developed by owner Desi Dundics during his career as a chief engineer of naval nuclear power plants.

By recognizing the technical and cultural elements of maintenance, and developing an incremental plan to build skills, planning, review and attitude components of a maintenance plan, the Equipment Links approach has similarities with the adaptive management framework used by many land and resource management organizations.

Focused on improving reliability and cost effectiveness, Equipment Links also offers consultation and facilitation services to its clients, who span many industry fields, from aerospace to water and sewage, and include medical, mining and transportation organizations. The company's maintenance software is used extensively by NASA, including the Jet Propulsion Laboratory's Deep Space Network of Antennas.

David York, Engineer for Equipment Links, is a former NVSGC fellowship recipient.

Summit Product Corporation

Summit Products Corporation, in Minden, Nevada, was founded in 1989 and specializes in state-of-the art electronic equipment for battery charge control and power management.

Their client list includes NASA, surveyors, the U.S. Navy, the U.S. Maritime Service, the petroleum industry, government agencies and original equipment manufacturers, the company prides itself on cost effective electronic solutions.

From concept and feasibility to full production, Summit's products include nickel-cadmium and nickel-metal hydride battery chargers using the most advanced

charging algorithm available. These battery chargers are used to charge space suit helmet lights and tools used for space walks.

Summit Products Corporation hosted an intern last academic year. According to Jack Frost, (President), the Space Grant intern [John Sousa] was motivated and very astute. "It needs the right intern and the right project for them to work on," said Frost.

Digital Solid State Propulsion

Digital Solid State Propulsion (DSSP), in Reno, produces the world's first "green" rocket propellants. "No toxins, no environmental pollutants – mind you, we're replacing legacy technologies," said company Director, Wayne Sawka, "so it has not been an instant sell." "Not many people need missiles," quips Michael McPherson (Director of Energetics Development).

Founded by Sawka in 2005, the company serves defense and commercial markets in both development and production phases of its activity, and is expanding into the oil service and entertainment industries. "In the future, we'll have digital fireworks," says Sawka, adding, "Anyone who gets excited about rockets, smoke and fire is interested by what we do."



Trisha Buescher, a chemical engineer with Digital Solid State Propulsion, checking the Rotavapor instruments which reduce water content of one propellant ingredient.
Photo courtesy of Judith Lancaster

Trisha Buescher, a 2009 graduate from UNR in Chemical Engineering, has been with DSSP three and a half years and is in charge of producing the propellant.

"If it contains too much water it doesn't work," she explains, as she checks one of the instruments in the laboratory where the liquid reduction process takes place. "Our propellant's two ingredients are mixed at room temperature," she says, "and with only two compared to most liquid alternatives, which have seven or more, it is really a relatively straightforward process."



The Challenger Learning Center of Northern Nevada

The Challenger Learning Center (CLC) of Northern Nevada is located at Sparks High School. "This CLC is in the developmental stage, but fund-raising for a full-featured center is progressing well and that facility will also be located at the school," explained Paul McFarlane (CLC Lead Flight Director).



Spaceship Earth Digital Dome where various immersive, full-dome programs are shown. *Photo courtesy of CLC*

The current facility is a custom-made trailer housing the Advanced Spaceflight Laboratory, where two possible mission scenarios are run – Moon Mission and Solar System Survey. Elementary students through adults participate in team activities focused on tasks necessary for successful mission completion, such as navigation, geology or astronomy. "Problem solving and communication are what this is all about," says McFarlane, "and this is math that matters."

"Interesting the 6th to 8th graders in science is key," says James Taranik (CLC board member). "There are relatively few students interested in science and engineering at university level, and consequently the number of programs in these disciplines is diminishing. Yet we need to fill the pipeline for aerospace industries with the baby boomers retiring soon. Perhaps the CLCs are at least part of the solution."

Alexander Energy Resources International

Alexander Energy Resources International (AERI) has been in the research & development phase for almost 10 years. As it has done in the past, AERI continues to develop technologies to enhance and/or replace many environmentally protective technologies currently in use with respect to renewable energy (wind & solar), water treatment, including desalination, as well as energy efficient building materials.

Moving from the R & D stage to manufacturing and implementing many of their own designs and/or hybrid technologies, AERI takes responsibility to contribute their efforts to produce sustainable humanitarian applications for emerging technologies compatible with nature.

AERI hosted an intern in Las Vegas 2009. Anne Marie Frappier explained she found her time at AERI very productive, adding, "collaborating with Ms. Lee Miller was extremely useful." Frappier and three fellow students, mentored by Dr. Darrell Pepper, (Professor, Engineering, UNLV), used thin-film solar cells to power an unmanned aerial vehicle as part of a senior design project in engineering at the University of Nevada, Las Vegas.

A historical perspective on science education in Nevada

Arriving in Reno in 1982 as Dean for the Mackey School of Mines, Dr. James Taranik, (currently Regent's Professor and President Emeritus at the Desert Research Institute) was part of the team which wrote the Space Grant proposal in 1990 to establish the program in Nevada. Taranik served as the director of the program for 15 years.

Taranik expressed concern about the low number of students, nationwide, who are majoring in engineering. "Considering how few aerospace engineering programs remain, said Taranik, "I wonder how aerospace industries will survive once the baby boomers retire." He added, "internships for high school students might work well and help to bridge the interest gap between elementary school and university." He suggested sponsorships from companies in Nevada for K-12 classes to participate in educational field trips would be useful, and might also provide long-term benefit for the companies themselves.

Taranik maintains close ties with NASA, is on the Board of the Challenger Learning Center of Northern Nevada, and is actively involved in remote sensing research.



Dr. James Taranik (center), Tim Minor (left) and Dr. Don Sabol (right) (all DRI) discuss a hyperspectral mineralogy image of Beatty, Nevada. Their projects, which are supported by DoE and NASA, are related to developing understanding of the spectral response of rocks, soils and vegetation. This research supports the development of hyperspectral sensors, like NASA's HyspIRI mission planned for 2021. *Photo courtesy of Judith Lancaster*



Nevada NASA Space Grant Consortium
2601 Enterprise Road
Reno, NV 89512
775-784-3476
nvspacegrant@nshe.nevada.edu
www.nvspacegrant.org



Nevada EPSCoR
5550 W. Flamingo Road, Suite A2
Las Vegas, NV 89103
702-522-7070
nshespo@nshe.nevada.edu
www.nevada.edu/epscor/