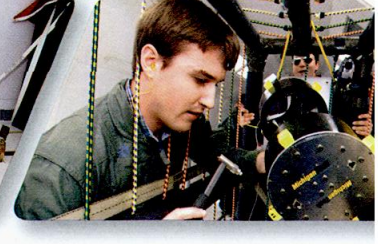
Credit:
2006
NASA Education
Highlights

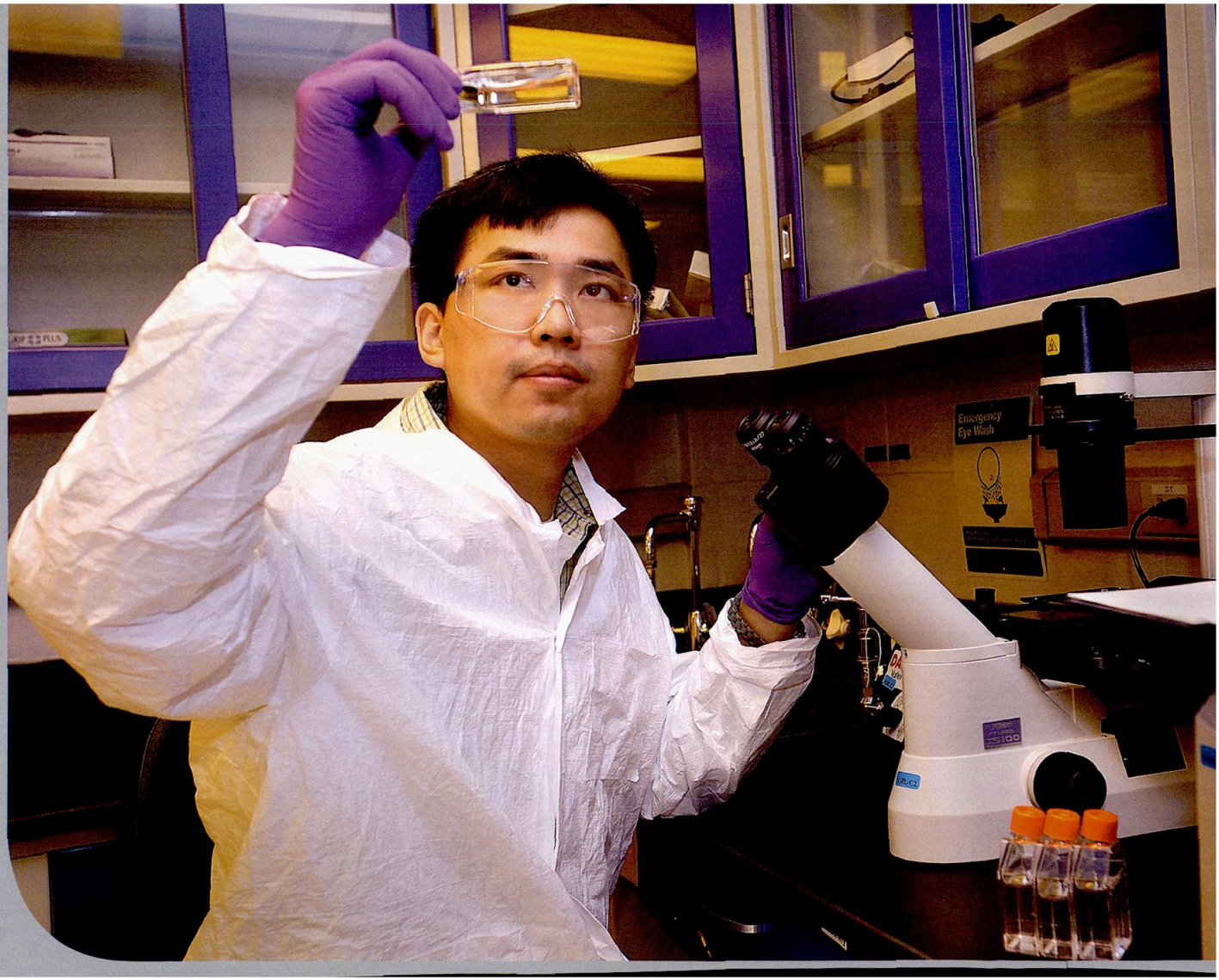
HIGHLIGHTS

Education Takes Flight

The Reduced Gravity Student Flight Program allows teams of undergraduate science and engineering students to propose, design, and fly a reduced-gravity experiment. Major universities such as Purdue University and Embry-Riddle Aeronautical University have adopted this program as part of their engineering curriculum. The 2006 campaign includes teams from Auburn University, Brigham Young University, Brown University, the California Institute of Technology, Carnegie Mellon University, City College of New York, Dartmouth College, Drexel University, and Drury University. Teams are investigating the effect of microgravity on the human body, fluids, inflatable structures, metals, and lasers. To date, student teams from 46 states have flown. These include more than 2,000 undergraduate students from 146 universities, 81 students from 9 community colleges, and 446 high school students from 73 schools.

http://microgravityuniversity.jsc.nasa.gov/

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Eye Wash

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KU team enjoys high-flying week

Engineering students 'pumped' to attend NASA reduced-gravity program

By Sophia Maines

Saturday, June 3, 2006

Ben Parrott can't wait to get on the "vomit comet."

"I've been planning this for a long time," the Kansas University senior said. "I want to jump up and do as many somersaults as I can. I want to see how many somersaults I can do."

Parrott and three other KU students are at NASA's Johnson Space Center in Houston awaiting their chance to experience weightlessness aboard a NASA C-9 aircraft.

The team, led by recent KU graduate Loral O'Hara, is among 65 student teams from across the country participating in the NASA Reduced Gravity Student Flight Program.

The team devised an experiment involving a satellite propulsion system that will be tested in the weightless environment.

They are on the first KU team to take part in the program, and it took them two years to get there.

"It's been a long time coming," O'Hara said.

The team on Friday experienced a hyperbaric pressure chamber and a low-oxygen environment.

On Tuesday and Wednesday, they'll take to the air.

The plane will soar above the Gulf of Mexico, climbing and falling in a series of parabolas. During the free falls, the students will experience a reduced-gravity environment and conduct their experiment.

The students have been told what it will feel like: a bit like skydiving, a bit like being underwater, a bit like neither experience.

"They say it's like a lot of different things," O'Hara said. "You can't really compare the feeling of being totally weightless to anything."

Parrott said at a free point, he hopes to spin in somersaults as many times as he can.

"I'm superexcited," he said. "I'm way pumped."

The whole experience of going to Houston has been a bit daunting for team member Zach Schauf, but he said he's getting acclimated.

"It's NASA, for crying out loud," he said. "As a student who's never gone to school outside of Kansas, it's kind of a big deal."

University of San Diego

The Spin

DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY NEWSLETTER

SPRING 2006 / VOLUME 1, ISSUE 1

Emily Perttu, Chemistry and Physics 2006

Meet Emily Perttu – USD Goldwater Scholar (Chemistry and Physics 2006)

My decision to attend USD involved scarcely more deliberation than a game of Eeny, Meeny, Miny, Mo, yet is one that I've always looked back on favorably. During my five years as a chemistry and physics student, USD provided me with numerous diverse opportunities that ignited my future in research. My first taste of research was with USD's Zero-Gravity Team during my sophomore year. Our team designed, built, and tested an experiment on board NASA's KC-135 microgravity aircraft ("The Vomit Comet") at Johnson Space Center outside of Houston, Texas. For someone who dreams of becoming an astronaut, the experience of touring NASA's training facilities, going to dinner with astronauts, and feeling weightlessness was invaluable. I now lead the team, and will be flying my third time this spring.

My research continued in the lab of Dr. Peter Iovine of the USD Department of Chemistry. I've worked in his lab for three summers, and in 2005 had the opportunity to conduct my research at the Institut Catala de Investigos Quimicas (ICIQ) in Tarragona, Spain. Once again, it was a remarkable experience that helped me prepare for graduate-level studies.

In 2004, I was awarded the Goldwater scholarship for my success in academics and in research, both of which were fueled

(continued on page 3)

Meet Emily Perttu

(continued from front cover)

by the support of my professors and the learning environment they create. The scholarship not only rewarded my past efforts, but also propelled my future studies. It enabled me to spend the extra year at USD needed to complete my double major, and also gave me the confidence that I could compete with other students across the nation. The faculty at USD provides all the necessary resources for a successful undergraduate experience and it is up to the student to take hold of the opportunity and run with it.

Credit:
UAB Reporter
April 3, 2006

NO MAYTAG REPAIRMAN ON MARS

Engineering students study DIY repairs in space

What do you do if something breaks on the way to Mars?

This and similar questions raised by space station experiments are being addressed by a team of UAB School of Engineering students, led by their advisor Heng Ban, associate professor of mechanical engineering,

On March 28, UAB's six-member student team headed to NASA's Johnson Space Center in Houston to recreate and expand on the space station experiments as part of the Reduced Gravity Student Flight Opportunities Program.

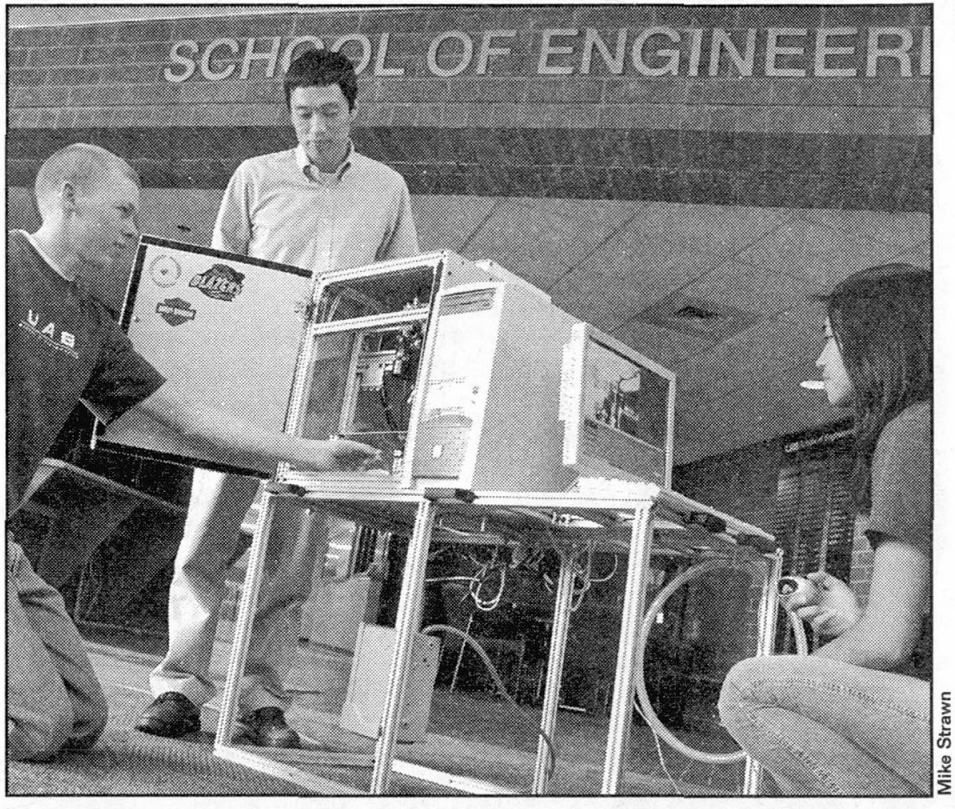
"At some point in a long, manned space flight, repairs will have to be made," says Ban, who receives funding from NASA to study semiconductor material development.

"Our students have built a special soldering system, and they will be testing it during zero-gravity flight and studying how reduced gravity affects the properties and strength of soldered joints," Ban said.

Ban said that space station experiments conducted this past year to evaluate the performance of solder showed that in microgravity the solder joints — used to join electrical connections — are more porous; the effect is a decrease in joint strength and the ability to conduct electricity that could contribute to equipment failure. The potential risk to crew safety and the success of space exploration will require a better understanding of solder joint properties, Ban said.

When the UAB students arrive home April 8, they will begin making presentations to schools in the Birmingham City, Jefferson and Shelby County school systems to help stimulate student interest in the fields of science and engineering. Nine presentations are planned, each describing the team's experience at Johnson Space Center and the results of their experiment.

The experiments also will be photographed and videotaped. Visitors can share the team's experience at www.microgravityuniversity.jsc.nasa.gov.



Mike Strawn

UAB engineering students will test a special soldering system for repairs in space during zero-gravity flight at NASA's Johnson Space Center in Houston. They will share their experiences with area K-12 students when they return.

Credit:

Miami
Herald

MIKE GENTRY/FOR THE MIAMI HERALD

HANGING ON: UM student Joseph Dussling, 19, left, works on experiment with NASA's Paul Brower, right, and Tim McNaudad, 19.

THE RIDE OF A LIFETIME

Four young UM engineering students flew with NASA into zero gravity.

BY NOAH BIERMAN
nbierman@MiamiHerald.com

Four University of Miami sophomores felt what it was like to have no up or down, no left or right.

They were in Houston, spending two hours Thursday and Friday on a NASA C-9 airplane that reproduces the feeling of zero gravity.

"It's so hard to describe," said Tyler Hawkins, of Osceola, Wis. "Suddenly, the plane . . . you're going . . . and suddenly you're just lifted off the floor."

Mark Huber, of Syracuse, N.Y., said "it's just weird."

"You could say it's like a roller coaster, right when it drops on the first hump. It's kind of like that," he said. "It just lasts for 25 seconds instead of two."

The students rode the long "roller coaster" more than 30 times as a NASA airplane rapidly flew up at 60-degree angles and down at 45-degree angles over and over. The movements made it feel alternately like they had double the earth's gravity weighing them down and then zero gravity as the plane jutted.

The students spent their freshman year designing the experiment that earned them the trip to semi-space. Two students flew

• TURN TO STUDENTS, 2B

NASA takes 4 UM students on a zero-gravity ride

• STUDENTS, FROM 1B

Thursday and two flew Friday.

Since 1995, the National Aeronautics and Space Administration has flown 40 to 50 student teams per summer on the plane that has earned two nicknames: the "Weightless Wonder" and the "Vomit Comet," for obvious reasons.

About 100 teams apply for the project each year, said Debbie Nguyen, NASA spokeswoman.

It costs the space agency $15,000 per team, she said. In addition to giving the agency good publicity, the program is designed to inspire the next generation of scientists.

The UM four, all aerospace engineering students, say they were the only team to win the ride while they were all freshmen. The students got together early last fall, when they barely knew each other.

Tim McNaught, of Tualatin, Ore., came up with the idea after participating in a NASA-run experiment while in high school. That project took him to NASA's Glenn Research Center in Cleveland, where he watched a box holding an experiment in zero gravity. This time, he wanted to experience zero gravity for himself.

"It's like a dream of mine to become an astronaut," he said.

McNaught and Joseph Dussling gathered the team and, with the help of an Oregon college professor McNaught had worked with, they designed an experiment.

Basically, they were watching how water, air, foam pellets and hard BBs moved through 30 feet of tubes in a zero gravity environment. By observing the flow, they were hoping to determine the best ways to get rid of waste in outer space, among other possibilities.

It was a complicated project, requiring a 40-page proposal and a 45-page follow-up data package. The students spent the year researching and designing it outside of class, all the while earning A averages in one of the most difficult college majors.

"None of us had any clue," Dussling said. "But we managed to get through and it's been a learning process."

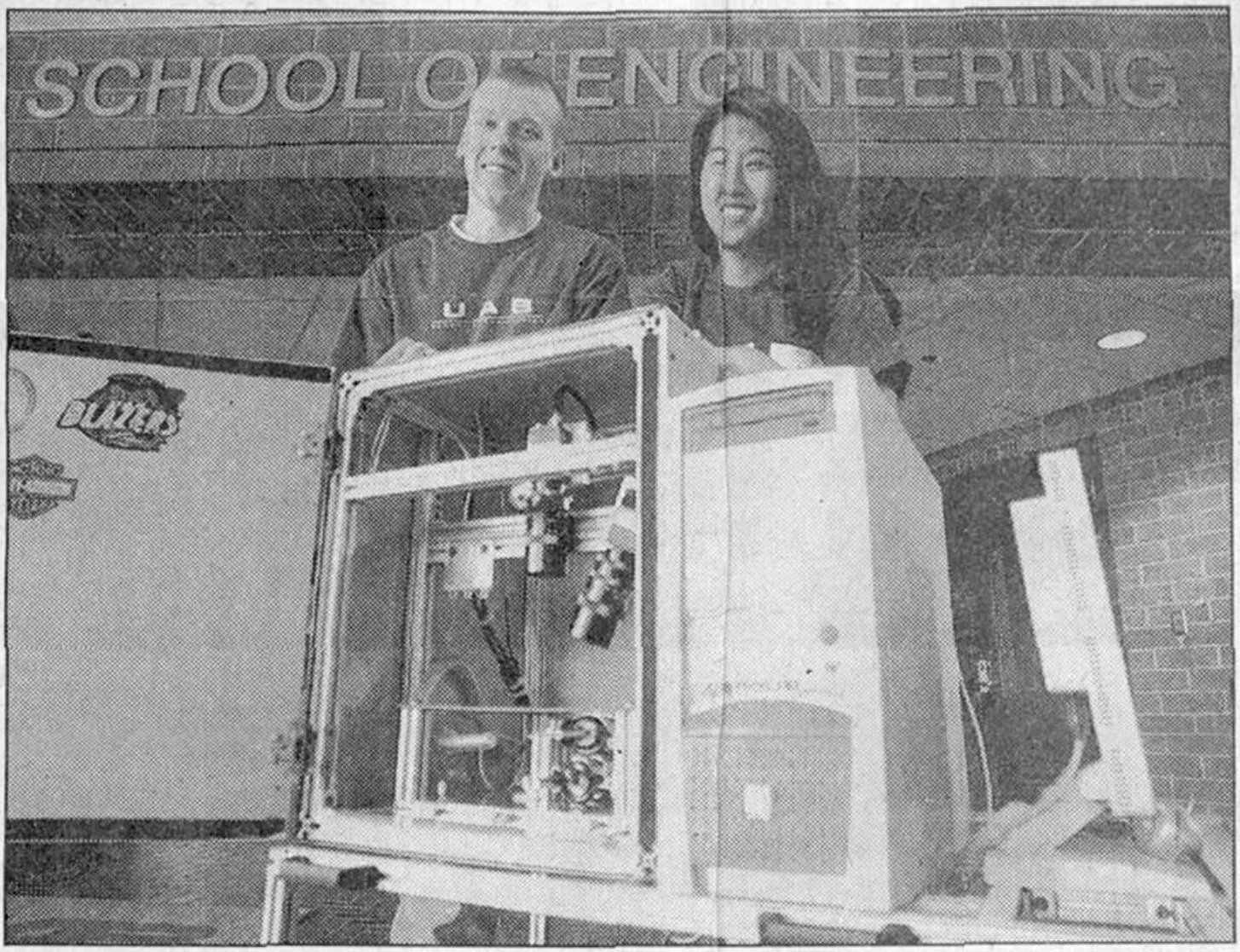
They spent Saturday nights at the library while their pals were going to parties.

When they got to Houston last week, they began training. They were issued green flight suits and had to pass physical tests and eat simple foods.

Dussling, like many who fly in the plane, needed the air sickness bag provided by the NASA crew.

"I still had an awesome time," he said. "I was sick for maybe like half of it, but it was still amazing."

Soldering on



NEWS STAFF/STEVE BARNETTE

UAB School of Engineering students David Scott of Oak Mountain, left, and Wendy Sudsinsunthorn of Pell City are part of a six-member team that built this special soldering system. The team leaves today for the NASA space center in Houston, where the experiment will be tested under zero-gravity conditions. Soldering is the joining of electrical connections, and the experiment could help scientists better understand gravity's influence on soldering.

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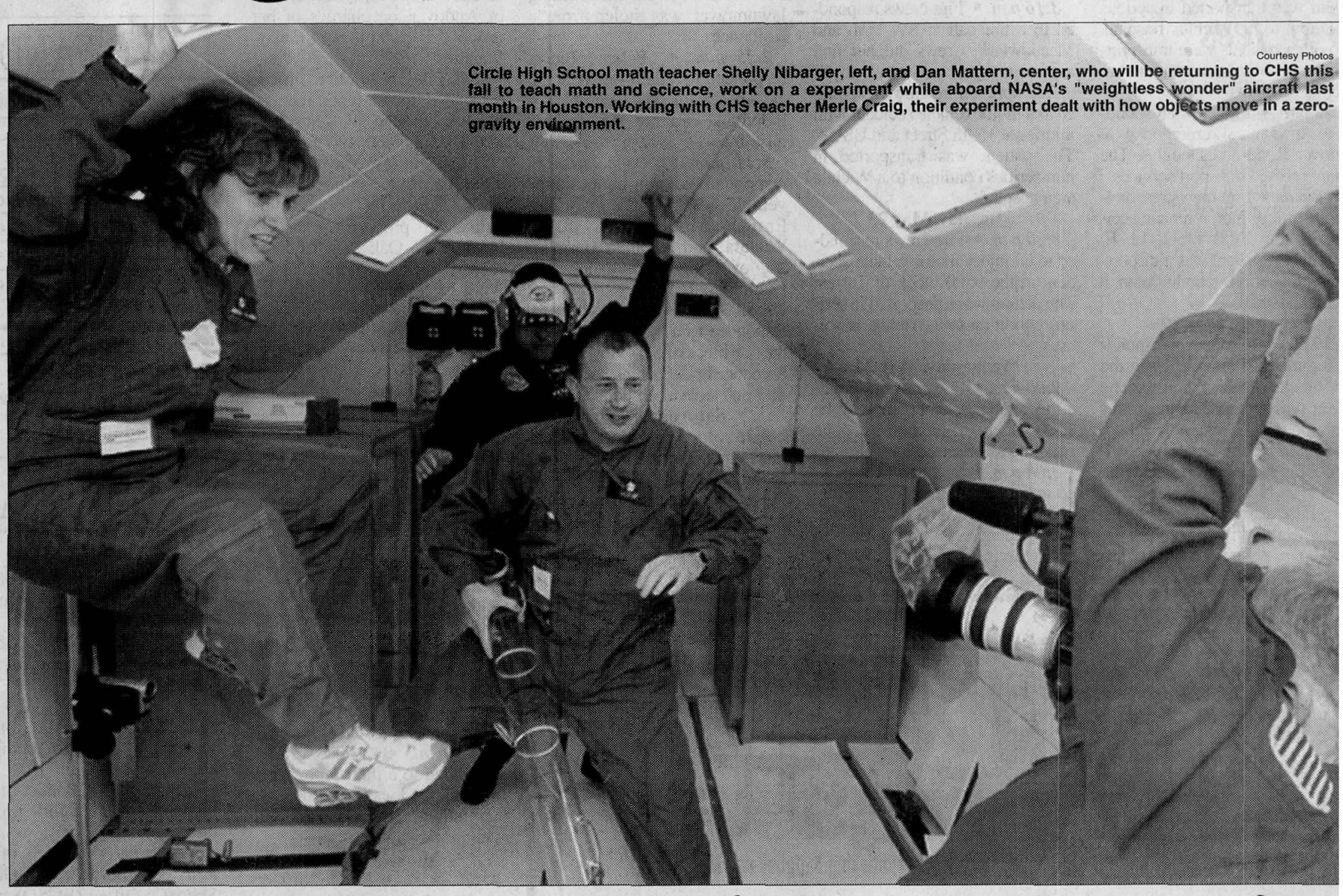
Weightless Experiments



Courtesy Photos

Circle High School math teacher Shelly Nibarger, left, and Dan Mattern, center, who will be returning to CHS this fall to teach math and science, work on a experiment while aboard NASA's "weightless wonder" aircraft last month in Houston. Working with CHS teacher Merle Craig, their experiment dealt with how objects move in a zero-gravity environment.

Area teachers experience zero gravity

RANDY FOGG

aja@andoverjournal.kscoxmail.com

TOWANDA - Three Circle High School science and math teachers were able to do something that has usually been reserved for astronauts.

Dan Mattern, Shelly Nibarger and Merle Craig were among six teams of teachers that were chosen to conduct student-designed experiments in zero gravity last month at the Johnson Space Center in Houston, Texas.

"It was definitely a success," Mattern said. "From my perspective, the experiment was more difficult to do than I thought."

Circle students had designed "Mathematics of Microgravity" to explore how objects move in the zero-gravity environment of space.

The experiment involved a clear plastic tube that had a motorized fan at one end. Three balls of varying size and weight were placed in the tube. One time the tube was allowed to float in space, while another time the tube was attached to the aircraft's floor.

"It was more tedious than I thought," Mattern said.

Using a video that was made of the experiment, students will be able to measure the distance and velocity that the balls traveled.

One of the tubes cracked while being shipped from Kansas to Texas, and the teachers ended up cutting the tube shorter than what they had planned.

The teachers will have their students gather data from the experiment next school year.

"It's something we can use for many years to come," Mattern said.

A CHS graduate, Mattern will be returning to Circle as a math and science teacher for the 2006-07 school year after spending one year as an instructor at Butler Community College. Nibarger has been teaching math at Circle, while Craig has been a science instructor.

Last year, NASA, the World Year of Physics, the American Association of Physics Teachers and the American Physical Society selected six proposals from high school students and teachers nationwide for experiments to be conducted aboard NASA's modified C-9 aircraft.

Courtesy Photos

Circle High School teacher Merle Craig stands in NASA's modified C-9 transport plane that has been nicknamed the "vomit comet." The plane goes through roller coaster-like patterns - known as parabolas - to create a weightless environment for 25 seconds.

The project had been scheduled for 2005, but was delayed one year because of the unusually active hurricane season and other complications.

The teachers went through physical training to prepare for their flight. They noted that it was a difficult to adjust to the changes.

"Your senses are telling your body, 'This is not right,'" Craig said.

The C-9 transport gave its passenger the feel of space as it conducted a series of parabolic maneuvers above the Gulf of Mexico, creating multiple periods of reduced gravity.

Each parabola of the mission gave the crew and scientists about 25 seconds of weightlessness to conduct research. Each flight did about 30 parabolas before returning to base.

Nibarger and Mattern conducted the experiment one day, and the on the next, Cr joined with the team's NA mentor Rebecca Cutri-Kohar perform the other experimen

The teachers had a diffic time orienting themselves d ing the weightless periods.

"Sometimes you didn't kn which way was down," Cr said.

Mattern said that his e would not pop at the end of flight. In the early morni hours of the next day, Matte ear ruptured.

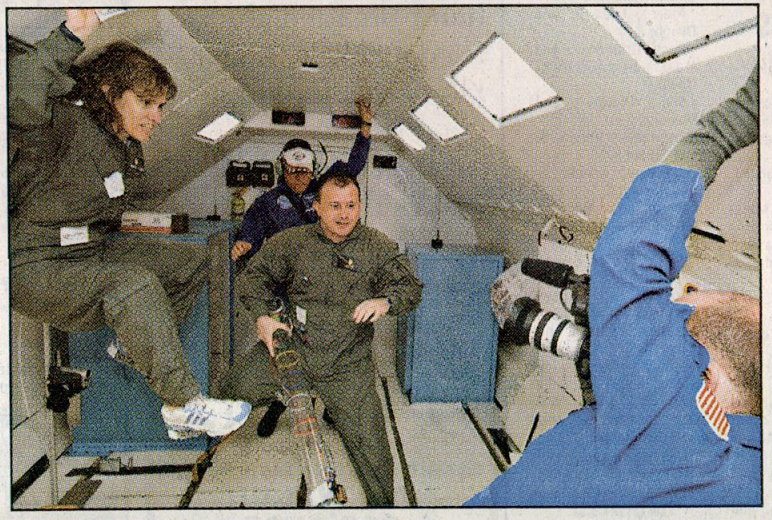
"It's a common thing," said. "It's something that heal itself."

In addition, the teachers w able to tour the space center were able to watch a m Space Shuttle launch cou down.

They said that they talked their students about the trip plan to talk to other interes groups about the experience.

"It was a good experience the way around," Nibarger s "It was an amazing opportun

"Entering an experiment Dan's idea," she continued. " were wondering, 'What was getting us into.'"



Circle High School teachers Shelly Nibarger, left, and Dan Mattern, center, went to NASA to perform a physics experiment aboard the "Weightless Wonder," an aircraft that creates short periods of zero gravity while in flight. The trip also included Circle teacher Merle Craig (not pictured).

Courtesy of NASA

Circle teachers take a weightless ride

■ The trio conducted a science experiment in zero gravity aboard a NASA aircraft.

BY AMANDA O'TOOLE
The Wichita Eagle

Three teachers at Circle High School waited more than a year to complete their mission.

The trio had won a trip to Johnson Space Center in Houston to complete a science experiment in zero gravity.

NASA would take them on the "Weightless Wonder," a C-9 aircraft that creates short spurts of weightlessness while in flight.

The trip was postponed twice because of maintenance problems to the craft and damage caused by Hurricane Katrina.

They finally got to fly May 11 and 12.

Now, with feet firmly on the ground, biology teacher Merle Craig and math and physics teacher Dan Mattern said they'll use the experience to inspire students.

"It generated a lot of interest in students," Craig said. "You've got to run with that. You've got to milk it for all it's worth."

Craig said the physical reaction to reaching zero gravity was a good way to experience the link between anatomy and physics.

And hopefully now he'll be able to better communicate the link with students.

Please see **NASA**, Page **6E**

NASA

From Page 1E

Mattern, who will return to Circle High from Butler County Community College in the fall, said the experience will also make equations in physics easier to understand.

Mattern has developed a lesson plan in which physics students will use information from the mission to learn to calculate velocity, speed and acceleration.

"It will be an easier transition between the math and physics gap there sometimes is," he said.

The trip was part of a NASA program called World Year of Physics.

The group, which also included Shelly Nibarger, conducted an experiment that measured laws of physics based on a ball propelled by a fan through a tube in zero gravity.

"All three of us that went down there are definitely excited about what we did," Mattern said. "Our own enthusiasm will get the kids interested in it."

The teachers made the trip for free, but others who ride the aircraft, which is also known as the "Vomit Comet," may pay about $10,000, Mattern said.

Pictures of the experiment can be viewed at http://zerog.jsc.nasa.gov/2006WYOP/May_12_06_Circle_HS/subviewer.cgi.

Reach Amanda O'Toole at 316-268-6357 or aotoole@wichitaeagle.com.

Training for a Zero-G NASA Flight

Embry-Riddle Students Ride the Weightless Wonder:

Story & Photos by Jeff Parnau

The 2006 Embry-Riddle Reduced Gravity NASA team, left to right: James Ristow, Yadira Chatman, Abraham Chavez, and Janiece Lorey. All have aeronautical or aerospace majors at ER's Daytona Beach, Florida campus.

It's no secret that many of today's airshow pilots call Embry-Riddle University their Alma Mater. In fact, the university has been named the best aerospace/aeronautical/astronautical engineering school by U.S. News & World Report since 2001, which is when the magazine began ranking universities. (ER was in the category of schools which offer a master's degree or less.) More than a few airshow pilots, including the late Eric Beard, were graduates from one of ER's campuses in Daytona Beach, Florida and Prescott, Arizona.

Sometime early in the year, I received an email from Mary Van Buren, in the university's marketing and communication office. She wondered if I would be interested in joining eight students on a micro-gravity experiment to be conducted on NASA's famous Vomit Comet (or, as NASA would prefer, the "Weightless Wonder.") Until recently, NASA used a converted KC-135 for astronaut training. Today, they use a C9-B, which in civilian terms is a DC-9. Although it's not as roomy as its four-engine predecessor, it is far less expensive to operate and maintain.

But let's start at the beginning. What does it take to be an astronaut for a day? For the students, it begins by submitting a proposed experiment which requires brief periods of weightlessness (or micro-gravity, to be more precise). My Embry-Riddle team proposed a "Nutation Experiment Slosh Simulation Test." It began with the statement, "Fuel slosh has been a long-standing problem for spinning aircraft. Sloshing fuel in the third stage spacecraft stack dissipates spin energy and causes the stat to nutate (or 'wobble'), which may lead to mission failure."

The students' goal was to develop methods of predicting fuel slosh, which would help in the design of economical ways to control it. It was approved, along with approximately 80 other experiments and tests to be conducted during NASA's "Microgravity Class of 2006."

Each participating team is allowed to bring one journalist along for the training and the ride, and that's why Mary contacted me.

Only working, paid, full-time journalists (or writers) can be considered for the invitation. And believe it or not, there is limited interest from the media. Why? The time commitment. Although the "fun part" of the experience is 16 minutes of weightlessness (sliced into 30-second pieces), the entire class can consume up to 10 days in Houston, and potentially two travel days. Or it might take as few as six days in Houston. Or you could commute to Houston. You can see the problem. Those 16 minutes might consume nearly two work-weeks of travel and on-site presence.

So what! This is the Vomit Comet! Just tell me what to do and, I'll get 'er done.

Job number one was to get the equivalent of a First-Class flight physical. I routinely fly on a Second-Class exam, so I had to make the appointment. I knew that an EKG was part of the First-Class exam, but decades ago someone told me that certain other parts of the pilot were also examined while the doc was wearing gloves. For that reason, I had never requested such an exam. I can now say that was a lie. There is nothing invasive or scary about a First Class flight physical. And now I know I have a normal EKG reading.

I am sure there was a background check. Finally, I was approved. We started with the Cirrus in East Troy on the morning of March 29, stopped in Little Rock for fuel, and then threaded our way through thunderstorms to Ellington Field in Houston. At least one Houston area airport was closed due to weather as we landed.

Thursday started with briefings and equipment setup by the students. During dinner I had the pleasure of sit-

Either Abraham Chavez has extremely strong fingers, or this guy's floating. The Embry-Riddle flag is in the background.

Above: Greg Poe celebrates his win on Saturday as the other competitors look on.

Right: Stephen Cox and Rob Reider call the action.

Lower Left: A parachute jump with one of the largest American flags opens the show.

Lower right: Stephen Cox interviews Greg Poe for the crowd and the cameras.

Edge 540. This time, however, with plenty of time to prepare and an awareness of the problems his fellow competitors were having with the wind and the box, Poe ripped through his two Saturday flights without error. He placed second to Sergei Boriak in the day's first flight and overtook Sergei after another great flight in Round 2.

Sunday dawned cool, damp, and cloudy and soon rain began to fall, canceling the day two events. As a result, the final scores for the weekend were based on Saturday's two flights. Poe was obviously elated over his win. "I was really in the zone today," he told commentator Stephen Cox after his Saturday flights. "I felt good and I flew great!"

For the second event in a row, Sergei Boriak finished second, again wowing the thousands of spectators with his engine-out dead stick maneuver. Jeff Mawhinney shook off a lackluster first flight on Saturday to produce his best flight of the series in his second six-minute sequence and parlayed that into a third-place finish. Jim Peitz finished fourth, followed by Jon Melby in fifth and week-one leader Skip Stewart in

sixth. Bill Stein and Matt Chapman rounded out the Winston-Salem field.

As is the case at all ACAP events, entertainment at the Winston-Salem show featured the AeroShell Aerobatic Team (who also serve as judges) and Greg Koontz as Clem Cleaver, a country bumpkin looking for a flying lesson. Clem manages to take off in a J-3 Cub and then comes back to land on the top of Greg's specially designed pick-up truck. Koontz also flies a great aerobatic routine in his bright-red Super Decathlon – including an inverted ribbon cut. The Winston-Salem fans were also treated to two runs by Neal Darnell's Flash-Fire jet truck, a fly-by from a C-17 Globemaster III from Charleston AFB, and warbird fly-bys from Cavanaugh Flight Museum's beautifully restored FM2 Wildcat and P-40 Warhawk. Rob Reider kept the fans entertained with his expert descriptions and provided color commentary alongside Stephen Cox during the competition flights.

After events in Denton, Texas and Birmingham, Alabama later in May (see the July issue of *World Airshow News*), the Series moves on to Atlanta, Georgia and Monroe, North Carolina in June to complete the first half of the season.

You can bet from now on, the competitors will look carefully at the size of that aerobatic box as they try to develop their winning strategy.

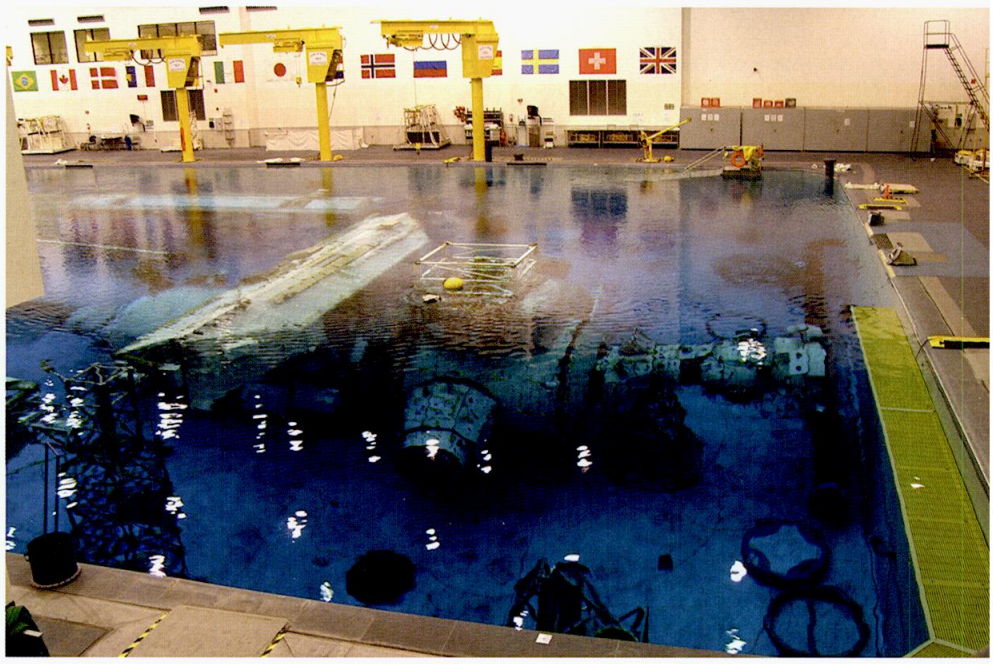
Winston/Salem Results

1.	Greg Poe	95.20
2.	Sergei Boriak	94.75
3.	Jeff Mawhinney	94.65
4.	Jim Peitz	93.90
5.	Jon Melby	93.65
6.	Skip Stewart	93.35
7.	Bill Stein	92.40
8.	Matt Chapman	91.80

ting with Dr. Donn Sickorez, NASA's University Affairs Officer, who co-directs the student reduced-gravity programs. In particular I wondered if anything "real" ever comes from the students' experiments. The answer was, yes — there are sometimes results that lead to more experimentation or a design change. But just as important, the student experiments and flights are an introduction to the inside of NASA, and may result in a NASA career.

Friday was by far the most brutal day for me. In order to ride the Vomit machine, you must be a card-carrying graduate of their one-day physiological training course, which includes a session in a depressurization chamber. The five hours of classroom lectures and a final test were bad enough (I abhor classroom environments), but the oxygen mask was the kicker — very uncomfortable. It had two modes. Using one mode made it difficult to inhale. Using the other mode made it difficult to exhale. I hated it. But you had to breathe pure oxygen for thirty minutes prior to the depressurization, to purge your system of nitrogen. Failure to do that can lead to the bends.

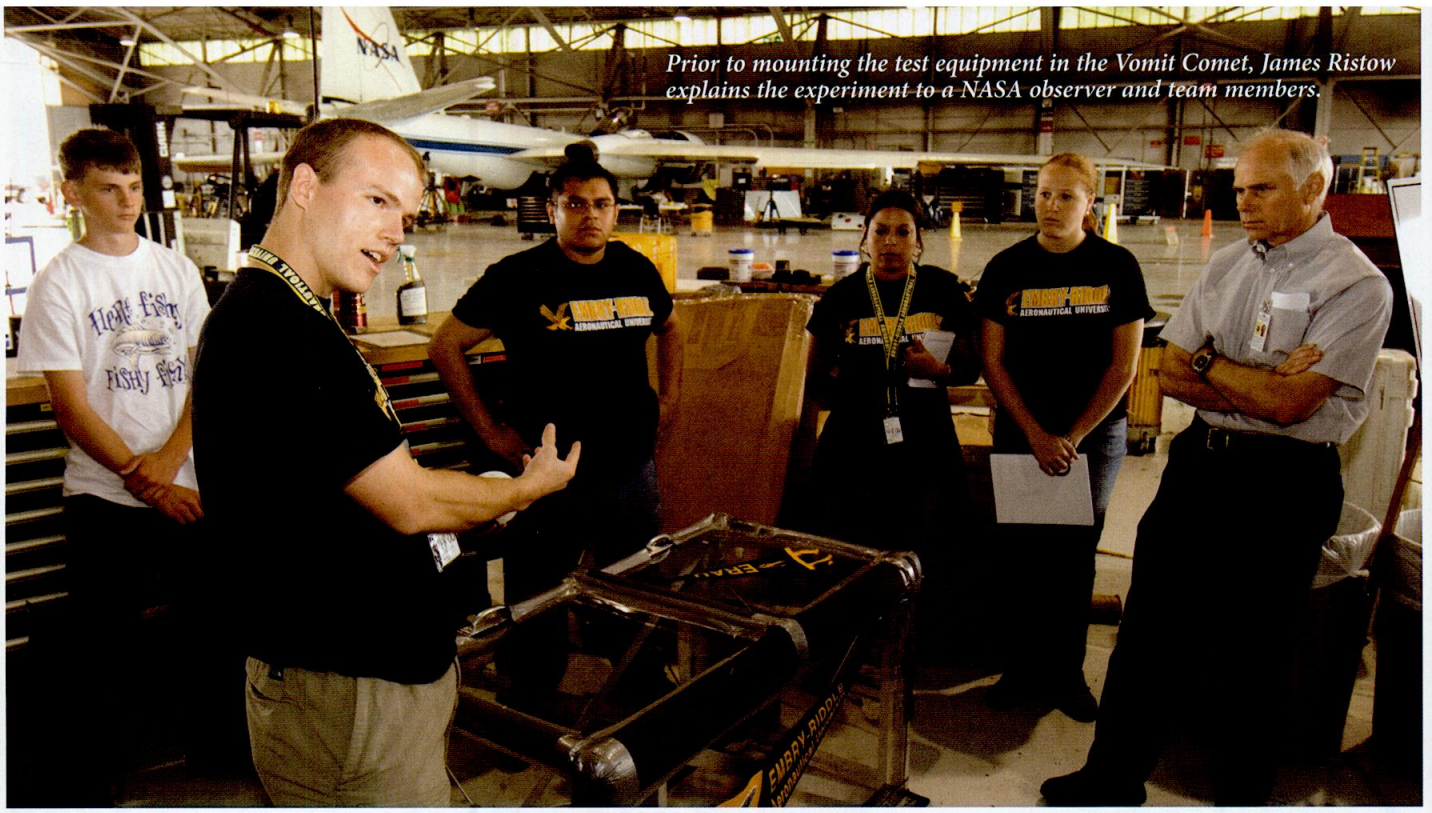
At 25,000 feet of atmosphere, we took off our masks. We were to keep them off either for five minutes, or until we recognized the early symptoms of hypoxia, which include changed vision, blue fingernails or lips, euphoria, dizziness, or the inability to perform simple tasks (such as addition or subtraction). I was just glad to have it off for a few minutes. At about 3-1/2 minutes, I noticed that "Number 12" was not



Top: Abraham Chavez (left) and team leader James Ristow prepare the nutation cylinder (which contains sensors and fluids) for their zero-G experiment.

Middle: Part of the mandatory NASA Zero-G training requires decompression to an atmosphere equal to 25,000 feet MSL, at which point you remove your oxygen mask and wait for the effects of hypoxia. Effects include reduced ability to differentiate colors, which is why there are color wheels on the walls.

Bottom: This 100-ft. by 200-ft. by 40-ft. deep tank is used to train astronauts. In this case, huge replicas of the International Space Station are under water. The fact is, though, floating in water is a not a true simulation of weightlessness. Our best non-orbital simulation is in the Vomit Comet, NASA's C9-B.



Prior to mounting the test equipment in the Vomit Comet, James Ristow explains the experiment to a NASA observer and team members.

3

responding to the question, "How do you feel?" Then I realized that I must be Number 12, although the number was above my head and behind me. So I put my mask on, thinking that I had become confused and disoriented. Looking back, I believe I never noticed I was sitting in seat 12, so I don't have much to say about hypoxia.

The weekend was unscheduled, so we did some very cool relaxing. Gene Soucy (Mr. Airshow) hails from Houston, and he suggested we go to a drag race, which I had never done. Gene thinks airshows should be run just like drag races, with pit areas open to the spectators. It was a noisy experience. Sunday, we were much quieter as we visited the Houston Space Center's Visitor Complex.

On the day of the flight, we were supposed to show up with zero hangover and a normal breakfast. Most people got this right, but remember these are college students. The most important meeting of the day was what I call the drug meeting. We were told what we were being offered, the effects of the drugs, and that we were highly unlikely to make it successfully through the flight unless we took them. One of the drugs would be similar to an amphetamine; the other was more like a sedative. I took the drugs, and within 15 minutes, there was no doubt as to their potency.

The five experiments were bolted to the floor of the Comet. The 20 seats in the back were for the climb and descent. When we got to altitude, we all unbuckled our seatbelts, and walked to the experiments. Everyone either sat on the floor or laid on their back during the first "pull," when you feel two G's positive during the climb. Then 25 seconds of weightlessness during which people were flying all over, laughing or looking extremely serious. When you heard the "feet down" call, you had about three seconds to get oriented for a "landing," which quickly became another two-G pull.

After a few initial arcs, the students began working on their experiments. There were two from each team (there would be another flight the following day with the other two team members), and it was quite interesting to watch 10 people try to learn a skill in a few minutes — a skill that takes real astronauts months or years to perfect.

They had predicted that up to a third of us would get sick, or if we were lucky, none. We were statistically perfect, with three of the 11 newcomers grabbing for one of their mandatory handy barf bags (front upper pockets). You could tell who was going to get sick by just looking at them — the eyes would be half shut and glassy, there would be no smiles, and no chat. The on-board NASA physician spotted the problems quickly, and escorted the victims to the seats in the rear of the airplane.

(Rumor has it that when a novice doesn't stop the involuntary retching, he or she is given an injection to knock them out. Makes sense to me.)

The Embry-Riddle experiment involved a clear container which held a cylinder on a spindle. An electric drill was to spin the cylinder, and then the spindles would be pulled away. The nutation was to be the result of liquid sloshing around inside the cylinder. Sensors located in the cylinder were to transmit nutation information to a computer, and the data would later be interpreted and studied.

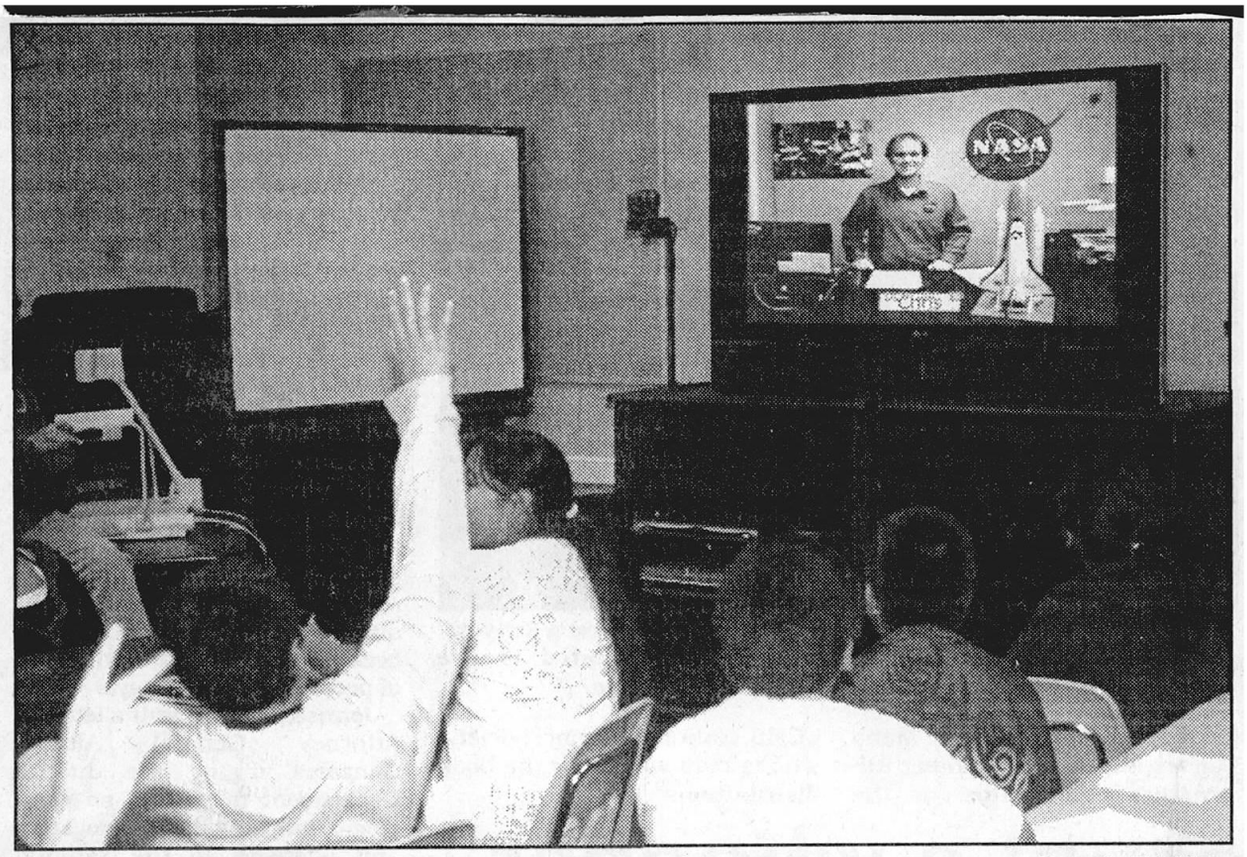
The team had a few problems during our flight. First, the cylinder just kind of banged around. Later, the drill failed and they couldn't spin it. But this was only the team's first flight. The experience they got on my flight would be used to refine the experiment for the second team, which would fly the next day. In that regard, there were no "failures," but rather experiences that would help refine the equipment.

After 32 arcs (each producing 25 to 30 seconds of weightlessness), a simulated Moon-walk and Mars-walk, we began our descent and return to Ellington Field. The three kids who got sick were pretty much recovered by the time we landed.

It was a privilege to join my team for this experience. Zero-G isn't for everybody, but in my case, it was a rare treat that money can't buy. Thanks to Embry-Riddle, Mary Van Buren, my team, and Donn Sickorez for making this a tremendous experience.

Read more about the zero-G experience in this issue's Stick Time with Jeff Parnau. For information about Embry-Riddle, www.erau.edu. To see the NASA photos of all of the teams, including ours, go to http://zerog.jsc.nasa.gov/studentmain.html

Credit:
Todd County
Tribune



Photos by Rich Winter

Todd County Middle School students participated in an interactive video conference call with NASA. Students at TCMS learned about the effects of gravity and microgravity.

TCMS students draw learning inspiration from NASA instructors

By Rich Winter

The NASA Space program is alive and well at Todd County Middle School. On Thursday, students at TCMS participated in a video-conference call with NASA, in which the topics of gravity and microgravity were discussed.

Todd County Middle School is one of 20 schools across the country that are participating in the program. Middle school principal Peggy Diekhoff was instrumental in writing the grant that brought the program to Todd County.

Four teachers at TCMS will be participating in experiments with NASA later this year. As part of an experiment submitted by TCMS, NASA experts and teachers will be studying, "How changes in gravity affect density."

During the Thursday afternoon video conference call, NASA employee Chris Stein gave an hour-long interactive demonstration with students at TCMS about gravity and microgravity. He explained that microgravity is simply an environment in which there is very little gravity.

Stein asked students what they thought some situations on earth might be in which students would experience microgravity? The students responded with several good answers, but there favorite seemed to be a roller-coaster, in which riders experience a lesser force of gravity when they are going down a steep incline while on the coaster.

Stein gave students a first-hand look at some of the projects NASA will be working on in the near future. Stein said astronauts will be going back to the moon and spending an extended period of time there. He added that NASA has plans of sending a manned spacecraft to Mars, and that scientists are currently studying what the long-term effects of micro-gravity will do to human beings that will spend over a year in space. "One of the ways we train is in a large pool here at NASA. Astronauts can train for space walks by simulating that action (weightlessness) in the pool," said Stein.

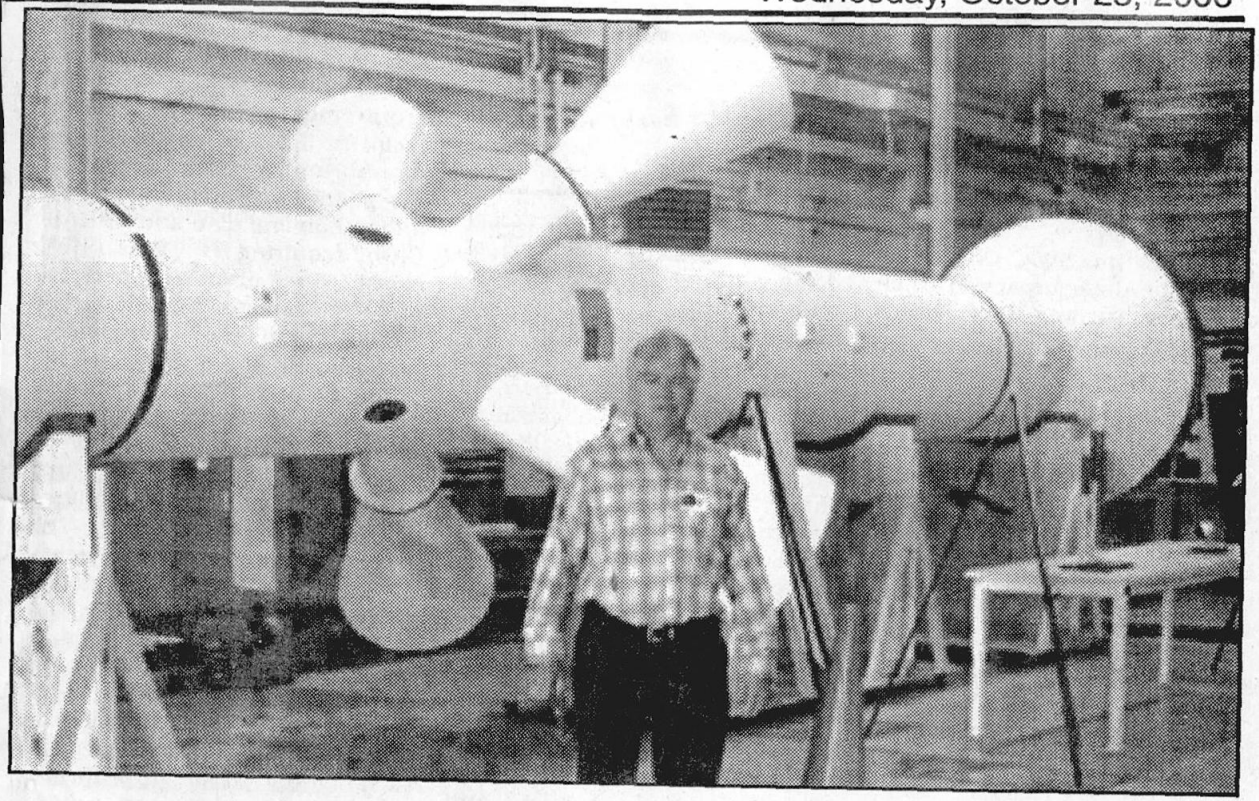
The NASA employee talked to the TCMS students about 'fluid shift' that astronauts experience while in space. Stein explained that because of the effects of micro-gravity, blood goes out of the legs and into the head and chest. "Microgravity affects the cardiovascular system by tricking the heart into thinking their is excessive blood in the body. The liver tries to get rid of what the body thinks is excessive blood supply," said Stein. The NASA employee explained that when astronauts return to a normal gravity environment, they may be dizzy and lightheaded for a few days while their body replenishes the blood supply they lost while in space.

Stein showed the TCMS students how astronauts work out while in space. He noted that because of the lack of gravity, weightlifting doesn't work (because the weights don't weigh anything), and that running on a treadmill won't do much for the astronaut because there is no resistance. Stein showed the TCMS students tether-chords that astronauts use to gain some resistance while working out.

The students were given a video-demonstration of how micro-gravity affects the neurovestibular system (Neurovestibular deals with the inner ear and balance issues that astronauts might experience while in space). Stein explained that because of the decrease in gravity, astronauts often have trouble telling up from down while in space. Stein said this feeling and most space sickness goes away after the first few days.

Stein closed his presentation by explaining the effects that micro-gravity have on the muscular and skeletal systems of human beings that might be in space for an extended period of time.

Afterwards Stein opened the video-conference up for any questions. The students also heard discussion on careers they might embark upon at NASA once their education is complete.



Courtesy photo

Todd County Middle School teacher Billy Beesly stands in front of an escape pad at NASA. Beesly recently attended a NASA Langley NES Leadership Academy.

TCMS teacher attends NASA Leadership Training

Fifteen School Administrators from across the United States were selected to attend the NASA Langley NES Leadership Academy in Newport News, Virginia. The NES (Nasa Explorer Schools) involve 150 schools from around the country that have been selected by the National Aeronautics and Space Administration. These schools have partnered with NASA to have their students become more involved in Science, Technology, Engineering, Mathematics, and Geography (STEM-G) learning.

The workshop included hands on uses of technology and advanced communications. A primary goal was the emphasis on "Inquiry-Based" learning. Another objective of the training was the implementation of Distance Learning Networks (DLN) and the collaboration with NASA scientist from the four corners of the United States. Oklahoma State University cooperated with the educational phases of the workshop offering support and graduate credit for these administrators.

Todd County Middle School is in the second year of their Nasa Explorer School experience. Billy Beesley is the onsite school administrator for the program and was selected to attend this training representing the midwestern states. The Leadership Academy held was the first of its kind organized by NASA.

Teachers to experience zero gravity

By Steve Smith Times Staff Writer
Published: Friday, May 5, 2006 11:53 AM CDT
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TOWANDA - Michelle Nibarger can remember being out at night with her dad while he pointed out the different constellations in the night sky and noted their names.

"I always thought he was really smart," she recalled.

Merle Craig can remember the times he would sit with his dad for hours at a time while they were on fishing trips.

"Sometimes you don't know what to say to your dad," he recalled - but then, he said, he could look up at the stars and start forming pictures and patterns in the night sky above him.

Merle Craig, at left, and Shelly Nibarger, teachers at Circle High School, will be joined by former CHS and now Butler Community College instructor Dan Mattern in taking part in a unique weightlessness experiment program through NASA's Johnson Space Center. - photo by Steve Smith

Nibarger and Craig are teachers at Circle High School. Nibarger teaches math, while Craig is a science instructor.

On Wednesday they left for the Johnson Space Center in Houston, where they will be getting a chance to feel for themselves the weightlessness of those who venture into the skies Nibarger and Mattern have gazed up into.

They are part of a three-member team - one of just six across the United States - which will be conducting experiments in "zero gravity."

As part of a celebration of the "World Year of Physics" their team was selected to travel to Houston, where they will test student-designed and built experiments.

The third member of their team will be Dan Mattern, who teaches physics at Butler Community College and who formerly taught physics, math and astronomy at CHS.

In 1905 Albert Einstein published three papers so important to science that physicists called it the "Miracle Year."

Eldorado Times article

The mission Nibarger, Craig and Mattern will be embarking on was originally scheduled for September of last year, to celebrate the 100th anniversary of Einstein's discoveries.

However, due to setbacks created by Hurricane Katrina and aircraft maintenance schedules they will be flying this week.

NASA; the World Year of Physics; the American Association of Physics Teachers; and the American Physical Society selected six proposals from high school students and teachers nationwide for experiments to be flown on a C-9 transport plane known as the new "Weightless Wonder" by NASA and also dubbed the "Vomit Comet" by the press and civilian passengers.

The modified C-9 transport is used to conduct scientific tests and to train NASA astronauts.

A similar plane was used to film scenes of weightlessness for the movie "Apollo 13" starring Tom Hanks and Kevin Bacon.

The theme for the experiment to be conducted by Nibarger, Craig and Mattern is "The Motion and Mathematics of Objects in Microgravity."

It will focus on the groundbreaking works of Sir Isaac Newton's laws of physics.

The experiment will explore how objects move in the zero-gravity environment of space.

It will subsequently enable the teachers' students to explore the physics of zero gravity by analyzing the motion of several objects.

Students will be able to use Newton's laws of motion and principles of mathematics to calculate such things as distance, velocity and acceleration, and compare these motions to environments experienced on earth.

After their arrival today at NASA's Johnson Space Center Nibarger, Craig and Mattern will spend several days preparing for their flight and exploring NASA facilities.

They will be performing their experiments high above the Gulf of Mexico as the C-9 conducts a series of parabolic maneuvers which will create multiple periods of reduced gravity.

Each parabola of the mission gives the crew, scientists and media about 25 seconds of weightlessness to conduct research and perform experiments.

Each flight does about 30 parabolas before returning to base.

During the flights, experiments will be performed and data collected (both manually and through being videographed) to be analyzed by math and science students.

Information collected will be used to reinforce existing physics laws and increase student interest in math and science while celebrating the "Year of Physics."

To get primed for the experience by the local teachers, CHS has been working with Rebecca Cutri-Kohart, who served as their NASA mentor.

Cutri-Kohart works as a flight controller in the Johnson Space Center's flight design and dynamics division.

She will be joining the team on its flight.

"Through their experiments and teachers, students can discover and and understand another world - the world of physics," said Donn Sickorez, university affairs officer for the space center's reduced gravity program.

"After all," Sickorez said, "it's physics that enables the plane to create such a unique learning environment."

Two years ago this coming fall, Nibarger recalled, NASA announced the 2005 "National Year of Physics" competition through which teachers could submit proposals for projects to be performed under weightless conditions.

Craig said his and Nibarger's journey to Houston started with Mattern, whose submitted proposal was selected and who asked him and Nibarger if they would be interested in joining him.

"He (Mattern) has always been really interested in space" and taught astronomy at CHS, Craig said, and even bought a book about rocketry science for him and Nibarger.

Algebra teachers "work with formulas all the time," Nibarger said, and through her upcoming experimenting "we're exploring some of the basic formulas of physics to see how they apply in a weightless condition."

Hopefully, she said, she will bring back data to share with students with regard to how the gravity pull of earth differs from the the conditions aboard the C-9.

From a biology teacher's view, Craig said, "we've talked in my classes about how weightlessness, or microgravity, affects the body by changing blood pressure and the size of the heart and eventually causing bones and muscles to deteriorate."

That, he said, has spurred the interest of his students with regard to what happens to animals under weightless conditions.

Actually, Craig said, it was CHS students who "started from scratch" last school year designing the experimentation project his team will be carrying out.

"They did a lot of problem solving, which is something we need to stress more of," he said.

Area science teachers to go to NASA

RANDY FOGG

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TOWANDA - Two Circle High School teachers, and a former CHS instructor now at Butler Community College will conduct an experiment developed by their students aboard NASA's "Weightless Wonder" aircraft next week.

NASA, the World Year of Physics, the American Association of Physics Teachers and the American Physical Society selected six proposals from high school students and teachers nationwide for experiments to be conducted aboard a C-9 aircraft.

"We're flattered that we have the opportunity," math teacher Shelly Nibarger said. "It's a chance of a lifetime."

Circle science teacher Merle Craig and Butler instructor Dan Mattern, along with Nibarger, were expected to arrive Thursday, May 4 at NASA's Johnson Space Center in Houston.

The school's experiment - "Mathematics of Microgavity" - will explore how objects move in the zero-gravity environment of space.

The teachers explained that the experiment would involve a clear plastic tube that will have a motorized fan on one end. Three balls of varying size and weight will be placed in the tube. One time the tube will be allowed to float in space, while another time the tube will be attached to the aircraft's floor. The distance and velocity that the balls travel will be measured.

"We wanted to incorporate math and physics together," Mattern said.

Craig noted, "The students did a lot of work on it. They did a lot of problem-solving."

The modified C-9 transport, where the teachers will conduct their experiment, has been used to train astronaut. The plane has been called the "Vomit Comet," because the majority of the passengers become ill when the pilot flies the plane in roller coaster-like patterns.

The aircraft will give passengers the feel of space as it conducts a series of parabolic maneuvers above the Gulf of Mexico, creating multiple periods of reduced gravity.

"I think it's going to be great," Craig said. "I'm hoping I'm not the first to lose it."

Each parabola of the mission gives the crew and scientists about 25 seconds of weightlessness to conduct research and perform experiments. Each flight does about 30 parabolas before returning to base.

The teachers have been working with Rebecca Cutri-Kohart, who has served as their NASA mentor. She has worked as a flight controller in the Flight Design and Dynamics Division at the space center, and she will join the teachers on their flight.

Andover Journal Article

WVU Engineering Students Fly on NASA Aircraft

Most people can only imagine what it feels like to be an astronaut floating freely inside a spacecraft. Six West Virginia University engineering students have experienced this at NASA's Johnson Space Center in Houston. The students are members of WVU's Microgravity Research Team, one of only 65 undergraduate student groups nationwide to be invited to take part in scientific research in a reduced gravity environment.

Students designed and constructed an experimental apparatus to study the behavior of the phenomenon known as the circular hydraulic jump under conditions of microgravity. In simple terms, when you wash a dish in a sink, the stream of water hits the plate, spreads out in a thin layer and undergoes an abrupt increase in depth (hydraulic jump) as it flows outward from the center of the stream.

Between July 19-29, the team tested the apparatus aboard NASA's C-9 "Weightless Wonder" aircraft, which produces weightlessness 25 seconds at a time by executing a series of about 30 parabolas – a steep climb followed by a free fall – over the Gulf of Mexico. During the free falls, students were able to gather data in the unique environment and experience how an astronaut feels while floating in space.

Following the flight, the group is now analyzing the experiment's effectiveness, evaluating scientific findings, drawing their conclusions and will provide the results to the national NASA Reduced Gravity Student Flight Opportunities Program. The WVU experiment – selected from more than 100 proposals across the nation – could result in a way to better cool things in space such as electrical equipment, said Jason Gross, a student team member.

Members of the Microgravity Research Team are: Adam Feathers, a senior civil engineering major from Newburg; Jackie Grimes, a junior aerospace engineering major from Sewickley, Pa.; Jason Gross, a senior mechanical and aerospace engineering major from Morgantown; Kerri Phillips, a senior aerospace engineering major from Weirton and 2006 Goldwater Scholar; Tyler-Blair Sheppard, a graduate student in mechanical engineering from Charlton Heights who received his bachelor's degree from WVU in May; and Tristan Wolfe, a junior aerospace engineering major from Morgantown. The team is advised by John Kuhlman and Donald Gray, professors in WVU's College of Engineering and Mineral Resources.

During the free falls, students were able to gather data in the unique environment and experience how an astronaut feels while floating in space.

PREPARING FOR FLIGHT
John Kuhlman, far left, professor of mechanical and aerospace engineering, discusses an experiment with a few members of the WVU Microgravity Research Team (left to right) - Tristan Wolfe, Jason Gross and Tyler-Blair Sheppard. The team designed and constructed an apparatus to fly aboard NASA's "Weightless Wonder" aircraft in Houston.

Weir High graduate shares NASA experience

By ANGEL RAE HILL
Staff writer

West Virginia University student and Weir High graduate Kerri Phillips is living a dream come true.

She worked for NASA last summer on unmanned vehicles and is planning to work with them again on two different projects. She recently shared her NASA experience with a group of Weir Middle students.

"Kerri was a student at Weir Middle and Weir High not too long ago, and look at what she's doing now," Weir Middle teacher Chuck Zarnoch said. "Girls, if you want to be an engineer, this is the time to do it."

Phillips visited Weir High and Weir Middle during her school's spring break to talk about NASA and engineering with the students. She said NASA likes its college students to reach out to the high schools and middle schools in their area.

Phillips is a junior majoring in both aerospace engineering and mechanical engineering, and she hopes to work for NASA or Northrop Gruman Unmanned Vehicle Systems after graduation.

"I also want to be an astronaut some day," Phillips said. "Right now, I'm a member of the WVU Microgravity Research team, and we were selected by the NASA Reduced Gravity Student Flight Opportunities program to fly aboard the weightless wonder, a C-9 plane in Houston, Texas, this summer."

She said the plane also is known as the vomit comet because of its nature. Phillips explained the plane travels to a high altitude, goes into a free fall and repeats the action over and over again for two hours. Phillips' release stated her team submitted a proposal to NASA for their research on jet impingements and the circular hydraulic jump that is affected by reduced gravity. They will gather data for their research while flying on the vomit comet. Phillips is excited she was selected as part of the flight team for the C-9 plane.

She and her teammates also will continue their work on unmanned vehicles for NASA. Phillips explained that unmanned vehicles can go places where people can't, and they are controlled by computers. The vehicles send information back to the controllers, and the vehicles are used in ocean and space exploration expeditions. The release stated she worked for the NASA Goddard Space Flight Center last summer on an autonomous underwater vehicle. She is conducting the research with three other graduate students. She said the vehicle eventually will be used to explore Europa, one of Jupiter's moons. Phillips said the the project is a big task and a challenge.

"I'm not used to working with such expensive equipment," Phillips said. "It's been a great opportunity."

She said the experience allowed her to meet other students across the country, and WVU had the largest representation with five students at the center. Phillips said her school has a NASA Space grant, and it allows students to work with NASA in the summer.

She shared some of her other experiences with NASA during the summer and passed around a piece of insulation.

"It's really light-weight, but heat won't transfer through it," Phillips said. "I got bored one day in my room and tried it on a curling iron set on high. The heat didn't go through it."

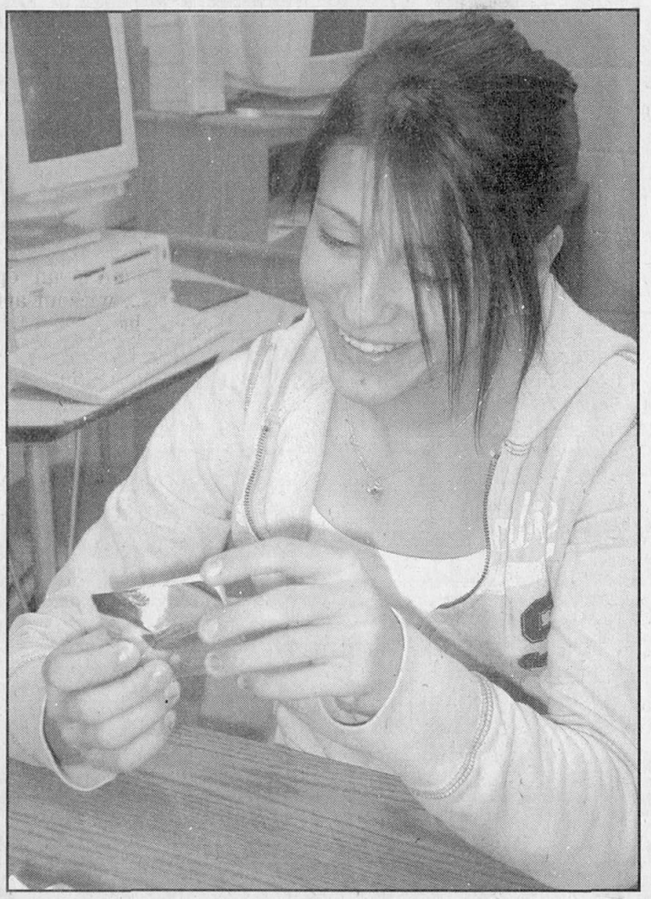
She said the insulation is used on satellites launched in space to protect them from extreme temperatures. Phillips said she had a chance to attend an unmanned vehicle conference where different companies displayed their products, and the conference cost $1,000 per ticket.

She also encouraged the students to excel in science and math and consider engineering as a career. Phillips said engineers get to solve problems, and there are different kinds of engineers. Zarnoch said the field is open right now, especially to females.

Angel Rae Hill can be contacted at ahill@weirtondailytimes.com

Angel Rae Hill

UNFORGETTABLE EXPERIENCE – West Virginia University student and Weir High graduate Kerri Phillips shared her experience with NASA with a group of Weir Middle School students. She worked for NASA last summer and is planning to work there again on two different projects.



Angel Rae Hill

HEAT RESISTANT – Weir Middle student Samantha Buffo examines a piece of insulation used to protect satellites and pieces of equipment launched in space. West Virginia University student and Weir High graduate Kerri Phillips said no heat will transfer through the insulation.

Purdue students complete research in NASA zero-gravity flight

WEST LAFAYETTE, Ind. — Original fluids research performed by a team of Purdue University students when they flew on NASA's reduced-gravity aircraft in Houston could help support life in space.

The students, who are participating in NASA's Reduced Gravity Student Flight Opportunities Program, flew on the C-9B zero-gravity aircraft affectionately known as the "vomit comet" in June as one of six Purdue teams to fly on the airplane this year. The plane is used by the space agency to induce weightlessness for experiments and astronaut training.

Purdue students in NASA's "vomit comet"
Download photo
caption below

"The selection process for flying in the vomit comet is very competitive, and this team is one of just 48 from universities from across the nation that were chosen to participate," said Steven Collicott, an associate professor in Purdue's School of Aeronautics and Astronautics and the team adviser. "One of the main considerations is the type of experiment the students propose to conduct during the flight. The students have to design and fabricate the experiments to meet NASA's safety regulations."

The plane flies in steep up-and-down parabolic maneuvers, producing periods of weightlessness lasting about 25 seconds during downward "parabola" or downward maneuver, giving students scant time to ready their experiments for the next parabola.

The team designed an experiment to analyze how liquid droplets impact and wick in narrow channels in a "grooved wall." Researchers need to study how fluids behave in zero gravity in order to design more efficient life-support systems that recycle water and air. The grooved wall is a structure with no moving parts that separates air from water in the recycling process.

"We need to learn more about how droplets adhere to the grooved wall and how they move within these grooves," Collicott said. "For example, does this behavior depend on droplet velocity, droplet size, the size of the grooves and so on?"

Brandon Wampler, a senior in the School of Aeronautics and Astronautics from Kentland, Ind., led the student team.

"We've been working on this experiment since the fall of '05," said Wampler, who earned his pilot's license this year. "It could be important for space missions because it will help develop a system to recycle water for drinking, cooking and other uses.

"Now that we have finished our flight, we have three months to write a report on our research findings."

The experimental hardware, which resembles a fish tank, must be built properly to make sure there are no leaks or breakage under extreme variations in pressure and gravity.

"We usually get about 30 or 40 weightless periods in each flight, and this team went up twice," Collicott said. "If you add all those periods up, you get approximately a half hour of accumulated time in weightlessness during which to complete your research. It's a unique opportunity to run an experiment in weightlessness."

The students, all of whom are undergraduates, completed their research projects while taking Collicott's "zero-gravity flight experiment" class.

The plane varies the steepness of its maneuvers, and this varying steepness produces different degrees of weightless. Most of the maneuvers reproduce the weightlessness experienced by space shuttle astronauts flying in orbit around Earth, but a few of the maneuvers reproduce the gravity on Mars and the moon.

Purdue's involvement in the program began in 1996, when students approached Collicott because he specializes in research and engineering on low gravity fluids topics.

"It was so good for our students that first year that I did it the next year and the next, and then I created an upper-level undergraduate course for students to design zero-gravity flight experiments specifically for the NASA program," Collicott said. "So it's actually part of our curriculum now. It's a wonderful team-based, hands-on multidisciplinary experience."

Collicott is one of three Purdue faculty members with vomit comet teams

flying this year. The others are Ivana Hrbud, an assistant professor in the School of Aeronautics and Astronautics; Ronald Reifenberger, a professor in the Department of Physics and a member of Purdue's Center for Sensing Science and Technology; and Arvind Raman, associate professor in the School of Mechanical Engineering. Six Purdue teams have been accepted to fly in the program this year. Collicott has three teams, Hrbud has two teams, and Reifenberger and Raman are co-advising one team. Hong Tan, an associate professor in the School of Electrical and Computer Engineering, has taken a Purdue team on a research flight in the past.

Hrbud advised teams that flew in March and April. The April team conducted an experiment that studied "propellant management devices as fuel systems."

"It was a wonderful opportunity for the students to work as a team because they must design the experiment, write the proposal and then conduct the experiment in low-gravity conditions," said Hrbud. "These types of skills, in addition to what students learn in the classroom, will give them an extra edge when they enter the professional world."

The March team conducted an experiment that focused on the mathematical modeling of "slosh effects in diaphragm propellant fuel tanks."

"Our experiment had never been accomplished, and it took us three years to prepare for the flight," said Brad Crosson, an aeronautics and astronautics engineering student from Roselle, Ill., who was a member of Hrbud's team that flew in March. "We collected some very interesting data and are working on our report now."

Learning more about the behavior of fluids in fuel tanks is important because sloshing fuel can cause satellites to lose control. The team's experiment measured the movement of liquid fuel inside "diaphragm propellant tanks," which are used on satellites and spacecraft. The experiment was designed to create reliable mathematical modeling for measuring the sloshing effect of fuel with the overall aim of improving efficiency and cost savings for space-related industries.

The Reifenberger-Raman team will fly in mid-August and research ways to test and monitor gas contaminants in a spacecraft and the effects of various gases on astronauts' health. Their project, "Effects of microgravity on microcantilever-based sensing in gaseous and liquid environments," is being studied at Purdue under the guidance of the NASA-funded Institute for Nanoelectronics and Computing.

Purdue recently passed a milestone, when the 100th student flew on the

airplane. Since 1996, 32 student teams have flown in the program, including 21 advised by Collicott. To date, 128 Purdue undergraduates have flown, spending more than 27 hours in zero-gravity, or the equivalent of 16 space shuttle orbits around the Earth, 57 minutes on the moon or one hour and 15 minutes on Mars. During those flights students operated 32 experiments.

The research projects help to prepare students for engineering jobs by teaching them to design and build experiments in teams with different students specializing in specific aspects of the experiment.

"This is organized just like NASA teams that design and build spacecraft," said Collicott, who teaches the course at his Purdue University Aerospace Sciences Laboratory. "The course typically attracts students who have ambitions to be astronauts. I usually choose the leader for each team, and this student is responsible for the entire proposal. It's a weighty position. It demands someone who is bright, dependable and writes well."

The experience provides students with an advantage in the job market.

"A hiring supervisor might have a stack of a hundred resumes for one job opening," Collicott said. "This type of experience helps our students stand out. It shows they have worked in a complex aerospace program. They are aware of both leadership and teamwork skills. If students are headed for graduate school, this is great research experience. If they are headed for industry, they have been introduced to concepts of manufacturability and design, and they've been introduced to issues of scheduling of fabrication."

Expenses for each team total about $6,000 and are paid for with industry contributions, university funding and by the students themselves.

"Our biggest expenses are not equipment, but expenses related to traveling to Houston for a week to 10 days," Collicott said.

The projects also include a component for outreach to motivate and inspire schoolchildren from kindergarten through 12th grade.

"Our students have visited hundreds of schools over the years," Collicott said. "They love to go back to their junior high and high schools and give talks."

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PHOTO CAPTION:
A team of Purdue University students conduct an experiment in NASA's reduced-gravity aircraft in Houston as part of NASA's Reduced-Gravity Student Flight Opportunities Program. The flight was one of six that Purdue students took this year. Facing the camera from left are Kate Bonamici, a Fortune Magazine reporter who flew with the team; Kathryn Bradley, a Purdue senior in aeronautical and astronautical engineering; and Andrew Maurer, a senior in aeronautical and astronautical engineering and physics. In the background are NASA officials participating in the flight. (Photo provided by NASA)

To the News Service home page

UW-Madison
Summer 2006

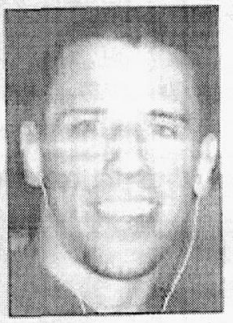
Brookfield Central grads to fly high

NASA will let them do a zero-gravity study

By Adam Kirby
Staff Writer

All his life, Pete Penegor has wanted to be an astronaut.

He isn't quite ready to make that giant leap just yet, but the 2004 Brookfield Central High School graduate will take one small step toward that goal next month.



Lipinski

Penegor

Penegor, 20, is scheduled to fly aboard a NASA zero-gravity simulator next month to run an experiment designed by his team at the University of Wisconsin-Madison.

The team, which also includes 2003 Brookfield Central alumnus Doug Lipinski, travels to the Johnson Space Center in Houston on Aug. 9.

"This is just awesome compared to anything else I've ever done," said Penegor, who is entering his junior year as an engineering, mechanics and astronautics major. "Once I get down there, I want to talk to as many people as possible."

Penegor and three other UW students will ride in a C-9B, a cargo plane that flies in a parabolic pattern to simulate the weightlessness of space. They will be testing the effects of capillary action in zero gravity.

Capillary action is the phenomena by which liquids climb the edges of narrow cylinders, like test tubes, against the pull of gravity.

In general, the experiment is designed to better understand the properties of capillary action in weightlessness.

Lipinski, who is entering his senior year at UW,

CONTINUED ON PAGE 16

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is the project team leader. He'll be joining Penegor in Houston, though Lipinski is not slated to ride in the C-9B — he did it last summer, when the UW team experimented on the effect of weightlessness on liquids of varied densities.

The experiment itself wasn't particularly successful last summer, Lipinski said, but the ride was a memorable one. Few people get to experience weightlessness, and Lipinski is frequently asked to explain what it was like.

"I felt very disoriented, like I had been spun in a circle a bunch of times and then just let go," said Lipinski, 21. "It's really hard to describe."

"The plane has the nickname of 'Vomit Comet,' so there's a belief that everybody is going to get sick, but they give you pretty heavy motion-sickness medication."

Over the course of an hour, occupants of the plane experience about 11 minutes of weightlessness.

The UW research team — nicknamed CAP Zero G, for capillary zero-gravity — submitted a 39-page proposal to NASA last fall. The space agency liked the experiment idea enough to bring the 12-member team to Houston to test it out.

Hundreds of teams at universities nationwide apply to NASA each year to conduct zero-gravity experiments, and roughly four dozen are selected.

The CAP Zero G Web site is at homepages.cae.wisc.edu/~rmzerog.

THE EXPONENT ONLINE

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1 Weightless experience aids Purdue research opportunities

By Phaedra Ellington
Summer Reporter

It's like a lot of things, but not like any one thing.

That is how Brandon Wampler described the ride aboard the C-9B zero-gravity aircraft that is affectionately known as the "vomit comet."

"It's like being on a roller coaster, or going over a big hill," said Wampler, a senior in the School of Aeronautical and Astronautical Engineering. "But there are no seat belts, so you don't get the feeling of your stomach floating because your whole body's floating."

Julian Phillips, a Purdue alumnus and FOX News anchor in New York, flew in the craft along with Wampler's team. He didn't feel the ride was that of a roller coaster.

"If you think you are going to experience a roller coaster sensation, forget it. You don't feel the ups and downs ... on the ascent, you are glued to your chair or the floor of the plane. Then the zero-gravity takes effect when the plane is about to drop," said Phillips in a e-mail.

Phillips also said being weightless is impossible to explain to someone who hasn't experienced it.

"There is simply nothing like it," said Phillips. "(It is) a total feeling of freedom and serenity as far as I'm concerned. (I) would do it again in a heartbeat."

The team was one of six from Purdue which were allowed to travel to Houston to ride the vomit comet. Wampler's team was in Houston from May 31 to June 11. The purpose of the trip was to see how experiments the teams had worked on would also work in a weightless environment.

Steven Collicott, a professor in aeronautics and astronautics, said the experiment was called passive phase separation and looked at how water droplets interacted with a grooved wall in a zero-gravity situation. The team hoped the water would collect on the wall and not bounce off or splash.

"It's a method to separate liquid and gasses," said Collicott. "It's useful in life support systems."

Wampler said the water did collect on the grooved wall.

"If you have water hit something fast enough, you get splashing; the size of the droplet determines if it would splash off or stay," said Wampler. "We couldn't get (the drops) to go fast enough to splash. They were sticking better than we thought. It's what we wanted."

Collicott added teams selected for NASA's Reduced Gravity Student Flight Opportunities Program are chosen by NASA.

"You have to submit a proposal," said Collicott. "(Since we entered the program) 35 teams have won and a little more than 35 have applied. Purdue students do good work."

The recent team who flew in the craft were Wampler, the team captain; Jeff Boyd, Joseph Fallon, both seniors in the School of Aeronautical and Astronautical Engineering; and Paulina Rabczak, a junior in the School of Aeronautical and Astronautical Engineering.

Those who worked on the experiment but didn't travel to Houston were Ryan Mulligan, Dan Pothala, and Kautilya Vemulapalli, all juniors in the School of Aeronautical and Astronautical Engineering.

STUDENTS PREPARE FOR NASA TEST

Embry-Riddle aerospace engineering students James Ristow (left), 21, Abraham Chavez, 26, Janiece Lorey, 21, Yadira Chatman, 32, adviser professor Sathya N. Gangadharan, and Jon Rossman Jr., 22, check out the project they will take on a NASA near-zero-gravity flight to test the impact of fuel sloshing about in tanks in space. In the plexiglass box is a PVC pipe covered with foam that will spin in microgravity. Inside the pipe is a water-filled sphere that will be put on the research aircraft in Houston, where the students will study the problem. **Story, D7**

BARBARA V. PEREZ/ORLANDO SENTINEL

BARBARA V. PEREZ/ORLANDO SENTINEL

Senior aerospace engineering students James Ristow (from left), Abraham Chavez, Yadira Chatman, Jon Rossman Jr. and Janiece Lorey discuss the 'fuel slosh' project they are working on for NASA at Embry-Riddle Aeronautical University. The students will go to Houston to run tests on their work.

STUDENTS EARN A RIDE

NASA to take group on near-zero-gravity flight for test

By DENISE-MARIE BALONA
SPECIAL TO THE SENTINEL

DAYTONA BEACH — A team of five Embry-Riddle Aeronautical University students has been selected by NASA to conduct its own experiment aboard an aircraft that replicates near-zero gravity at Johnson Space Center in Houston.

The students will take a local high-school student along as well. An essay contest that ends this month will help them decide who gets to be a part of their ground crew.

The Embry-Riddle team was one of 25 nationwide selected to participate in NASA's annual Reduced Gravity Student Flight Program. Most of the team's members will travel to Texas at the end of the month and spend 10 days training, undergoing physiological tests and touring the facilities that make up Johnson Space Center, where astronauts train.

They also will fly on a modified C-9B aircraft, the same one that scientists use to conduct experiments in almost weightless conditions. As the research plane flies parabolic curves to simulate weightlessness, the students will have 20 to 30 seconds at a time to conduct their experiment, NASA officials said.

Four of the college students, all seniors and aerospace-engineering majors, will use a model spacecraft they built to determine how the sloshing of fuel affects the vehicle's ability to maintain its flight path.

Often, when a spacecraft stack — a rocket and its spacecraft — enters a spinning phase while in space, the fuel moves

PLEASE SEE EDUCATION, D8

Students win near-zero-gravity test ride

EDUCATION FROM D7

around so much in its tank that the whole stack wobbles. It's a long-standing problem that could lead to mission failure, said the team's leader, James Ristow, 21, who studied the topic while interning at Kennedy Space Center at Cape Canaveral two summers ago.

This experiment will be unlike others done on fuel sloshing, he said.

"The reason that's important is because it will actually be a test in microgravity rather than a test on the ground with gravity," Ristow said. "The tests we do now are tests being done with normal gravity."

The students will try to measure how much the wobbling grows over a short time and how far the craft wanders from its intended path. This is data that could be used by spacecraft designers, for example, to figure out a better location for fuel tanks, Ristow said.

Sathya N. Gangadharan, an engineering professor at Embry-Riddle who is the team's faculty supervisor, said the NASA program gives students a chance to see and feel what it's like to work in the national space program. They get to collaborate on real-world problems.

The trip to Houston also gets them excited about research.

"That excitement, it takes them a long way and it's a motivation to stay in the space field," Gangadharan said.

That's what Dawn Leveritt, the program's coordinator, is hoping for. The whole goal of the program, she said, is to encourage students to pursue careers in science, technology, engineering and math.

Once they finish the program, they will return to their communities and share their experiences, which could spark other students' interest, too, Leveritt said.

Team member Abraham Chavez, 26, looks forward to being able to tell people what it's like to float around in space.

"Once in a lifetime, a person gets to experience something like this. It's not cheap, and it's not accessible to everybody. It's the closest thing to being an astronaut, let's put it that way," Chavez said, helping to demonstrate the team's project in a university laboratory last week. "I think everybody in here, even Dr. G [Gangadharan], would like to be an astronaut."

Before the team leaves March 29, the members will choose a high-school student to join them.

Students throughout Central Florida have until March 8 to submit an essay of 300 words or less explaining why they want to help with the project and pursue careers in technical fields using math and science.

Entries should be e-mailed to erau.nesst@gmail.com and include student's contact information, age, grade level and name of school.

Ristow said the winner, who gets a free flight to Texas and lodging, will be notified by March 13.

NEWS RELEASE

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Embry-Riddle Students to Conduct Fuel-Slosh Experiment on NASA Aircraft

Posing with part of the experiment are (left to right) Yadira Chatman, James Ristow, Jon Rossman Jr., Janiece Lorey, Dr. Sathya Gangadharan, and Abraham Chavez.

Daytona Beach, Fla., Feb. 8, 2006 -- A student team from Embry-Riddle Aeronautical University has been selected by NASA to conduct an experiment of their own design aboard the space agency's C-9, a research aircraft that flies parabolic arcs to simulate weightlessness.

The team, which will participate in NASA's Reduced Gravity Student Flight Opportunities Program from March 30 to April 8, consists of five Aerospace Engineering seniors: team leader James Ristow, fliers Abraham Chavez, Janiece Lorey, Jon Rossman Jr., and alternate flier Yadira Chatman.

As part of the outreach requirement for the proposal to promote mathematics and science in schools, the team will conduct an essay competition among local high schools. The winner of the competition will accompany the team to Houston as a member of their ground crew.

Yadira Chapman, left, and Janiece Lorey are restrained by foot straps as they and their experiment enter weightlessness on NASA's C-9 aircraft.

The title of the Embry-Riddle project is "Nutation Experiment Slosh Simulation Test: Prediction of Spinning Spacecraft Nutation Caused by Fuel Slosh Energy Dissipation."

"Fuel slosh has been a long-standing problem for spinning spacecraft," says team leader Ristow. "Sloshing fuel in the third-stage spacecraft stack dissipates spin energy and causes the stack to nutate or 'wobble,' which may lead to mission failure."

The experiment will test different types of propellant tanks (a sphere, a cylinder, and a flexible walled tank) filled with water for their susceptibility to dissipate energy from a spinning mock spacecraft. The students will also test slosh simulation prediction methods.

Abraham Chavez, left, and team leader James Ristow pause for a photo before their flight on the C-9 begins.

"A predictive simulation that takes fuel slosh into consideration would save time and money in the initial phase of spacecraft design," Ristow says.

Held annually at Ellington Field near the Lyndon B. Johnson Space Center in Houston, the Reduced Gravity Student Flight Opportunities Program has the goal of increasing the number of technical professionals graduating from U.S. colleges and universities. A review panel of NASA scientists and engineers selected student teams from a substantial pool of applicants across the nation to participate this year.

"I'm proud that Embry-Riddle students have been chosen for this prestigious program," says Dr. Sathya Gangadharan, an engineering professor at Embry-Riddle who serves as the team's faculty supervisor. "They've worked very hard to develop an

experiment that addresses one of NASA's real-world challenges."

During the first week of the NASA program, the students must pass physical examinations and will receive physiological preflight training. During the second week, the students will fly in the C-9, conducting their experiment in weightlessness as the aircraft performs 30 parabolic arcs, including two that simulate gravity on Mars and the moon. After the flights, the students will take part in debriefings and reviews.

Embry-Riddle Aeronautical University, the world's largest, fully accredited university specializing in aviation and aerospace, offers more than 30 degree programs in its colleges of Arts and Sciences, Aviation, Business, and Engineering. Embry-Riddle educates more than 32,000 students annually in undergraduate and graduate programs at residential campuses in Prescott, Ariz., and Daytona Beach, Fla., through the Extended Campus at more than 130 centers in the United States, Canada, Europe, and the Middle East, and worldwide through distance learning.

Administrative Offices: 600 South Clyde Morris Blvd., Daytona Beach, FL 32114

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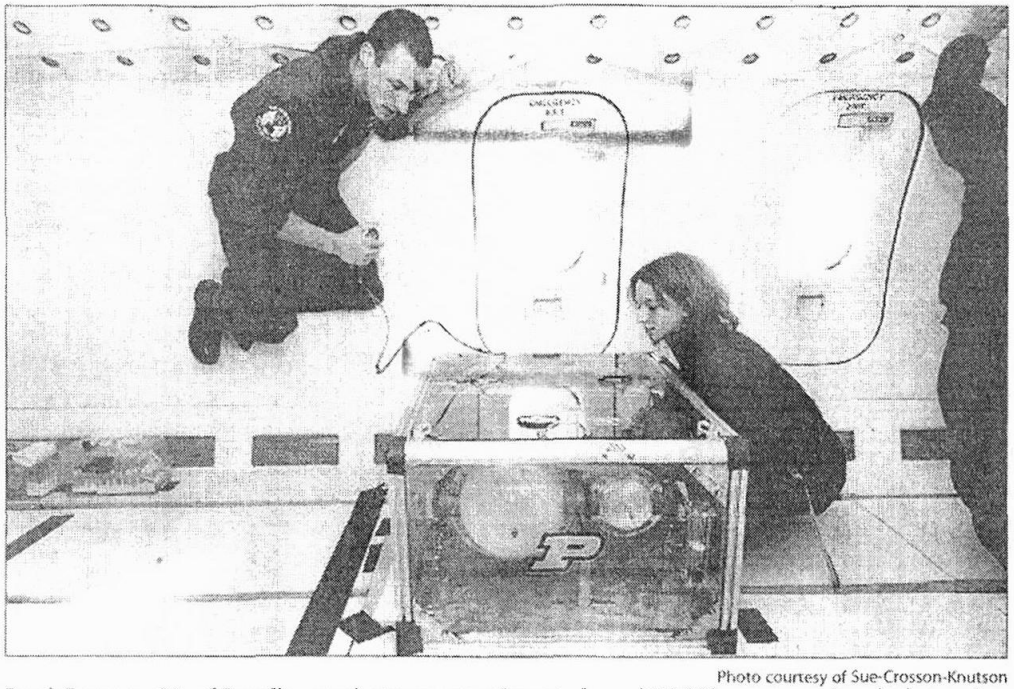

Photo courtesy of Sue-Crosson-Knutson

Brad Crosson, 23, of Roselle, conducts an experiment aboard NASA's zero-gravity airplane, also called the "Vomit Comet," while studying last month at the Johnson Space Center in Houston.

Free-floating for rocket science

Roselle resident Brad Crosson may not have left the planet. But in the spirit of "Star Trek," he has gone where few men have gone before.

A December 2005 aerospace engineering graduate with a master's degree from Purdue University, Crosson, 23, is now in flight training as a pilot for the U.S. Air Force.

Last month, he and fellow Purdue student James Kallimani, 25, of Gary, were part of 50 teams of students selected nationally to participate in experiments conducted on a C-9B zero-gravity airplane, better known to the rocket-scientist set as the "Vomit Comet."

At the NASA Johnson Space Center in Houston, the two science students tested what they called "slosh effects in diaphragm propellant tanks," an experiment that Crosson said he hoped would make satellites of the future more fuel efficient. The real fun, however, was in being weightless.

"The entire experience was amazing," Crosson said. "Only two people out of the whole group got sick. You're going up to 40,000 feet in this [simulated] plane, and then falling at the same speed of gravity for 10,000 feet. It's like having the ground push you up and away. I felt like Spider-man crawling around the walls."

David Sharos

HARVEY

THE BEAT NEAR WEST
AROUND WESTERN COOK AND EASTERN DUPAGE COUNTIES

ROSELLE

Sloshing becomes NASA experiment

2 students taking expertise to space center

To some, the words "Vomit Comet" might suggest a rather graphic name for a new roller coaster at Great America.

But for Roselle resident Brad Crosson, 22, and his friend James Kallimani, 23, of Gary, the Comet represents a ticket to ride next month to NASA's Johnson Space Center, where the two Purdue aerospace engineering students will conduct experiments in a zero-gravity airplane. They will be among 50 teams participating Oct. 13-20 in experiments with NASA.

Crosson and Kallimani said their experiment involves "computational modeling of slosh effects in diaphragm propellant tanks."

"One of the better examples is when you take a half full milk jug and slide it across the table. The milk jug will slide for a little bit, and then sometimes it continues to inch across the table as the milk 'sloshes' around inside," Kallimani said. "After the milk stops sliding across the table, the liquid inside settles, and comes to a rest. This is because there is gravity acting on the milk inside it."

In space, the same thing happens inside the fuel tanks of satellites and other spacecraft, Kallimani said, and when a satellite moves, the fuel starts to slosh.

"Our goal is to mathematically model this slosh effect," he said.

David Sharos

DOWNERS GROVE

Summer interns take flight

In June, six teams of Purdue students participated in NASA's Reduced Gravity Student Flight Opportunities Program where they flew on the C-9B zero-gravity aircraft affectionately known as the "vomit comet." The plane is used by the space agency to induce weightlessness for experiments and astronaut training.

"The selection process for flying in the vomit comet is very competitive, and this team is one of just 48 from universities from across the nation that were chosen to participate," says Steven Collicott, an associate professor in Purdue's School of Aeronautics and Astronautics and the team adviser.

The team designed an experiment to analyze how liquid droplets impact and wick in narrow channels in a "grooved wall." Researchers need to study how fluids behave in zero gravity in order to design more efficient life-support systems that recycle water and air. The grooved wall is a structure with no moving parts that separates air from water in the recycling process.

Brandon Wampler, a senior in the School of Aeronautics and Astronautics from Kentland, Ind., led the team.

"We've been working on this experiment since the fall of '05," says Wampler. "It could be important for space missions because it will help develop a system to recycle water for drinking, cooking and other uses."

Purdue's involvement in the program began in 1996.

A team of Purdue students conduct an experiment as part of NASA's Reduced-Gravity Student Flight Opportunities Program. Facing the camera from left are Kate Bonamici, a "Fortune Magazine" reporter who flew with the team; Kathryn Bradley, a Purdue senior in aeronautical and astronautical engineering; and Andrew Maurer, a senior in aeronautical and astronautical engineering and physics. In the background are NASA officials participating in the flight.

http://news.uns.purdue.edu/html3month/2006/060712.Collicott.vomit.html

College notes

Roselle students to take part in NASA experiment

Brad Crosson of Roselle, a Purdue University aerospace engineering student, has been approved by NASA to participate in an experiment on a zero-gravity airplane at the Lyndon B. Johnson Space Center in Houston from Thursday, Oct. 13 to Thursday, Oct. 20.

Crosson is a 2001 graduate of Lake Park High School in Roselle.

Along with Purdue team members, Crosson will travel with his advisor, Aerospace Engineering Professor Ivana Hrbud, to Houston to implement the experiment, Computational Modeling of Slosh Effects in Diaphragm Propellant Tanks. The Purdue team is one of 50 university teams selected nationwide.

Conducted in small propellant tanks, the experiment aims to calculate the movement of liquid fuel inside diaphragm propellant tanks such as those used on satellites and spacecraft propulsion systems. The sloshing of fuel can cause satellites to lose control of their overall motion. Currently, a reliable mathematical model for measuring the sloshing effect of fuel does not exist. By modeling this motion, it will help industries save countless dollars by optimizing their spacecraft.

NASA approved each team for implementation of an experiment on the C-9B zero-gravity airplane, commonly known as the "Vomit Comet." Teams participating in NASA's C-9B Reduced Gravity Student Flight Opportunities Program received approval of their formal proposal and completed a NASA physical.

NASA's Microgravity University participants receive three days of training in Houston before entering the zero-gravity airplane, which includes physiological training and weightlessness training.

Wednesday, April 26, 2006

STATE & LOCA

Engineering students work in zero gravity environment

CHRIS KOOGLE
Staff Writer

A team of students from the mechanical engineering senior design class recently visited NASA Space Center in Florida to conduct an experiment in a zero gravity environment.

The goal of the experiment was to gather data on the effects of entrainment *in microgravity environments*, Daniel Brady, senior in mechanical engineering, said. The students sent in the necessary application to NASA early this semester and were surprised when they were invited to conduct their experiment, he said.

"NASA runs a national program where students can do experiments," Brady said. "It went well. We didn't get the exact results we wanted."

Brady explained that entrainment is simply water droplets shearing off water flow in a pipe. This is important because it has a significant effect on power plants, he said. Entrainment could occur in the boiler of a power plant, if that occurred the droplets would not evaporate, instead the droplets would then impact the turbine blades of the power plant, significantly shortening the life of the blades, he said.

The results they found, Brady said, were interesting because they showed a clear difference between entrainment in zero-g and normal gravity conditions. Brady said the experiment the students performed had only been done in normal gravity previously so these were new results.

"This is important to NASA because if a power plant is to be used in space, it needs to last 10 years or more without needing replacement," he said.

One of the main challenges was programming a computer to know when microgravity starts, and start recording data. This was solved by coding in an accelerometer, Brady said. During the actual flight, most of the experiment ran automatically with the students only required to change the flow rates of water and air. The students did not get *as much data as they had hoped due to* complications in the second flight with the computer, he said.

"The experiment was a success because we recorded good data on the first flight and showed a significant difference between microgravity and normal gravity conditions," Brady said. *"This experiment will be continued for* two more years, and next years class will get the opportunity to fly again and build on the results we collected."

Andrew Macemon, senior in mechanical engineering, said the group could not all fly at once and that feeling zero-g was "weird."

"Two of us were scheduled to fly one day, and two the next, with one alternate. Another university wasn't able to get all of their people to come to Houston, so our alternate Erin Skiba was able to fly," he said. "It wasn't really scary, it was just weird. You would think that your stomach would feel like it was in your throat, like at the top of a roller coaster, but I didn't experience this at all. At the top of the parabola, you would just feel yourself lift off of the floor gradually. It wasn't violent at all."

"The [negative] 2 G's were the toughest to not get sick on. The actual microgravity portion wasn't that hard to get through. Overall, nobody from UT got sick, which is good."

UT students conduct experiments in a weightless

The Daily Beacon 3

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* Photo courtesy Daniel Brady

UT students conduct experiments in a weightless atmosphere.

Figure 30 – Daily Beacon Article, April 26, 2006