

Connecticut Valley  
Spectator  
Jan. 13, 2005

# Dartmouth students to experience weightlessness

By Joseph Cote  
Staff Reporter

**HANOVER** — Four Dartmouth students are preparing for an opportunity of a lifetime. This summer, Dartmouth seniors Eve Russell, Abigail Davidson, junior Jennifer Tonneson, and sophomore Lauren Edgar will fly in NASA's C-9, a plane capable of creating zero-gravity environments, to conduct research that will potentially apply to space travel.

The four students heard in December that their proposal to study postural muscle activation in zero gravity was accepted by NASA. They will travel to the Lyndon B. Johnson Space Center in Houston, Texas, and spend July 21-30 preparing for and flying in the plane before presenting their findings.

Russell, a psychology and brain sciences major from Seattle, Wash., completed an

## **WEIGHTLESS from page A1**

internship with NASA over the summer. She worked at NASA's Jet Propulsion Laboratory at the California Institute of Technology. Davidson also worked for NASA over the summer, interning at the Johns Hopkins Applied Physics Laboratory in Columbia, Md.

Russell said the gist of the proposal is to test a new way for astronauts to avoid muscle atrophy while in space. Now, astronauts avoid postural

muscle atrophy by spending an hour a day on exercise machines, which are bulky and can be used by only one person at a time, Russell said.

Postural muscles are those muscles used for balance and walking, such as the muscles of the lower back and calves, Russell said.

The students' experiment will test whether it would be more efficient for astronauts to exercise using large elastic bands called Thera-Bands,

often used in physical therapy, which would take up less space.

Russell said she and her companions will perform a set of exercises with the bands on earth while connected to electrodes that measure muscle activation while on the ground.

Then they will board the plane, two at a time, and perform the exercises again at zero gravity, while again measuring muscle activation, and

compare the results.

"We need to make sure that the same level is reached at zero gravity," Russell said.

Edgar said the flight takes about an hour and a half and completes 30 parabolas during that time from a height of 35,000 feet.

As the plane dips to about 24,000 feet, the women will experience 20-30 seconds of zero gravity. They will also experience four Gs — four times earth's gravity — as the

plane begins climbing again.

"Oh my gosh, I can't wait," Edgar said. "I've always been interested in space exploration and my long-term goal is to become an astronaut."

"It was great (to be selected) because we worked very hard on the proposal," Davidson said. "It was exciting and surprising. It was just really great. The project sounds great, but to fly is the best part."

After their time in

Houston, the students will give a series of presentations to share their results. There will be presentations at Dartmouth, as well as the women's high schools during semester breaks.

Edgar, also from Seattle, said she and Russell are also planning to present their findings at the Museum of Flight in Seattle.

"A major component is the outreach program," Edgar said.

Rolla Daily News  
August 5, 2005

## STUDENTS RESEARCH WEIGHTLESS WELDING

*This is the first in the "Miners in Space" series about UMR's trip to the Johnson Space Center in Houston, Texas, where students tested welding aboard NASA's "Weightless Wonder."*

Jaime Baranyai  
Staff Writer

HOUSTON — As NASA spent the better part of two years grappling with the foam problem that resulted in the loss of the shuttle Columbia and its crew in 2003, a team of engineering students from the University of Missouri-Rolla was solving problems of its own.

While NASA focused on returning the shuttle to flight, the UMR Miners in Space team put its efforts toward building and designing a welding machine that would work in zero gravity.

For its experiment the Miners in Space designed a machine to test the strength of welds made in a zero gravity environment. The team chose this experiment because welding in a weightless environment will become increasingly important for tasks and repairs needed to be performed in space.

SEE WELDING, 2A



JAIME BARANYAI/ROLLA DAILY NEWS PHOTOS

Above: UMR Miners in Space team members Regan Tackett, left, and Michael Dancer work on the welding experiment the team will test in a zero-gravity environment aboard NASA's "Weightless Wonder." Right: Abbie Stewart, left, and Michelle Rader ready the welding experiment to fly aboard NASA's C-9 aircraft.



## Ten teams participate in zero-gravity experiments

Jaime Baranyai  
Staff Writer

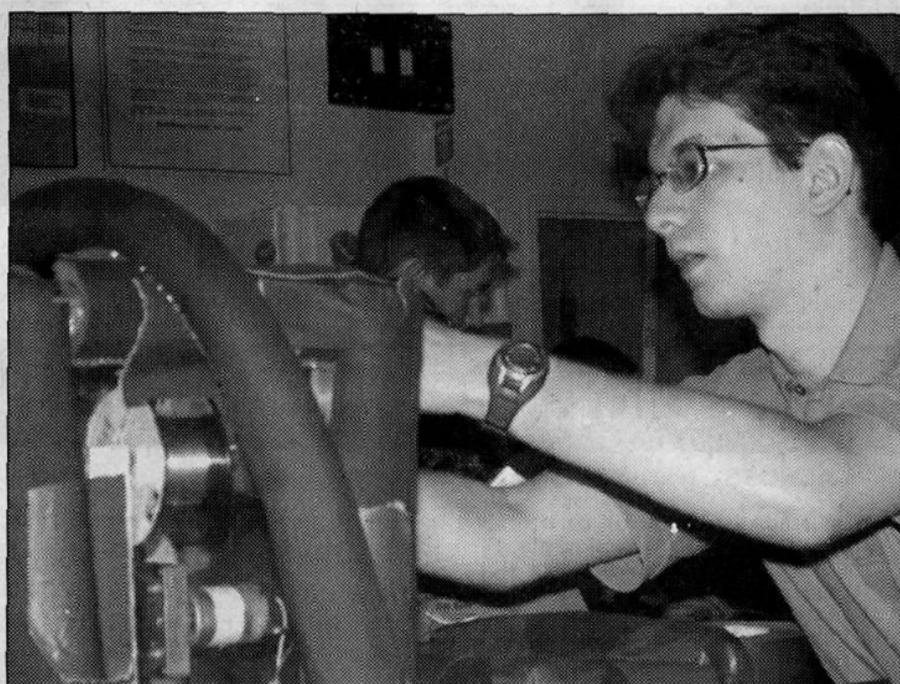
HOUSTON — The UMR Miners in Space joined teams from nine other schools when it participated in NASA's Reduced Gravity Student Flight Opportunities Program at the Johnson Space Center in Houston, Texas.

Flying aboard NASA's C-9 "Weightless Wonder" aircraft, the 10 teams (five at a time) conducted experiments in zero gravity conditions.

As one would expect of college students selected by NASA to participate in the program, they are working on projects that are complex and potentially relevant to the future of space exploration, engineering, science and technology. The experiments are the result of months, in some cases years, of hard work by student engineers who sometimes call upon NASA officials for help. Many of these students may very well be the NASA engineers of tomorrow. The UMR team experimented with welds made in zero gravity. So what were the other teams working on? Plenty.

A group of students from Dartmouth College tested the effects of short, intensive resistive exercises on postural muscles. The team from Michigan Technological University was studying equipment that may improve satellite technology

SEE EXPERIMENT, 3A



JAIME BARANYAI/ROLLA DAILY NEWS PHOTO

David Harris, a ground crew member for the UMR Miners in Space team, puts foam padding on the sharp edges of the welding experiment to prevent possible injury to others during the "Weightless Wonder" flight.

## Students experiment in 'Weightless Wonder'

### CONTINUED FROM PAGE 1

and students from Texas A & M University experimented with fluid dynamics and hydrostatic pressure under microgravity conditions.

Students from Oregon State and Western Oregon universities came with the goal of getting NASA to Mars sooner. To do this the team designed a prototype of a nuclear reactor to simulate how nuclear fuel may be used in space travel. "With the fuel technology we have right now it would take about eight months to get to Mars," said Oregon team member Kathryn King. "We're going to try to find a way to get there in 80 days." Just think, there was a time when going around the world in 80 days seemed a novel idea.

Other experiments tested scientific laws, had fun with the principles of physics, tested new ideas for satellites, studied fire control in microgravity, tested magnetic fields, explored the gravitational effects on cartilage and neurological function, investigated cellular structures and much more.

Too much to digest? Sure.

Too hard to test? Not at all. At least not for these groups of aspiring rocket scientists.

Oftentimes, the experiments involved a lot of equipment. UMR's required a 300-plus

pound welding machine. Equipment used by some of the other schools arrived at Ellington Field on trailer trucks and some were shipped disassembled in boxes with the words "This Side Up - NASA or Bust" written on the sides.

Once delivered, team members unloaded the boxes and began assembling their experiments.

The Miners in Space hauled its experiment to Houston, Texas, in a trailer truck.

"It would have been way too complicated — and nearly impossible — to have it shipped," team member David Harris said. "Transporting it in the trailer was definitely the better choice."

NASA wants the teams to have a good time during flight week, especially on board the "Weightless Wonder," but made it clear that the research mission is the priority for each team.

"You're here for a reason," Donn Sickorez, public affairs officer for the Reduced Gravity Student Flight Opportunities Program, said. "That is to test your experiments and conduct research in a weightless environment. This is an incredible opportunity and we want you to make the most of it."

"We will be there every step of the way to help make your time here a success."

# From Jaime's Journal Day 1: The arrival in Houston

*I kept a journal during every day of the trip to Houston, Texas. Here in Just Jaime, I'd like to share those experiences with you.*

## **Day 1 Thursday, 7.21.05**

We were welcomed to Ellington Field by Reduced Gravity Student Flight Opportunities Program officials wearing NASA badges and the sound of T-38 jets flying overhead. I was psyched. We were finally here and this was it.

This morning would be the start of a very intense week and a half for all of us and the beginning of all the steps that had to happen before we boarded NASA's "Weightless Wonder."

The plane was waiting for us when we got to the hanger. The sheer size of it was amazing and I could feel myself filling with excitement. I couldn't believe I was here with the team and I would get to fly on that plane in less than a week and experience what it was like to be weightless. Never did I dream of getting an opportunity like this one.

After we were checked in – paperwork, badges, goodie bags from NASA, experiment and all – I got the camera and started clicking. The "Weightless Wonder" was awe-inspiring and we all stopped to look

The shiny white plane with a sky-blue stripe down the middle,

complete with the NASA emblem on the tail, captured me – as it did the rest of the us. Students from nine other university and college teams started taking pictures of the plane and setting up their experiments.

There was quite a bit of excitement in the hanger at Ellington Field that Thursday morning. The hanger was hot (usually over 100 degrees) and we were sweating, but I don't think we cared – we were at NASA. We were standing next to the huge plane that would soon be launching us 34,000 feet above the Gulf of Mexico to experience what it feels like to be weightless - and that was really all that mattered. Reduced Gravity Student Flight Opportunity Program officials gave us an overview of the week, safety briefings and help on our experiments throughout the day. We even got to visit with a few astronauts.

Most of the day was devoted to set-up of student experiments.



JUST JAIME: IN HOUSTON

My team's experiment was going well and I got lots of pictures.

After talking with one of the program engineers, my team needed to make a trip to the hardware store for some final adjustments to the experiment before it would be completely ready to fly aboard the plane next week.

While the team did that, I attended more meetings and a briefing for journalists where we discussed taking pictures in flight, setting up a video camera on board the C-9 and the challenges of using our equipment in zero

gravity. All they tips they gave us helped: Don't take pictures with your head down, don't look through the viewfinder for an extended of time, make sure you remove the strap on your camera (otherwise it will float up and get in the way), and most importantly – make sure you have your camera in hand when the plane is going back to regular gravity conditions. Those are all things I never thought of because I'm not used to "thinking in zero-G," as I was told by NASA engineers. I got a lot of questions answered and felt better about how I would approach taking pictures in a weightless environment.

Hope I can get some good shots! (Just in case I don't,

NASA has its own photographers and videographers on board the plane just for that...wow, wouldn't THAT be a cool job!) The day ended with a banquet dinner for all of the teams. By the time that was over we were all ready to go to bed. I was tired but I couldn't wait for physiological training the next day. (Look for that experience in my next column).

Rolla Daily News  
August 7, 2005

# Rolla Daily News

VOLUME 131, NO. 200

SUNDAY, AUGUST 7, 2005



Scenes from the Phelps County Fair.

## MINERS IN SPACE



# DEFYING GRAVITY



JAIME BARANYAI/ROLLA DAILY NEWS PHOTO

**Floating Free:** UMR Miners in Space team member Regan Tackett experiences zero gravity aboard NASA's "Weightless Wonder" aircraft. The team traveled to the Johnson Space Center in Houston to test a welding experiment in a weightless environment. Top, from left, Michelle Rader, Caleb Keller and Abbie Stewart have fun in zero G (NASA Photos).

## Miners make history aboard 'Weightless Wonder'

Jaime Baranyai  
Staff Writer

HOUSTON - As the shuttle Discovery returned to flight on Tuesday, July 26, 2005, the University of Missouri-Rolla Miners in Space team was making its own history aboard the first flight of NASA's C-9 "Weightless Wonder," as part of NASA's Reduced Gravity Student Flight Opportunities Program.

Minutes after watching a live feed of the shuttle launch in a briefing room at

Ellington Field in Houston, Texas, members of the UMR team boarded the "Weightless Wonder" with students from five other colleges and universities to conduct research in a reduced gravity environment.

"This is going to be a great flight day," John Yaniec, lead test director for the Reduced Gravity Student Flight Opportunities Program, said. "We get to make the very first Reduced Gravity flight mission with this aircraft on the same day the shuttle returns to flight - that's really something."

NASA's Reduced Gravity Student Flight Opportunities Program at the Johnson Space Center in Houston, Texas, provides the unique weightless, or "zero gravity," environment of space flight for testing and training purposes. Considering the age of the shuttle program and current plans for the International Space Station, this capability is ideal for the development and verification of space hardware, experiments, crew training and research.

SEE MAKE HISTORY, 4A



JAIME BARANYAI/DAILY NEWS PHOTO  
Caleb Keller and Michelle Rader get ready for a "ride" in the altitude chamber.

### C-9 STATS

Born On: . . . . . January 15, 1970  
First Owner: . . . . . KLM Airlines  
U.S. Navy: July 8, 1989 - Aug. 9, 2000  
As of Sept. 30, 2004: 53,064.3 hours on the aircraft  
Primary Function: Reduced Gravity Research Platform for NASA  
Contractor: . . . . . Boeing Aircraft Corporation  
Cost: . . . . . \$35 million  
Thrust: . . . . . Two turbofan engines - 14,000 pounds of thrust from each  
Wingspan: . . . . . 119 feet, 3 inches  
Length: . . . . . 93 feet, 3 inches  
Height: . . . . . 27 feet, 5 inches  
Max. Takeoff Weight: 110,000 pounds  
Range: . . . . . More than 2,000 miles  
Ceiling: . . . . . 37,000 feet  
Speed: . . . . . 565 miles per hour (Mach .86) at 25,000 feet  
Seating: . . . . . 20 seats for Reduced Gravity Research Missions  
Crew: . . . . . Reduced Gravity Operations: Pilot, Copilot, Flight Engineer, Test Directors, Flight Surgeon, Videographer, Photographer  
Mission Length: Reduced Gravity Missions normally last an hour and a half to two hour, complete about 3; parabolas with periods of 25-30 seconds of weightlessness and fly four times a week  
Reduced Gravity Conditions: Negative-gravity, Zero-gravity, Lunar-gravity (one-sixth gravity), Martian-gravity (one-third gravity); Most time is spent in zero-gravity conditions.  
Operating Location: Johnson Space Center and Glenn Research Center  
First Reduced Gravity Mission with NASA: . . . . . July 26, 2005

## Students undergo physiological training before boarding

Jaime Baranyai  
Staff Writer

HOUSTON - After proving its experiment was ready to fly on the "Weightless Wonder," the Miners in Space team had to show NASA its fliers were ready to step up to the challenge.

The team members who will tested the experiment aboard the plane - Caleb Keller, Regan Tackett, Abbie Stewart and Michelle Rader - all had to be

approved for the flight. To make sure students were ready to board the C-9 aircraft, NASA put them through an entire day of physiological training. The training included five hours of classroom instruction on hypoxia, hyperventilation, decompression sickness, spatial disorientation and of course, motion sickness.

"There's a possibility that students can experience some of these during the flight and we

want them to know the symptoms of each and how to handle them," Mike Fox, human test support group manager at NASA, said. "Safety is our first priority and we want students to be prepared for what their bodies will experience in zero gravity."

Hypoxia is the term used to describe a state of oxygen deficiency in the blood, tissues, and cells sufficient enough to cause an impairment of mental and

body functions. Essentially, hypoxia means a lack of oxygen. Symptoms of hypoxia can include an increased rate and depth of breathing, cyanosis ("bluing" of fingertips, lips, etc.), slurring of speech, lethargy, poor coordination and mental confusion. Other symptoms can include blurred vision, dizziness, tingling, numbing, headache and fatigue. A more pleasant side effect is euphoria. Although there are a number

of symptoms, what each person experiences during hypoxia, or loss of oxygen, is different. In the rare event that students would experience hypoxia on the "Weightless Wonder" NASA wanted them to know their individual symptoms. To do this, students were given oxygen masks and took a "ride" to 25,000 feet in an altitude chamber during which they experi-

SEE TESTING, 10A

# 'Vomit Comet' tries even the strongest of stomachs

Jaime Baranyai  
Staff Writer

HOUSTON - While flying on the "Weightless Wonder" causes a lot of excitement, it also makes some fliers worried about losing their lunch. Although the plane is called the "Weightless Wonder," it's also known as the "Vomit Comet" and it got that nickname for a reason.

Although students are flying in the new C-9 aircraft this year, the KC-135 used for previous Reduced Gravity Research flights was known to induce vomiting among several of its passengers. By the time it was retired in 2004 after eight years of simulating weightlessness for students conducting research in microgravity conditions, 285 gallons of vomit had filled the small, white trash bags conveniently located in the chest pockets of every passenger's flight suit.

Despite the plane's nauseous nickname as the "Vomit Comet," Donn Sickorez, university affairs officer for the Reduced Gravity Student Flight Opportunities Program, said that 70 percent of people who fly aboard the aircraft experience little to no symptoms of motion sickness if they take the recommended dosage of anti-nausea medication prescribed by the flight surgeon the morning of the flight. Only 20 percent of fliers experience motion sickness during the flight. "Most people are a little nervous about getting sick on the flight, but the truth is that most people are usually fine," Sickorez said.

To lessen the chance of experiencing motion sickness, NASA gives students the option of taking a medication called SCOP-DEX an hour before the flight. "You don't have to take the medication, but we strongly encourage you to do so," flight surgeon Dr. Daniel Fitzpatrick said. "You have an 80 percent chance of getting sick if you don't take the meds, so I can't think of any reason why you wouldn't want to."

SCOP-DEX is a combination of Scopolamine and Dexedrine. This combination is used in

attempt to help fliers avoid motion sickness on the plane. These medications are prescribed based on the weight of the flier. The more a person weighs, the larger the dosage given.

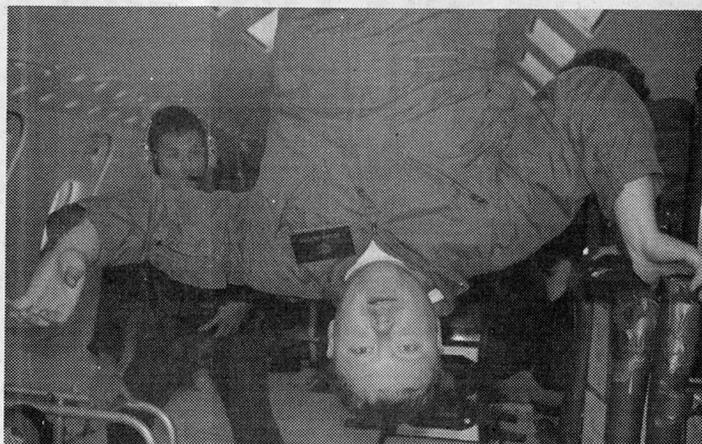
In addition to taking medication on the ground, NASA is offering fliers a new option this year: An injection of Scopolamine while on the plane. While the pills take an hour to take effect, the injection is fast-acting and can provide relief to those experiencing nausea during the flight.

NASA officials also give fliers several tips for preventing motion sickness on board the "Weightless Wonder." The first is to eat breakfast the morning of the flight - so long as it's not the IHOP special with bacon, eggs and sausage. A small, low-fat meal such as a bagel and a banana will be just fine. "Stick to your normal morning routine and eat something you're used to," John Yaniec, lead test director for the Reduced Gravity Flight Opportunities Program, said. "You know what works for you and what doesn't, so you be the judge on what to eat and how much."

Even before thinking about breakfast, students were reminded to watch what they ate for dinner the evening before the flight. "The night before you fly probably isn't the best time to try any new foods, eat a greasy burger or drink a lot of soda," Yaniec said. "Eat something that's easy on your stomach so you won't see it tomorrow on the plane."

## What Not To Do During Flight

More advice was geared toward what students could do to prevent motion sickness once on the plane. Keeping the body oriented forward was one. Not turning the head too quickly was another. Sitting down in the back of the plane is another good idea should motion sickness set in. The most important advice Yaniec gave students was to refrain from "going crazy" on the first few periods of weightless-



JAIME BARANYAI/ROLLA DAILY NEWS PHOTO

Regan Tackett flips and turns in zero gravity aboard the "Weightless Wonder."

ness. "Your first instinct is going to be to fly everywhere and go a little bit crazy - it's only natural," he said. "But if you start moving around too much too soon you're not going to feel very good. I suggest you take it easy the first few periods of weightlessness and let your body adjust to the sensation before you start moving around a lot."

Yaniec also cautioned students about certain movements in zero gravity. "Remember if you jump up like you would on the ground you're going to spring off the

floor and hit the roof (of the plane)," he said. "Remember that you need very little force to move in zero gravity."

After students listened to the pre-flight briefings, excitement and nervousness filled the room. Yaniec tried to calm any worries the fliers might be having. "I know you have a lot on your mind and the anxiety levels are a little high because of all the responsibilities that come with your experiment, but just try to relax and have fun - it's going to be great."

And he doesn't want anyone to worry about getting sick. "It's a myth that most people throw up," Yaniec said. "The reality is that most people don't. Even if you do there's no need to worry because there will be eight crew members ready to take care of you and make your flight as comfortable as possible. Your job is to do your science and enjoy the experience, and it's our job to make sure that happens."

University of Missouri-Rolla Miners in Space team members Regan Tackett, Caleb Keller, Abbie Stewart and Michelle Rader were lucky enough to keep the vomit out of the comet on their flight. All four took the recommended medication.

"I took the medication and I never got sick," Keller said. "The whole experience was awesome and I'd love to do it again."

Tackett agreed. "I'm glad I took the medication," he said. "I was able to move around, do flips and have fun upside down without getting sick. It was great."

Although Stewart and Rader were a little concerned before the flight about getting sick in zero gravity conditions they did just fine. "I think I was so focused on

running the experiment that my body had time to adjust to the weightlessness, which prevented me from getting sick later in the flight," she said.

Rader said she was having too much fun to feel queasy. "I was having so much fun the thought of getting sick never even crossed my mind," she said. "It was awesome."

# Miners in Space team makes history at Johnson Space Center in Houston

## CONTINUED FROM PAGE 1

After nearly two years of ground work on a welding experiment, the Miners in Space team was ready to put its machine to the test in a weightless environment. For their experiment the students wanted to determine how strong a weld completed in a weightless environment was compared to one made on the ground.

Following an intense week of training with NASA at Ellington Field and the Johnson Space Center, the team was ready for its first day of flight. Although all seven members of the team went on the trip together, only four would get the chance to experience what it was like to be weightless. The lucky four were Regan Tackett, Caleb Keller, Abbie Stewart and Michelle Rader. Tackett and Keller would be on the first flight day and Stewart and Rader would fly on the second.

After a day of struggling with how to hook the experiment to the plane's power supply, Tackett and Keller boarded the plane -- unofficially known as the "Vomit Comet" -- equipped with ear plugs to muffle the screaming engines, hard candy and gum to ease the dry mouth caused by the anti-nausea medication and of course, two small white trash bags tucked in the chest pockets of their flight suits in case of motion sickness.

With 14,500 pounds of thrust from each engine, the C-9 aircraft took off from the runway at Ellington Field to give its passengers the unique experience of weightlessness.

How is weightlessness achieved without being in space? It's less complicated than most people think. The aircraft flies at an altitude up to 34,000 feet in a roller coaster like pattern completing several of these parabola shape maneuvers during each flight. After ascending at a 45 degree angle and going "over the top" the plane begins its 45 degree angle descent creating a 25-30 second period of zero gravity. After hitting what's called the "sweet spot" when the

plane's passengers experience complete weightlessness, the aircraft pulls out at 1.8 G's and the students feel the force of twice their body weight until the next parabola when they experience weightlessness again.

This sudden change in G-forces is the reason some of the fliers on board get to know firsthand how the plane got its nickname as the "Vomit Comet." Fortunately, all four fliers on the Miners in Space team were able to keep the vomit out of the comet thanks to pre-flight anti-nausea medication that NASA prescribes.

"It was awesome and I never felt sick at all," Keller said. "I'd love to do it all over again. That first parabola was the best."

As the plane went "over the top" the first time and the G-forces "came off," smiles, cheers of excitement and euphoria immediately followed. The sound of laughter filled the plane as students effortlessly floated to the ceiling. The joyful celebration said it all: This is what it's like to really fly, just like in all those childhood dreams.

The first reaction students have is to start flailing their arms and legs as if swimming. Because air is a lot less viscous than water, all that flailing doesn't help much. They quickly learn to plan their moves so they have a way to stop, such as grabbing onto the support straps or even one of their fellow fliers.

As each weightless cycle neared its end, John Yaniec, lead test director for the Reduced Gravity Student Flight Opportunities Program, would yell "Feet down, coming out," which meant that brief period of weightlessness was about to abruptly end and the students would feel the effects of gravity again soon.

"You better have your feet pointed toward the floor when John says that, otherwise you could fall on your head when the zero gravity ends," Tackett said. "There were a few times I was upside down and I had to hurry up and flip the other way. It was the greatest experience of my life



JAIME BARANYA/ROLLA DAILY NEWS PHOTO

Miners in Space fliers pose with astronaut Don Thomas.

and the most fun I've ever had."

As the plane started another climb, the 1.8 G's came back. Once over the top, weightlessness -- and euphoria -- again. During a Reduced Gravity flight, this sequence is repeated 32 times to give students enough time to collect data in zero gravity conditions.

"Being weightless is such a unique experience it's almost impossible to describe," Tackett said. "I wish I had a better way to describe it, but it's so different from anything else I really can't. All I know is that it was the best feeling in the world."

Keller agreed. "Being weightless was definitely the most incredible feeling ever," he said. "The feeling of floating was unbelievable and the whole experience was awesome."

Some of the Miners in Space hope getting to fly on the "Weightless Wonder" won't be the only time they experience the effects of zero gravity. Stewart and Rader hope to become astronauts someday.

"I've always wanted to be an astronaut and now that I've gotten a chance to experience what it would be like I want to pursue that dream more than ever," Stewart said.

That's something that Donn Sickorez, public affairs officer for the Reduced Gravity Student Flight Opportunities Program, is pleased to hear. "We're trying to encourage young people to become scientists and engineers," he said. "The U.S. needs more

Sickorez said.

Yaniec made that clear from the beginning of flight week. "Your first job is to conduct your research," he said. "You've been working on it for a long time on the ground and now it's time to put it to the real test in zero gravity. We want you to have fun, but you have to stay focused on running your experiments aboard the plane. This is a research aircraft, not an amusement ride."

The Miners in Space team did focus on running its welding experiment on the plane, but encountered problems. The first day of the flight there wasn't enough power on the plane to run the experiment and the second day the welding apparatus jammed.

Despite the disappointment about the experiment, the team had a great time aboard the "Weightless Wonder" and remains optimistic about its experiment.

"The overall experience was great and I think we learned a lot," Stewart said. "I think we have a good idea, we just need to fix the glitches and find a way to make this experiment work in zero gravity."

All seven team members, including ground crew Michael Dancer, David Harris and Jason Gallagher, said they would like to stick with the experiment and NASA engineers encouraged them to do so.

Back on the ground, students adjusted to the side effects the zero gravity environment and the anti-nausea medication left them with. Although some of them were drowsy, every one of them had huge grins when they stepped off that plane. Stewart summed it up best when she said: "This has been a once-in-a-lifetime opportunity and it was the greatest experience I've ever had. I hope I get the chance to do it again someday."

# Viewpoint

## From Jaime's Journal Day 2: Flight day on the 'Vomit Comet'

This reporter goes 34,000 feet just to bring you the story.

*I kept a journal during every day of the trip to Houston, Texas. Here in Just Jaime, I'd like to share those experiences with you.*

### Day 6 Tuesday, 7.26.05

It was one of those days that made you want to hang on to your life forever!

#### The Best Day

Today was one of the best days of my life, if not THE best. After an intense week of training, I finally got to fly aboard the "Weightless Wonder!"

It was so much better than anything I had ever imagined that I don't quite know how to describe it.

Being weightless was one of the neatest feelings in the world.

I wish I had a better way to describe weightlessness, but it's something so elusive it's hard to find the words.

It was truly amazing and it was definitely a once-in-a-lifetime opportunity. My best day ever went like this...

#### Pre-Flight

When my alarm went off at 0600 hours Tuesday morning, I didn't care that it was so early - I was ready.

Today was the day.

Today was the day I would fly on the "Weightless Wonder" - the day I had been anticipating for months and the day I would get the closest ever to my dream of becoming an astronaut.

As I put on my flight suit I felt a twinge of nervousness in the pit of my stomach that quickly turned to pure excitement.

I had oatmeal and a piece of toast for breakfast and headed to the hanger of Ellington Field with the team.

Although we thought the experiment was completely ready to go, we ran into another problem with a connector and plug for the power source on the plane.

So here we are half an hour before take-off running to Lowe's for another part.

While some team members did that, the fliers (that included me!) were listening to the medical briefing about the motion sickness medication and what to do if they did get sick on the flight.

The fliers were recommended a certain dosage of anti-nausea medication based on their weight.

I took a "Level Two" dose for my weight category and swallowed a small round pill and an orange triangle-shaped pill to combat motion sickness.

You didn't have to take the medication but the flight surgeon strongly encouraged it, so I wasn't going to take any chances.

After the medical briefing and dispensing of pills we got to watch the space shuttle Discovery launch. That was neat.

There was a room full of cheers and hand clapping at lift-off and the excitement was contagious.

It got us even more pumped about our own flight.

After watching the launch and taking an important bathroom break (you definitely wanted to take care of that *before* the flight), we were ready to board the plane.

We walked to the plane in a single-file line, nothing but sunglasses and smiles as our team members and NASA photographers snapped tons of pictures. That was awesome. I felt like I was in the movie "The Right Stuff."

Today I was walking on air.

I felt larger than life and nothing was going to change that.

I think most of us felt like we had become the people we had always looked up to in our childhood dreams, and that was quite an amazing feeling.

#### The Flight

John Yaniec, lead test director for the Reduced Gravity Student Flight Opportunities Program, welcomed us on board and said: "Ladies and gentlemen, this is going to be a great flight day."

Conduct your research, be safe and have fun aboard "Vomit Air!" (Even though he affectionately refers to the C-9 as Betsy).

Once on the plane I was anxious to get in the air, but the meds were starting to kick in and I felt a little strange.

Mostly just tired, but still awkward.

Regan and Caleb said they were starting to feel a little weird too.

As we waited for take-off we ate hard candy and chewed gum to ease the dry mouth the medication was causing.

We got a special perk when the plane taxied down the runway: A look at all the military fighter planes in private hangers at Ellington Field.

That was pretty neat.

As the engines of the C-9 revved and the noise got louder, Regan, Caleb and I grasped hands and got ready for take-off.

It wasn't really any different than taking off in a regular commercial airplane,



Just Jaime — In Zero-G

but it was thrilling because we knew we'd be weightless soon.

After we were above the Gulf of Mexico we were given the "Go" to set up our experiment, cameras and equipment before the first period of weightlessness.

Yaniec gave us a five minute, three minute and one minute warning before the first "parabola", or period of weightlessness.

The first thing I felt was the force of twice my body weight as we climbed to an altitude of about 34,000 feet.

As the G's "came off" and Yaniec yelled "Over the Top," we experienced that first 25 seconds of weightlessness - and it was incredible. Gravity released me and it was the greatest feeling in the world. I was overcome with joy and excitement as I floated to the ceiling. It was absolutely wonderful.

During that first period of weightlessness no one knew quite how to react or had control over their bodies, which added to the charm of the whole experience.

There was laughter, cheers and shouts of pure joy aboard the aircraft and everyone was celebrating...at least for the time being.

After what seemed like only a few seconds (but was really 25),

Yaniec then yelled "Feet Down, Coming Out," which meant to get your feet on the floor and sit down because the weightless period was ending.

That meant you were going to fall on your head in regular-G if you were upside down for more than a second or two after the "Feet Down, Coming Out" command.

Although being weightless isn't really something I can explain I will say this: It was the most wonderful, most amazing and most free I have ever felt.

The moment captured me and I never wanted to let it go.

The weightless periods never seemed to last long enough and always left me wanting more.

Despite the fact the plane didn't have enough power to start our team's experiment, Caleb, Regan and I had a wonderful first 10 parabolas.

I was trying to take the advice of our flight directors and not go crazy during the first periods of weightlessness to avoid motion sickness, but Regan and Caleb seemed to have stomachs of steel. By the third parabola, they were already flipping and turning while I was taking pictures.

It was wild.

It's incredibly hard to capture photos of people in zero-G, especially because I was floating too!

But I managed to get some great shots.

During the two-G periods around parabolas nine and 10 I started feeling a little strange, but I didn't really think I was getting sick.

However, on the next parabola I pushed myself off the floor a little too hard and shot straight to the roof. While I was amused, my stomach was not.

#### For Strong Stomachs Only

The flight surgeon told us if we did get motion sickness it would come quickly without much warning.

He was right.

Within a split second I yanked the barf bag out of my flight suit chest pocket and filled its contents.

I was officially a victim of the "Vomit Comet" and would be referred to as a "kill" after the flight.

Even though I got sick, it really wasn't too bad.

It didn't matter; I was still having the time of my life. (At least I wasn't puking the whole time like the guy next to me).

A crew member helped me to the back of the plane where I strapped loosely in the plane seat and kept my body orienta-

tion forward (which was supposed to make me feel better).

It did for a while and it was killing me to be missing out on the weightlessness so I went back to the cargo area for another parabola... little did I know I made this move too soon.

I grabbed another bag from my flight suit and I was back in the seatbelt.

Even still, I really didn't feel that bad.

To be on the safe side, the flight surgeon gave me an injection of anti-nausea medication in my left arm. I started feeling a little better and after being "out" for some of the parabolas I was ready to get back to the cargo area for what was supposed to be the last 10 periods of weightlessness.

But the pilot came over the speaker and said we were going to have to cut the trip short because we were low on fuel.

That was a real bummer.

Just when I was ready for more zero-G it was time to go home.

But I did manage to get in on two last periods of weightlessness and that was more than worth it.

Hey, I had about 10 or 11 good ones (periods of weightlessness) and that's a lot more than most people will ever get, so I was incredibly happy.

Even when I had to sit down I was having the time of my life. I couldn't believe it was time to go home, the entire flight seemed to go by in the blink of an eye.

It went by so fast sometimes it's hard to believe it happened.

#### Both Feet Back on the Ground

During the decent, I actually felt worse than I did at any point during the flight. I seemed to get the most sick on the way down, which was strange. Despite how drowsy I was feeling, I walked off that plane with the biggest smile in the world.

I absolutely loved it, even if I did spend part of it a little sick to my stomach.

I was surprised I got sick at all, but I guess that's just the way it goes.

I think part of my motion sickness was due to the "provocative" behavior of looking through the viewfinder of the camera, but it was worth it to get good photos for my stories.

The funny thing is that I felt better during the weightless periods - it was the two-G times that made me feel the worst. I felt great during the zero-G phases.

Once on the ground, I could barely keep my head up - or walk in a straight line for that matter.

I think this was due in large part to the injection of the medicine I received on the plane - one of its biggest side effects is drowsiness and it hit me hard.

Not only did I feel drowsy, I was completely out of it. I couldn't even carry my backpack from the plane to the hanger - I had to have someone else help me.

Once inside the hanger, I laid down for about two and half hours.

I drank a lot of fluids and slept some. It took me a while, but by the afternoon I was feeling OK.

Even now at 10 p.m. I still feel tired - there's a reason why they make you have a designated driver after the flight. I didn't care about the side effects - it was a small price to pay for what I got in return.

As I said before, not many people get an opportunity to fly aboard this aircraft and I was thrilled to be one of them.

This was definitely one of the best days of my life and I'll never forget it.

Being weightless was a feeling matched by no other and I wish more than anything I could experience it again.

There is no greater feeling on Earth.

That feeling of pure joy and freedom was unbelievable and all I want to do is hang on to it forever.

# Students undergo testing to board NASA's 'Weightless Wonder'

## CONTINUED FROM PAGE 1

enced the symptoms of hypoxia first-hand.

At 25,000 feet they were instructed to take off their oxygen masks for five minutes to experience how their bodies reacted to the lack of oxygen. While some students experienced the euphoric effects of hypoxia and were acting pretty silly after a few minutes without oxygen, others weren't having such a good time. Student fliers from the University of Missouri-Rolla were in the latter category. Stewart and Tackett were dizzy, Rader was lethargic and tired, and Keller was experiencing tingling sensations. Tackett and Rader were also having some vision problems.

"It wasn't too bad, but I definitely wouldn't want to do it

again," Rader said.

Stewart agreed. She said she was uncomfortable before the "flight" even started.

"The oxygen mask was uncomfortable and I was having trouble breathing, which was pretty nerve-recking," she said. "I got used to it after a while but I still didn't like it. Then I got really dizzy when we had to take off our masks."

Most students had trouble filling out the simple worksheet they were instructed to complete during the five minutes without their oxygen masks on. "I didn't get much of the worksheet done," Rader said. "It was hard to think and concentrate."

Tackett wrote a number in the blank where he should have signed his name. "It was hilarious when I saw what I had written on my worksheet after



JAIMIE BARANYAI/ROLLA DAILY NEWS PHOTO

Abbie Stewart and Regan Tackett experience the symptoms of hypoxia in the altitude chamber.

the flight."

Stewart managed to do some of the math problems and spell her name backwards, which was more than what some people did.

After putting the oxygen masks on again, it was time to begin the "descent." On the way "down" students experienced rapid decompression and were instructed to perform a "Valsalva" by keeping the mouth closed, pinching both

nostrils and blowing hard as if blowing the nose. This technique was used to clear the ears.

Following their experience in the altitude chamber, the students took a written test based on the classroom lectures. After the tests were graded they were awarded certificates for completion of the physiological training.

They were then officially ready to fly on the "Weightless Wonder."

# History of the C-9

Jaime Baranyai  
Staff Writer

---

HOUSTON - On the same day the space shuttle *Discovery* returned to flight on July, 26, 2005, NASA's C-9 aircraft made its first mission for the Reduced Gravity Student Flight Opportunities Program. Since the KC-135 aircraft was retired in December 2004, the C-9 is the new "Weightless Wonder."

NASA acquired the C-9 from the United States Navy on Aug. 9, 2003. The U.S. Navy and the U.S. Air Force have utilized the C-9 aircraft for passenger transportation, medical evacuation and special missions.

The C-9 is the military version of the McDonnell Douglas DC-9 used by commercial airlines. Although it looks similar to a typical commercial plane, its Reduced Gravity missions that give fliers a taste of weightlessness are far from an ordinary plane ride.

NASA's mission for the C-9 aircraft is to provide its researchers a way to perform experiments in a reduced gravity environment. The aircraft will also be used for Heavy Aircraft Training (HAT) for astronaut pilots, support shuttle transportation from landing sites in California and New Mexico back to Kennedy Space Center, Trans-Atlantic Landing support and the Emergency Mission Control Move mission.

Rolla Daily News  
Aug. 8, 2005

## UMR team keeps busy during trip to Johnson Space Center

Jaime Baranyai  
Staff Writer

HOUSTON - The University of Missouri-Rolla Miners in Space team did a lot more than fly and test its experiment in zero gravity during last month's trip to Houston.

The zero gravity flight was the high point, but it was just one part of the big picture. NASA did a good job of keeping the team busy during the week and half it spent in Houston. The team had meetings, briefings, classroom-style lectures and physiological training in preparation for the flight. The schedule also allowed time for the team to make any last minute adjustments to its experiment.

Meeting astronauts and going behind the scenes at the Johnson Space Center added to the excitement of flight week. The students even got to see where astronaut training takes place at the Sonny Carter Training Facility.

Regan Tackett enjoyed watching astronauts use the underwater training facility. The pool is used to train astronauts for extra vehicular activities (EVAs) that have to be performed outside the shuttle in space. "The sheer size of the facility is amazing," he said. "Getting to see astronauts in

training was a very unique opportunity. If we weren't in this program on this trip we wouldn't have been able to have that chance."

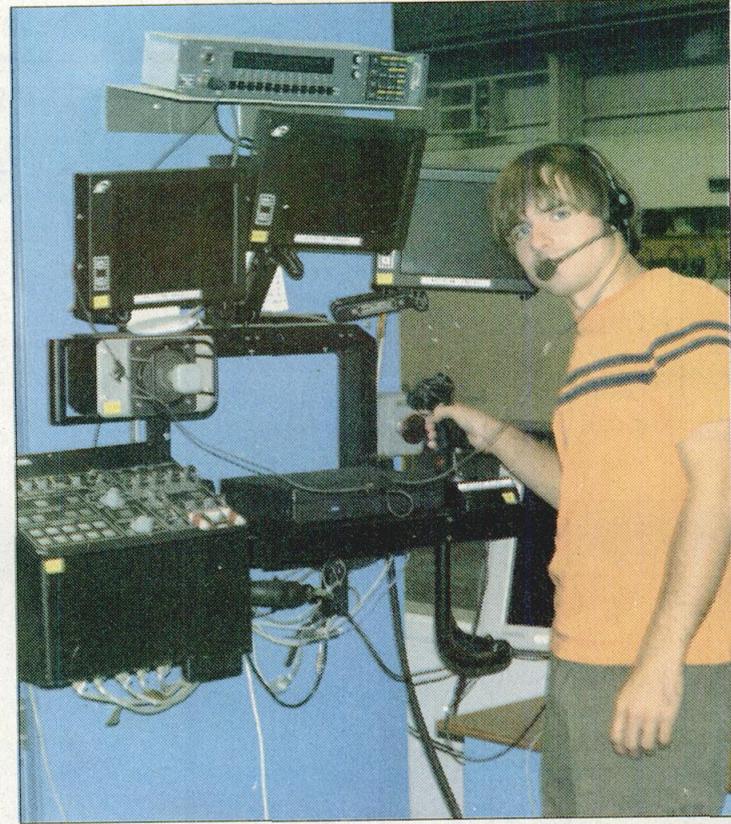
That goes for most activities the team participated in during the week. Security badges, official escorts and additional badges were needed most places.

Michelle Rader said her favorite part of the trip, other than the flight of course, was the tour of the Johnson Space Center. During the Johnson Space Center tour the Miners in Space team members got to sit in the Apollo Era Mission Control room (the very one used during those flights and the same one used to film the 1995 movie "Apollo 13"), see the current Mission Control room and mock-ups of the International Space Station and the space shuttle, and talk with an engineer who designs space suits.

"The Johnson Space Center tour was neat because they showed us things that the general public doesn't get to see," Rader said. "It was especially great seeing Mission Control because the shuttle Discovery is in flight."

Rader also enjoyed meeting astronauts during the week. "It was great getting to meet and talk

SEE TEAM, 2A



JAIME BARANYAI/ROLLA DAILY NEWS PHOTO

Caleb Keller, UMR Miners in Space team member, in the control room at the Sonny Carter Training Facility in Houston.

Thank you! The Rolla Daily News is proud to be the hometown newspaper of Lyle Pursell,

# From Jaime's Journal Day 3: Training day

Friday, 7.22.05

Today was great.

Today was physiological training.

After spending the morning in classroom-style lectures learning about hypoxia, hyperventilation, decompression sickness, spatial disorientation and motion sickness, the team and I were ready to take a "ride" in NASA's altitude chamber.

After a light lunch (recommended to us by our instructors), we headed to the Sonny Carter Training Facility where we needed more badges and official escorts to get in.

Once inside we were briefed with more information and had to fill out another medical form.

After the double-check from the flight surgeon, we were finally ready to get fitted for our oxygen masks and flight equipment.

That was a lot of fun.

Despite how silly we appeared in our primitive-looking flight gear, deep down inside we loved it. At least I did.

I just kept thinking, "This is so awesome!"

It might not seem like a big deal, but for us it was one step closer to being on the "Weightless Wonder."

Although this was part of our training for the flight to come, all we could think about was what this mysterious altitude chamber would be like.

After listening to the lectures about all the things that

could happen to our bodies at extremely high altitudes, I think it's safe to say that most of us were more nervous about being in the chamber than flying on the "Weightless Wonder."

We weren't going to need our own oxygen supply on the "Weightless Wonder" and we weren't going to have it taken away, so we didn't have to worry about that.

However, we were going to have an oxygen supply in the chamber and at the simulated altitude of 25,000 feet it was going to be taken away.

This was done so we would each know what our individual symptoms of hypoxia were, in case we were to experience those aboard the "Weightless Wonder."

Hypoxia is essentially a lack of oxygen.

The best way to prevent it is to know your symptoms, so to the chamber we headed.

Getting the masks on and the oxygen hooked up made me nervous.

The equipment was bulky, uncomfortable and swallowed my face.

Breathing seemed like work and I was having my doubts about what the next 45 minutes would be like, but after a while I got used to the equip-

ment and relaxed.

We started the "ascent" and at 25,000 feet were instructed to remove our masks. Now came the fun part - for me at least.

Fortunately, my symptoms of hypoxia were enjoyable, even a bit euphoric.

Normally it takes people about two or three minutes to start noticing their symptoms, but within 30 seconds I was having a pretty good time.

I heard "Number Five (that was me - we were referred to by seat numbers) is the party animal of the group," over the intercom and all I could do was laugh.

And I kept laughing. I looked around and kept laughing.

I heard the instructor ask me if I was OK and I replied back over the speaker, "I'm good, I'm good!"

I didn't really care much about trying to complete the simple worksheet that was handed to us at the beginning of the five minutes.

That was amusing.

Every time they instructed us to look at the worksheet and answer the questions I just looked at it, looked up and laughed.

When asked to list the states beginning with the letter "M" I came up with three - and



Just Jaime - gets approved for flight.

wrote Missouri twice.

While I was sitting there being amused by absolutely nothing, my teammates were unfortunately experiencing some of the negative symptoms of hypoxia.

Abbie and Regan were dizzy, Michelle was incredibly tired and lethargic and Caleb was experiencing some tingling.

Michelle and Regan were also experiencing some blurred vision. Regan put the number five in the blank where he was suppose to sign his name on the worksheet, but Abbie managed to get some math problems finished and spell her name backwards.

I pretty much skipped most of the questions - I wasn't really processing much at that point. No one was.

We all got a kick out of comparing our worksheets after the chamber "ride."

What was even more fun was watching the video, especially since you do things you don't even realize.

In addition to my laughter, I saw myself breathing pretty hard after being off the oxygen for three or four minutes - but it was something I hadn't noticed at the time.

It was also great watching everyone else.

One kid was dancing in his seat to whatever music was playing in his head and another was just looking around having a good time.

Others were desperately trying to concentrate on filling

out the worksheet. I had a great time.

I only wish my other team members would have experienced the same symptoms I did.

After the altitude chamber "ride" we took a final written test and were officially certified to fly aboard the "Weightless Wonder." I couldn't wait.

The last perk of the day came when we were given a behind-the-scenes tour of the Sonny Carter Training Facility.

We got to see the huge pool where astronaut training takes place. That was quite a treat.

Unless one of us becomes an astronaut, that's the first and last time we'll ever get to see that.

In fact, most all of our experiences here will be a once-in-a-lifetime opportunity for all of us - unless of course we do become astronauts or go on to work for NASA.

I hope I get to write about some of the members of the team someday when that happens, but just in case it doesn't we're making sure to have the time of our lives right now.

All I can say is this: Whatever your dreams are - believe them, chase them, learn them and live them - for there is no feeling as incredible as when you achieve them.

Rolla Daily News

Aug. 9, 2005

# MINERS IN SPACE

## Months of preparation required before students could experiment

Jaime Baranyai  
Staff Writer

HOUSTON - Although flying on the "Weightless Wonder" was the highlight of the University of Missouri-Rolla Miners in Space team trip to the Johnson Space Center in Houston, Texas, it took months of preparation and several final adjustments before the team and its experiment were approved to fly.

NASA had two important requirements for the student research teams flying aboard its C-9 "Weightless Wonder" aircraft: The team's experiment and the fliers had to be in perfect condition.

If that sounds like a tall order, it's because it was. Preparation to take on the challenges of conducting research on the "Weightless Wonder" began months ago when the students started designing experiments at school. They were constantly in touch with Reduced Gravity Student Flight Opportunities Program coordinators about the progress of their experiment and continued to build, make improvements and redesign their project as needed. At the same time, team members were filling out various forms of paper work and taking FAA Third Class flight physicals.



JAIME BARANYAI/ROLLA DAILY NEWS PHOTO

The Miners in Space team gets a "Go" for its flight on the "Weightless Wonder."

The real tests came in July during flight week in Houston. Evaluation of the experiment took place during what NASA called the "Test Readiness Review" when the team presented and explained its experiment to NASA personnel for the final stamp of approval.

The team's presentation to NASA test directors, engineers, safety inspectors and

flight surgeons had to be flawless. The team needed to prove that its experiment was safe, reliable and ready to fly on the "Weightless Wonder."

John Yaniec, lead test director for the Reduced Gravity Student Flight Opportunities Program, said safety is NASA's No. 1 priority.

"We have to make sure all the experi-

ments are safe to fly," he said. "Safety on board the aircraft is what's most important."

During the Test Readiness Review, team member Michael Dancer explained how the experiment would work, demonstrated how the machine would perform an automated weld aboard the aircraft and went over emergency procedures in case something would go wrong.

When NASA officials asked questions, Dancer had good answers. After listening to the presentation, the group of officials who would decide the team's fate gave the Miners in Space team a "Go" for the flight.

Although there was a little bit of worry in the hangar that morning when the welding experiment didn't weld, the Miners in Space passed the Test Readiness Review anyway. The test directors had already seen the experiment work and were convinced it would do so on the plane.

"I remember this experiment from two years ago," Yaniec said. "I'm pleased with what the team has done and it looks great. Miners in Space: You're good to go."

The Miners in Space were relieved to hear those words. "We're finally past the hard part, the hurdles and the tests," Dancer said. "Now it's time to fly."

Thank you! The Rolla Daily News is proud to be the hometown newspaper of Angel Johnson

# Team keeps busy

## CONTINUED FROM PAGE 1

with some of the astronauts, especially since I hope to be one someday," she said. "They had a lot of great advice and it was neat to hear their stories."

Abbie Stewart said it wasn't just the astronauts who impressed her, but all of the NASA personnel the team worked with throughout the week. "I was really impressed with how much NASA worked with us during flight week," she said. "They were just as anxious to make our experiment work as we were and that was exciting. Everyone was more than willing to help us and that was awesome. We really appreciate all the help from NASA."

In addition to all the "space stuff," the team had its own adventures going skydiving.

"Skydiving was a blast," Tackett said. "It was a rush, but it didn't even compare to being weightless."

He said while skydiving gave him the sensation of falling, being weightless had the opposite effect. "You feel like you're falling when you're skydiving, but when you're weightless you're floating — there's no sensation of falling. Weightlessness was the greatest feeling in the world."

Tackett said being able to fly on the "Weightless Wonder" was by far the neatest experience of his life. "You can go skydiving or do almost anything else whenever you want," he said. "But the flight aboard the 'Weightless Wonder' was a once-in-a-lifetime opportunity."

Caleb Keller agreed. "Skydiving was fun, but getting to experience weightlessness was way better than that," he said. "I can't believe all the awesome things we've gotten to do on this trip in such a short amount of time — everything's been great."

The team members who flew on the "Weightless Wonder" weren't the only ones having a good time. Ground crew members Michael Dancer, David Harris and Jason Gallagher said they all enjoyed being on the trip even though they didn't fly this year. "We all got our chance to fly two years ago and that was great," Dancer said. "Of course I'd love to fly again, but it's also fun to watch others have the experience."

Harris agreed. "The best part of the trip for me is getting to watch my team members have the time of their lives," he said. "I also enjoy getting to do all of the other activities during flight week and just being at NASA is great. I hope I can work there someday."

After it was all said and done that's how most of the team members felt. "The entire experience was unbelievable and I want a job with NASA now more than ever," Stewart said. "Hopefully someday I'll have that chance."



**HOLLYWOOD THEATERS**

\$5.50 Bargain Matinees All Shows Before 6 PM

**FORUM 4** 1101 Forum Drive  
341-2418

DUKES OF HAZZARD (PG-13)  
1:50 - 4:30 - 7:10 - 9:50

# From Jaime's Houston Journal: A few last words

7.28.05

Abbie and Michelle flew on the "Weightless Wonder" today and that was awesome. They had a great time during the flight and never got sick. After my flight I told the team members that none of them were going to get sick because I had already gotten it out of the way for everyone...and I was right. All four of them managed to keep the vomit out of the comet, even though their journalist did not! (It's OK. Considering I had the time of my life, zero-G is once place I didn't mind taking one for the team).

With the second flight day over, the Miners in Space mission was (unfortunately) nearing its end...but not without a little more fun. We got a behind-the-scenes tour of the Johnson Space Center, which was really neat. We got to sit at the desks in the Apollo Era Mission Control room, see the current Mission Control room and several other areas that are otherwise "off limits" to the general public. We also got to talk with people working at NASA and saw mock-ups of the International Space Station and the space shuttle.

My favorite part of the tour was seeing Mission Control, especially because the space shuttle Discovery was in flight. The Apollo Era Mission Control room was neat too. Every time I watch the movie "Apollo 13" I'm going to think back to this tour when I was in that very room and when I flew on a plane just like the one they used to film that movie. After getting a glimpse of what goes on behind the scenes at NASA I can tell you that what goes on there is the result of incredible imaginations - and



Just Jaime —  
The journalist

pure genius - at work. The accomplishments and the possibilities are truly amazing and never-ending. The fact that we made it into space, to the moon, and achieved so many other milestones that were once thought "impossible," is proof that humanity is extraordinary beyond our wildest dreams. If it weren't for the people at NASA and all their dreams, we would have never achieved all those "impossibles." NASA's vision of going to the moon and Mars is a grand one and I look forward to what the future holds for space exploration.

7.29.05

After 10 unbelievable days, it's time to say good-bye. No more waking up at 0600 hours, no more classroom lectures, no more crazy training without oxygen and no more floating in zero-G. The hardest part of the day was turning in my flight suit. I took my name badge off the front left pocket, smiled and thought, "Wow...this has been incredible," as I crumpled the flight suit and threw it into the washing machine. Even though we weren't allowed to keep our flight suits, we could keep our name badges and all the memories that came with it. And we would hold on to those memories for the rest of our lives.

*To Abbie, Michelle, Mike, David, Regan, Caleb, and Jason (who are also known as the Miners in Space): Thank you for making this trip the best experience I've ever had and thank you for your help throughout this journey. It's been incredible and you've been great. I'll cherish the memories forever. Best of luck to you in all your future endeavors and always remember: Failure is not an option!*

## Skyline grad rides NASA's 'Vomit Comet'

By Dennis Fitzgerald

NASA calls it the "Weightless Wonder." But to those who've taken the plunge, it's the "Vomit Comet."

And Lauren Edgar recently had a ticket to ride.

Edgar is a 2003 Skyline High School graduate and aspiring astronaut from Issaquah. Most recently, she was part of a Dartmouth College team selected by NASA to conduct a reduced-gravity experiment aboard a C-9 aircraft.

The experiment took place while the plane, high over the Gulf of Mexico, plummeted earthward at speeds sufficient to defeat the effects of gravity. It is an experience notorious for testing one's ability to hold down a meal.

Before her ride last week, Edgar was not at all reluctant.

"I can't wait," she said.

The Dartmouth team was among 20 groups from colleges around the country that participated in NASA's Reduced Gravity Student Flight Program. Many schools propose projects. Not all are accepted.

Those who make the cut are invited to NASA's Johnson Space Center in Houston for training and preparation.

Between her recent training sessions, Edgar said her interest in the space program began when

she was in the second grade.

That was the year her family visited her grandmother in Florida, and she got to see a launch of the Space Shuttle Discovery.

"It was just awe-inspiring," she said.

She resolved to become an astronaut and has not wavered from her goal.

"I've always been strong in math and the sciences," Edgar said. "I really like knowing how things work."

The experiment that Edgar's team is conducting addresses a serious problem for astronauts. While in space for long periods of time, they experience muscle and bone loss.

The losses occur because muscles and bones are not stressed the way they are when gravity acts upon them. Astronauts are required to do long workouts on bulky equipment to counter the effects of reduced gravity.

Edgar's team seeks to show that much shorter bouts of exercise, with simple elastic straps, would be equally effective.

It would be an important breakthrough, she said.

Astronauts would be able to



Edgar

spend more of their time conducting experiments and would not have to dedicate precious space aboard their aircraft to exercise equipment.

The experiment, which was scheduled for late last week, involved a C-9 aircraft that climbed steeply and dropped into a 25-second dive. During those precious seconds, the Dartmouth undergraduates were to test their proposal, while striving to keep their composure in the gravity-free cabin.

After the plane leveled off, it was to repeat the climb and dive 29 times. The experiment was to be repeated each time.

Among their preparations in Houston were tests that predict how each member of the team would react in reduced gravity, Edgar said. Individuals respond differently. Some get sleepy; others may become belligerent or euphoric.

It's important to know how they'll cope before they board the plane, she said.

Edgar's mom, Karen, said she's a bit surprised at how steadfastly her daughter has held to her goal of becoming an astronaut.

"I thought it would be a passing fancy," she said.

But she's not surprised that Edgar is among the select group chosen for the NASA program.

"She was always a very ener-

## Cheerleaders in training



Contributed

**Students practice a routine during cheerleading camp. Local high school cheerleaders taught the weeklong mini-cheer camp for elementary school-age girls at Eastridge Christian Assembly July 18-22.**

getic, purposeful child," Karen said, laughing. "She never slept."

If it is not her destiny to be an astronaut, Edgar says she will work in some way with the space program.

"Just being involved in it would make me happy as well," she said.

She also hopes that more girls

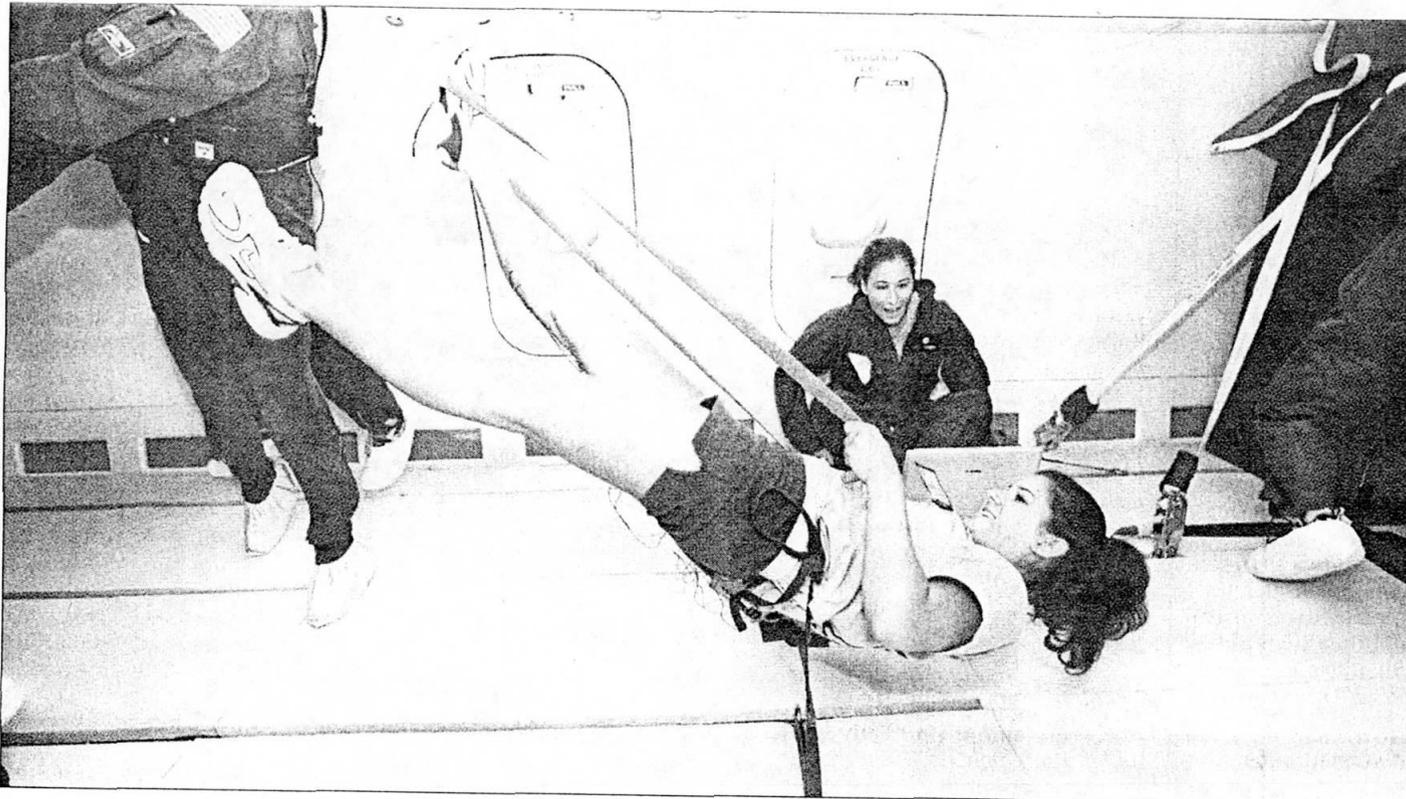
will see that they can succeed in math and science careers. Too many girls give up on math and science in middle school, she said.

Edgar advises them to "stick to it."

For more information about NASA's Reduced Gravity Student Flight Program, go to <http://micro-gravityuniversity.jsc.nasa.gov>.

## Adventures on the Vomit Comet

Lauren Edgar performs exercises in zero-gravity aboard a NASA C-9 'Vomit Comet' aircraft while her partner, Abigail Davidson, monitors her progress. Edgar, from Issaquah, and Davidson, both attending Dartmouth, were testing a series of exercises designed to prevent astronauts' muscles from atrophying. Their experiment and flight were cut short when other students' experiments started smoking.



NASA

## Escaping gravity

By Chris Winters  
Journal Reporter

Lauren Edgar, an Issaquah student at Dartmouth College and graduate of Skyline High, got her first taste of zero-gravity recently. "It was incredible. Nothing compares to your first feeling of weightlessness," Edgar said.

She and three other Dartmouth students were selected to take part in a NASA program to send students up in a C-9 jet used for astronaut training at Johnson Space Center in Houston. It flies in a series of parabolas, providing up to 30 seconds of weightlessness as the plane enters a nose dive.

The C-9 is nicknamed the Vomit Comet, but Edgar reported that she didn't feel any motion sickness. She has wanted to be an astronaut since she was 7 years old.

The students, in five groups of two on each flight day, conducted scientific experiments in those moments of free fall.

Edgar and her partner, Abigail Davidson, from New York, ran an experiment to see if short and intense exercises could better maintain muscle tone than the two-hour daily sessions astronauts undertake to prevent atrophy.

Edgar performed the exercises with electrodes hooked up to her

calf, thigh and back muscles while Davidson monitored the progress on a laptop.

"Surprisingly, it wasn't too difficult doing them in zero-gravity, other than I found myself upside-down," Edgar said. She is now back in New Hampshire preparing to start her junior year.

Unfortunately, her July 28 flight was cut short after just six parabolas. Another pair's experiment involved a water tank that started leaking. Then another pair next to Edgar and Davidson ran too much current through an amp meter and it started smoking, Edgar said.

The pilot cut the power to the

experiments and turned the jet around.

But Edgar said she'll get another chance soon, possibly as soon as November, schedules permitting. She will probably go up with the same group of students as last time.

"Hopefully they'll get their act together in the next couple of months," Edgar said.

But now that she's had her first taste, she can't wait to go back up.

"I felt perfectly at ease up there and I would love to see what it is like again," she said.

Chris Winters can be reached at [chris.winters@kingcountyjournal.com](mailto:chris.winters@kingcountyjournal.com) or 425-453-4232.

## Recent arrival enters race for council seat

Journal Staff

KIRKLAND — Arthur R. Best will make his first bid for public office in the open position 2 seat on the Kirkland City Council.

Best, 62, a software engineer who moved to Kirkland from Fremont in November, after four years of trying and a decade of visiting their daughter in the city.

He will face real estate developer Bob Sternoff in the Nov. 8 election.

Best said he is seeking office because he will soon have grandchildren and to preserve the city's small-town character.

"Issues of zoning and development are most important to me and to myself, to keep the city from going the way of Bellevue," Best said.

"I'm not against development," Best said, "but I want it to be managed."

Best said he opposed attempts to build a four-story office complex at the municipal lot at Lake Street and Cent Street because it "was not in the best interest of the community."

"Kirkland is a jewel," he said, "a really valuable diamond," and he spends a lot of time looking for ways he makes a cut.

"We've got to spend a lot of money to make sure we do the right thing."

A 1964 graduate of the Massachusetts Institute of Technology, Best is a volunteer teacher at Christ Church Anglican Church and a volunteer mentor with the Choices, a pregnancy counseling group.

He and his wife, Sharon, have three children, Bianca, 24, and Arthur, 22.

4643 244<sup>th</sup> Place SE  
Issaquah, WA 98029  
October 10, 2005

Ms. Dawn Leveritt  
NASA Program Coordinator-RGF & Higher Ed Programs  
Johnson Space Center -Mail code AE 2  
2101 NASA Parkway  
Houston, TX 77058-3696

Dear Ms. Leveritt:

I am writing to you on behalf of my daughter, Lauren Edgar, who was a participant this summer on NASA's Student Reduced Gravity Flight Opportunity program (Dartmouth College- Flight week July 20-31). She is now on an off-term program from Dartmouth and in remote areas with limited communication abilities until after November 15.

Lauren had asked me to submit the enclosed press clippings to you from her flight week. Each of the team members sent the news release to their local papers, and two of the four, Lauren and teammate Eve Russell, both from the Seattle area, did receive some good coverage from the local papers. They also were interviewed live while in Houston about their impending flight experience by KOMO radio 1000 (one of our major stations) and the interview was repeated at regular intervals throughout the day. I do have one copy of that phone interview if desired.

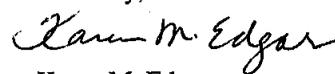
Most of these clippings are from Lauren's local and county papers which have nicely covered her long standing interest in working in a space-related career for some time—so I hope the content of this package does not look skewed! I don't know if you have received clippings from any other Dartmouth teammates, but apologize for the long delay in getting these to you!

As you will see in the clippings, the Dartmouth flight was one of those that was incomplete due to problems with experiments from other college teams aboard that day (July 28, PM flight group B). My daughter informed me that since the teams were unable to complete their experiments, NASA had invited them to return during 2006 to repeat their flights. I was wondering if you knew when these teams might hear further word on a new flight week, or could put me in touch with whomever might have this information?

The reason I ask, is that an organization which is very interested in having Lauren and Eve speak about their experience, as part of their outreach, is the Museum of Flight in Seattle. (which we were thrilled to hear will now be lead by Bonnie Dunbar!) Lauren has been heavily involved with promoting educational programs at the Museum since her freshman year in high school-- both as a Museum Apprentice and a teen spokesperson. Her museum contacts were delighted when she approached them about presenting on her Reduced Gravity Flight Opportunity, and agreed to have her speak to their audiences during her December college break. They also were interested in having her present to their educator group in October, but she was already away on her off campus experience.

Since her July flight was incomplete, this has put her ability to promote this program at the Museum of Flight on hold. She is still unsure if they wish her to speak in December on the portion of the flight that she did do (she and one teammate flew on Day 1 but only did 6 parabolas before the flight was brought in), or to wait until they repeat their flight and have more complete data. When she connects with the museum personnel upon her return in November, it would be helpful if she could share any additional information about her team's future flight dates in order to schedule her outreach with the Museum and other interested organizations.

Thank you for any information you are able to provide. I know that the Dartmouth team is enthusiastically looking forward to returning to Houston to complete their experiment in 2006! If you have any further information, I can be reached by email at: [kedgar5@comcast.net](mailto:kedgar5@comcast.net) or at the address listed above.

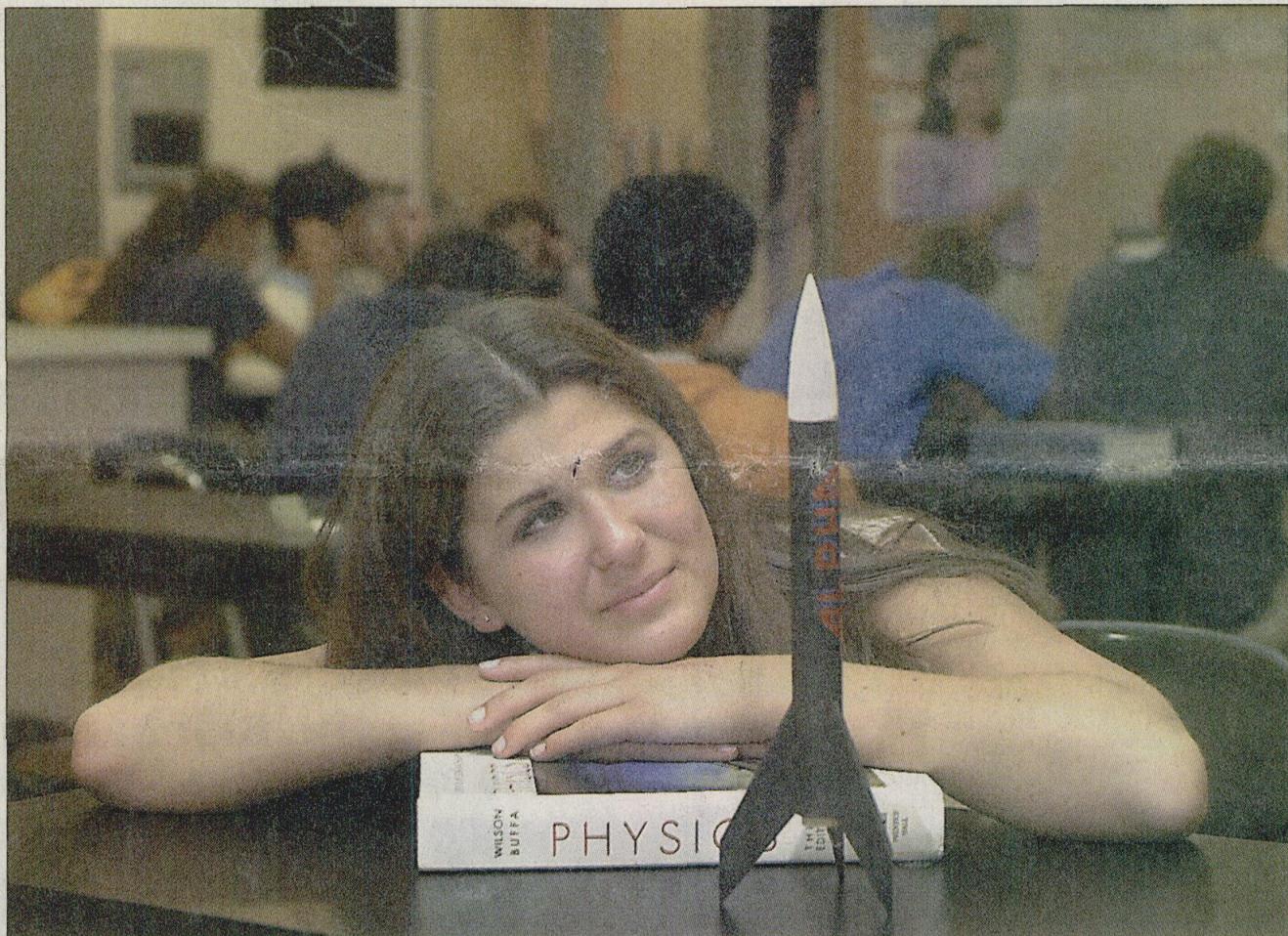
Sincerely,  
  
Karen M. Edgar

King County  
Journal

July 26, 2005

# Beyond Planet Earth

*Woman's dream takes her on NASA's 'Vomit Comet'*



Steve Shelton/Journal file

Lauren Edgar was one of the Journal's Top Graduates for Academic Achievement in 2003. Now at Dartmouth College, she is pursuing her long-term goal of becoming an astronaut. This week she will take part in an experiment aboard NASA's legendary 'Vomit Comet.'

## Skyline High graduate will conduct gravity tests on herself aboard C-9 jet

**By Chris Winters**  
Journal Reporter

Reaching for the stars has always been more than a turn of phrase to describe Lauren Edgar's lifetime goals.

The 19-year-old Skyline High graduate will come one step closer this week when she takes part in an experiment aboard NASA's legendary "Vomit Comet," a C-9 airplane that is used for astronaut training. It flies in vertical parabolas over the Gulf of Mexico, providing about 25 seconds of free fall to sim-

ulate a reduced gravity environment.

Edgar's experience could happen today, the same day the shuttle Discovery is scheduled to launch.

Edgar, who will be a junior at Dartmouth College next year, is joined by three other Dartmouth students and grads in conducting an experiment aboard the C-9. "I've always been interested in space exploration and so this is another aspect of it," she said during an interview via phone from the Johnson Space Center in Houston.

The experiment is designed to test a variety of short intensive exercises conducted in reduced-gravity environments. Without gravity exerting the same constant pull felt on Earth, astronauts' muscles tend to atrophy, so part of their daily regimen is a series of two-hour-long



## DISCOVERY COUNTDOWN

Liftoff planned for 7:39 a.m. today, A6

exercises using heavy equipment.

The theory behind Edgar's project is that shorter duration, but more intense periods of exercise, would have the same or better effects.

See DREAMS, A7

# Dreams

CONTINUED FROM A1

When she goes up in the *Vomit Comet*, Edgar will conduct the experiment on herself.

She's been a space nut since age 7, when she saw the Space Shuttle *Discovery* launch in Florida.

"It was the first time that I understood that there were people on board and they were leaving this planet," she said.

Her long-term goal is to become an astronaut, designing and conducting experiments in space as a mission specialist. She is majoring in earth science and engineering and also hopes to get a minor in astronomy.

Edgar's mother, Karen Edgar of Issaquah, said her daughter always has been very focused and since childhood had been a competitive gymnast.

"I think that had something to do with the development of her drive and her ability to focus," her mother said.

Lauren is well on the way toward that goal. She graduated from

Skyline in 2003 with a 3.96 GPA, one of the top five in her class and the *Journal's* Top Grad for Academics that year. At the same time she volunteered at the Museum of Flight and once went to NASA's Advanced Space Academy in Huntsville, Ala., to take part in underwater and other exercises used in astronaut training.

"She didn't really want to come home from that experience and she doesn't want this one to end," Karen Edgar said.

Eve Russell, a Seattle native who just graduated from Dartmouth, also is on the team. She's applying to medical schools and while not the lifelong space nut that Edgar is, she worked last year at NASA's Jet Propulsion Laboratory studying the biology of microbes associated with the Mars Express orbiter and its assembly facilities. That got her interested.

"I think in the long term I would be more interested in the physiological side of space, how we can have human astronauts up in space," said Russell, a graduate of Lakeside High in Seattle.

Another encounter was with Jay Buckey, a doctor and astronaut

who taught last year at Dartmouth.

Buckey had attended a presentation Russell gave at Dartmouth on her research at the Jet Propulsion Laboratory in Southern California. At the same time, Edgar had sought out Buckey on different issues.

Buckey steered the two of them and two other students, Abigail Davidson from New York and Jennie Tonneson from Virginia, to NASA's Reduced Gravity Student Flight Program and encouraged them to apply their current experiment.

Their project was selected from more than 100 experiments to fly aboard the C-9.

Edgar finds the prospect of the flight's coming on the same day as the *Discovery* launch thrilling, although she knows that by the time she might become an astronaut the space shuttles probably will be retired.

"If we continue with the space initiative then we're continuing back to the Moon and hopefully on to Mars," Edgar said. "We're not going to stay in Earth orbit forever, so we're going to have to keep broadening our horizons."

# LAWRENCE JOURNAL-WORLD PULSE

Tuesday, November 8, 2005

# Space dreams



Story by Terry Rombeck  
Illustration by Karl Gehring

## Students launch astronaut ambitions in KU programs

**T**hroughout Ben Parrott's childhood, he told adults he wanted to be an astronaut when he grew up. "They usually said, 'Ah, that's cute.' They'd pinch you on the cheek and tell you to go for it," he says.

More than likely, they figured he — like most children — would outgrow that phase.

He didn't. Parrott now is a junior at Kansas University, and he still wants to be an astronaut. By the time he made it to this level, majoring in aerospace engineering with his sights set on designing

spacecraft, those doubting grown-ups started taking him seriously.

"It's definitely attainable," Parrott says of his astronaut dreams. "They used to laugh at me when I said it. They don't anymore."

### Realistic goal

Some never get over the childhood dream of floating in space.

Loral O'Hara had the dream when she was a child. It hasn't changed much through the years.

"I'm interested in the exploration

Please see STUDENTS, page 3E

ING



A mix of gritty lyrics and cello has for the band's "La Di Lupo," and a different inspired by sity of the r's chant to y Death joins Elliot ellations at 8 020 Mass.

ost  
ews,



0 million  
ue Story,"  
ck," \$3.1  
million

et  
th grades are  
orld Teen  
rom 7 p.m.  
s Center,

3E.

5E  
4E  
6E  
5E  
6E  
5E  
6E

US

n  
ditor  
com  
at  
com

# What would you bring aboard if you were an astronaut?



**Amanda Montgomery, Schwegler School, fourth grade**  
 "I would bring my best friend, because she's really nice and she could keep me company."



**George Stockhamme, Cordley School, fifth grade**  
 "I would take some exercise equipment that didn't involve any weights, because they say it's hard to stay in shape while you are in space."



**Tristan Pate, Quail Run School, fourth grade**  
 "My dad, because I would have someone I know to go with me so I wouldn't get bored by myself."



**Becky Dreifuss, Bishop Seabury Academy, freshman**  
 "Lots of books, Manga, a camera and my art supplies."



**Emily Dreifuss, Bishop Seabury Academy, seventh grade**  
 "I would probably bring my Playstation 2, so I could play games when I get bored."



**Jamesha Flanagan, Schwegler School, sixth grade**  
 "A whole bunch of CDs, my headphones and some books."



**Shanowa Whiteman, Broken Arrow School, second grade**  
 "My puppy, because I love him and I would miss him the most."



**J.J. Beavers, home-schooled, fifth grade**  
 "I would bring my video games and play them every chance I had."

## Students launch astronaut ambitions at KU

CONTINUED FROM PAGE 1E

side of it," says O'Hara, a KU senior in aerospace engineering. "I could go to Antarctica, but people have been there. I want to go where we've never been before and explore."

O'Hara already has her pilot's license, which she figures could help her get a leg up in the astronaut selection process down the road.

With the average age of new astronauts at 34, she has a while to hone her resumé. She'll start working at Rocketplane Limited Inc., a private Oklahoma City company aiming to start a space tourism operation, after graduating in December.

Even with that experience, she knows becoming an astronaut could be difficult.

"Everyone's so highly qualified," she says.

NASA currently has about 100 active astronauts and has been accepting about 20 new candidates every two to three years.

There are generally 150 to 200 applicants for every open astronaut position, and many of the candidates who don't make it in are just as qualified on paper as those who do. The applicant pool has rarely dwindled, even in difficult times such as those that followed the 1986 explosion of the space shuttle Challenger.

But that shouldn't discourage students, says Steve Hawley, a KU graduate, former astronaut and current director of space science for NASA.

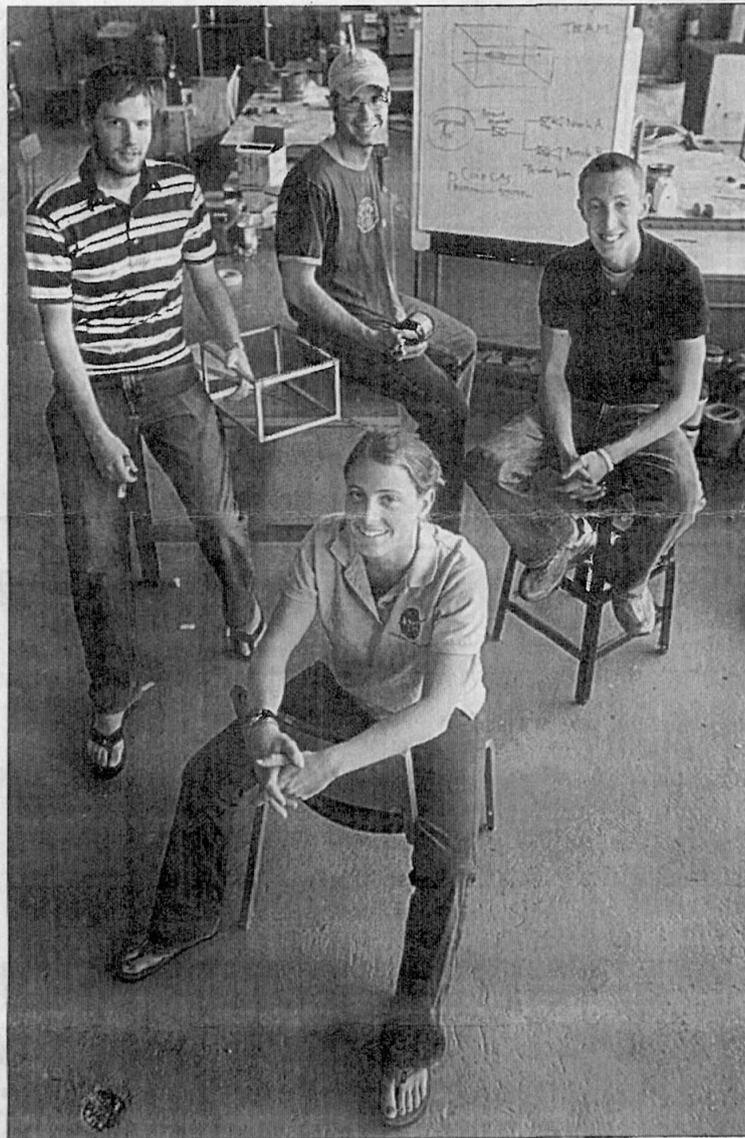
"I think it is (realistic)," says Hawley, who was born in Ottawa and grew up in Salina. "You can be a kid in a small town in Kansas and grow up and do this stuff. It doesn't mean you can't be competitive in these kinds of positions."

### Stack of paper

In 1978, when Hawley was accepted into the space program, most of the new astronauts had a military background. Now, it's about half-military and half-civilian, though most of the civilians have advanced degrees, mainly in science.

Hawley has served several times on astronaut selection committees.

"Everybody initially is a



Nick Krug/Journal-World Photos

**MEMBERS** of the Kansas University Microgravity Team, clockwise from front, are team leader Loral O'Hara, a senior from Overland Park; Austin Pyle, a junior from Halstead; Zach Schauf, a junior from Newton; and Ben Parrott, a junior from Overland Park. In June, the team will test a satellite propulsion system it designed at the Johnson Space Center in Houston.

stack of paper — a transcript, a resumé, references, medical information and a standard government application form," he says. "What you need to do is figure out a way to give the selection committee a reason to keep you. ... Realistically, we're spending several minutes, at best, looking at any one folder."

Those could include a perfect grade-point average, extensive community participation, good writing skills or a long list of accomplishments for a young age.

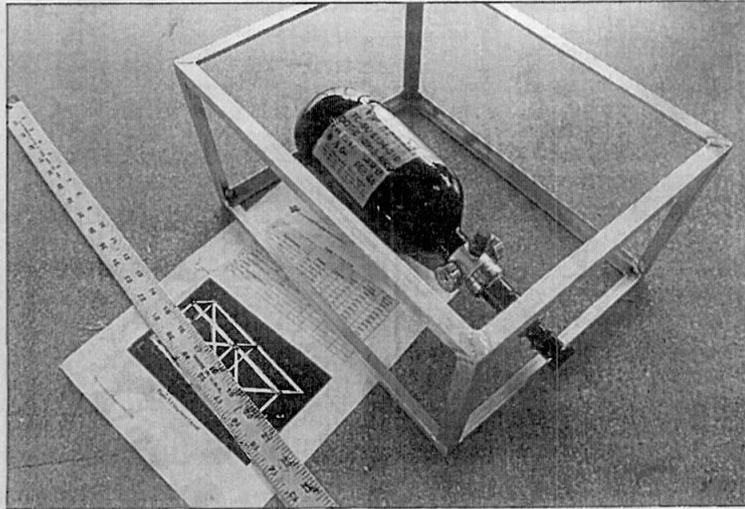
"The thing we look for, first and foremost, is somebody

that has demonstrated technical achievement and the ability to learn," Hawley says. "Therefore, there are a few degrees that wouldn't qualify, but a technical degree of any kind is going to be qualifying. And therefore, you should do something that really interests you. If you're not passionate about it, you're not going to be good at it."

### Good timing

Hawley says current KU students may be coming to the space program at an opportune time.

With the space shuttle era



**THE TEAM'S** satellite propulsion system, which is not yet fully completed, will be tested at zero gravity.

### ASTRONAUTS WANTED

Join the fast-paced world of space exploration as an astronaut with NASA. Ideal candidates will be between the ages of 26 and 46 and free of medical conditions that could impede space flight operations. Candidates who have had vision surgery are disqualified.

Military experience or an advanced degree in a scientific or technical field is preferred. U.S. citizenship is required. Beginning pay is \$56,445, with salary advancement up to \$104,581 possible with experience.

For more information, visit <http://astronauts.nasa.gov>.

body president, is now a fourth-year medical student at KU's Wichita campus. He's wanted to be an astronaut since he visited the Kansas Cosmosphere in Hutchinson when he was 10 or 11, and was going to medical school with hopes of becoming a flight physician.

But Mills says he thought the explosion of the space shuttle Columbia in 2003 pushed back NASA's plans enough that he might miss his window of opportunity to spend much time in space. He's opted to go into pediatrics instead.

"It didn't seem like the space program was going in a good direction," he says. "It's a bad time to join the corps."

But Mills isn't ruling out a change of heart down the road.

"If there was an opportunity to go up, I'd be the first to sign up," he says.

Other KU students have a more optimistic approach. Zach Schauf, a junior in aerospace engineering, says he'd like to have a hand in designing the next generation of manned space vehicles — and someday fly in them himself.

"There will be a lot of opportunities for new study and design of the new spacecraft," Schauf says. "There's going to be a lot of new positions. If we want to go to Mars, we'll be at the peak age."

coming to a close, a new manned space vehicle in the works and goals of returning to the moon and getting a man on Mars, NASA will have plenty of work to keep astronauts and others busy, he says.

"People who are students today and are interested in becoming astronauts are going to be joining potentially at a very interesting time," Hawley says. "They could be very well-positioned to be the people who might go back to the moon, and would be ideally suited to be going to Mars."

For Justin Mills, though, the space program wasn't developing quickly enough.

Mills, a former KU student

Daily Beacon  
April 20, 2005

Wednesday, April 20, 2005

# Students to study at NASA

**ALEX KENNEDY**  
*Staff Writer*

University of Tennessee students will be performing experiments in zero-gravity conditions this summer at the NASA's Johnson Space Center in Houston, Texas, after being selected by the NASA Reduced Gravity Student Flight Opportunities Program.

The two groups of students that were selected were chosen as a result of a tough application process which involves proposing a concept relevant

to NASA and research that will contribute to the advancement of its space program. Each group submitted a long and detailed report of their proposal to NASA earlier this year.

"This has been an excellent opportunity for us as students to experience the process that scientists go through whenever they are working on a project," team leader Eric Thompson said.

The zero gravity conditions are obtained in the NASA C-9 aircraft. Its flight pattern is compared to that of a

roller coaster, creating an atmosphere of zero-gravity in the cabin for short intervals of time.

The students will be sent to Houston in the summer, where they will undergo ten days of intensive training. Training includes the observation of NASA scientists at work, physical evaluations and readiness exams, all in preparation for performing their experiments in zero-gravity conditions.

See **NASA** page 6



Adam Brimer • The Daily Beacon

*Ali Nejad, Robert Ray, Chris Shough, Eduardo Gonzalez, Brandon Raissian, and Eric Thompson (left to right) along with Julie Pierson (not pictured) will be performing experiments this summer at the NASA's Johnson Space Center in Houston, TX.*

# NASA

---

*continued from page 5*

"There will be a lot of basic training, like what the astronauts usually go through," SCOPE team member Robert Roy said. "We'll go through exercises like dealing with cabin pressure and learning how to complete activities with or without an oxygen mask."

The UT teams will be carrying out their experiments along with 10 or 11 other groups simultaneously in the aircraft. Three months after the tests

have been run during the C-9 flights, the teams are required to report back to NASA with their findings, analysis and conclusions drawn from the experiment results.

One of the groups, consisting of Eric Thompson, Robert Roy, Julie Pierson and Brandon Raissian, will test the velocity difference between air and water, which simulates a common reaction with liquid potassium that will occur in a space-based nuclear reactor and determine the best ways to prevent damage on the system by the water. This will reduce or eliminate the

amount of mechanical repairs that will have to be done while in space.

The project is called Simulation for Confirmation of the Onset Correlation of Liquid Potassium Entrainment, or SCOPE. For SCOPE, it will be the first year as part of the program.

The other group, consisting of Stephen Young, Chris Shough, Joseph Tipton, Sheena Edwards, Christopher Johnson, Eammon Bemis and Nathan Fortner, is known as HERCULES. This stands for "Heat Exchange Research and Condensation by Utilizing a Liquid/Fog Experiment Setup."

# Students hope to experiment on 'Vomit Comet'

ASHLEY YEAGER  
Staff Writer

The National Aeronautics and Space Administration has grounded Chris Sough and his team twice. But he hopes that his third attempt to take the project SCOPE onto the Vomit Comet will have a different result.

"I would love to ride and be weightless," Sough said. "But I don't want to get my hopes too high, so we are just going to focus on building our experiment."

Sough is a senior in the Mechanical Engineering Capstone Design class and is the team leader for the Simulation For Confirmation Of The Onset Correlation Of Liquid Polymer Entrainment, or SCOPE, research project.

The project simulates movement of liquid droplets through a horizontal pipe.

At microgravity, no force pulls the liquid to flow on the bottom of the pipe. The liquid flows at the center of the pipe. According to Sough, his team wants to investigate how liquid flows between and interacts with air and water. This project developed in 2004, when Sough was a junior, and Vlastislav Naoumov, advisor for the Capstone Project, asked Sough to join the team working on the project then.

"Sometimes we ask juniors and sophomores to join the team because we need an extra student," Naoumov said. "I like to ask juniors so that they have some experience when they sign up for the class. It has been great to watch Chris mature from a junior student into a team leader."

Naoumov said that it was disappointing for his teams not to fly last year, and he explained that NASA grounded the flights because of the administration's Return to Flight program.

NASA had to use the Vomit Comet for its original purpose — to train astronauts for weightlessness, according to Naoumov.



In the spring, if NASA maintains the scheduled 2006 Reduced-Gravity Student Flight Opportunity Program, the student projects, which the Johnson Space Center selects, will fly on a C-9 to collect data.

"The plane does 20 to 30 parabolas and for 20 seconds, at the top, you hit zero gravity," Naoumov said. "It is a short period

of time, about 600 seconds. That is not enough time to physically do an experiment, so then we have computers record the data."

The 20 seconds of weightlessness is about enough time for a student to turn on the experiment and let it happen and then turn it off again as the force of gravity returns.

Naoumov said that NASA receives 200 to 250 proposals for projects and the program only allows 50 projects to have the chance to collect data at zero gravity.

"We have had two projects each year from Tennessee," Naoumov said. "I am crossing my fingers. We all are."

Because two teams are usually chosen, Naoumov split his capstone class into two teams. A group of four students is working on the HERCULES or Heat Exchange Research And Condensation Evolution By Utilizing A Quick Fog Experimental Setup.

Adam Jirelekas is the team leader for this project, which focuses on condensation and steam movement. After the delay and then canceled flight plans, both teams have disassembled and redesigned their experiment facilities.

NASA requires the experiments to fit in a box with 2-by-2-by-5-foot dimensions, and with the additional tests the teams have done under the force of gravity, they have been able to make their experiments more efficient.

Both projects study energy generation and the influence of microgravity on the process of nuclear energy.

"The probes that travel in space, especially past Mars, use nuclear energy," Erin Skiba, a SCOPE team member, said. "We study energy flow and how to make it more efficient."

See Science on page 6

## Science

continued from page 1

The projects focus on heat exchange and hydraulic problems and the data can suggest design ideas to cool own nuclear reactors more effectively, according to Naoumov. According to the ASA Web site, <http://science.nasa.gov>, solar energy is not practical because sun's rays are so weak that it

would require solar panels that weigh 1,200 pounds to catch and convert enough energy for propulsion. That additional mass would make the craft too heavy to escape the Earth's atmosphere.

Current space probes carry a radioisotope thermoelectric generator. The RTG weighs about 130 pounds and is capable of conducting the probes communication, navigation, onboard systems and scientific instruments. In 2003 NASA

proposed Project Prometheus to develop nuclear energy facilities to propel long-duration space missions. The SCOPE and HERCULES projects deal with the process of generating large quantities of energy at microgravity conditions. The experimental data will help NASA engineers to develop systems such as heat pumps and electrical generating plants for space use, especially sending humans to Mars. But as with all NASA programs, funding is a

major concern, even for the program which Naoumov's students participate.

"Just to go to Johnson Space Center is \$3,000," the professor said. "Then there is the extra money to build our experiment facilities. The students purchase all the equipment and that is another \$3,000 to \$4,000."

The Tennessee Space Grant Consortium contributes money to cover the projects, but even with a secure slot to fly the experiment, the students are not

sure about ever getting to conduct microgravity experiments because of NASA funding for the air craft and program.

"It's frustrating, but the experience of building and testing our experiments on gravity is enough," Sough said. "Being weightless is good for bragging rights, but this class is the most practical thing."

The capstone project requires that the students discuss their experiments with

the public, and in the past, those students that have flown on the Vomit Comet have presented their scientific findings at the American Institute of Aeronautics and Astronomy meetings that are held in January.

Naoumov, himself, will be presenting a paper in Orlando, Fla. on Nov. 11 about the NASA student programs and his branch of the senior capstone design class.

Figure 28 – Daily Beacon Article, October 25, 2005

# 'Vomit Comet' mimics zero gravity for projects

ASHLEY YEAGER  
Staff Writer

Scientists, astronauts and students call it the Vomit Comet, and very often someone will get sick during the ride. Lawrence Taylor, director of the Tennessee Space Grant Consortium, said,

"It's one thing to throw up in zero G, and as you come back to one G (the force of the earth's gravity) and then to two Gs, well then of course, everything lands, and it's a strange world, you know," Taylor said.

Taylor was referring to the C-17 aircraft that the National Aeronautics and Space Administration uses to determine the effects of weightlessness. In the 1970s, NASA began using a former Air Force plane, a KC-135 known as

the Weightless Wonder, to train astronauts for a zero-gravity environment because they were getting sick in space.

"The program was initially called 'Barf in Space,'" Taylor said, who is able to give to money to students and professors for research through the consortium.

The plane flies at an altitude ranging from 24,000 to 33,000 feet in a sine-wave trajectory, or what Taylor called a parabolic wave.

"What happens is, for about 30 seconds, while the plane is descending it has zero gravity. And then it has about two G's at the bottom of this (wave), and then it goes back up and then you come back over the top," Taylor said.

The Vomit Comet fluctuates between zero and about two Gs,

which is a feeling of weightlessness and then a force two times stronger than the pull of gravity.

A typical ride is two to three hours, and the plane flies 40 to 50 parabolas, which can occur consecutively or with short breaks to readjust equipment.

The plane is not only used to train astronauts for a weightless environment, but it is used to conduct research as well.

The Reduced-Gravity Students-Flight Opportunities Program allows students to

travel on board the plane and perform microgravity experiments, Taylor said.

"For example, how does water boil? You know, you put a pan on a stove, water bubbles and comes to the surface, and that's because there is gravity," Taylor said. "But what happens at zero G? You can imagine, all these bubbles sort of aggregate together into one bubble, but where does it go?"

Students at UT developed an experiment in 2000 to study this and how the liquid-vapor then travels through a pipe. As a

volunteer project, several students wanted to simulate boiling water and the effects of evaporation and condensation in reduced-gravity conditions, said Vatcheslav Naoumov, who was the faculty advisor for the projects.

The MAMMOTH Flow experiment, or Making a Mixing Measurement of Two-Phase Flow, was a project to study the heat flow from solids to liquids, when vapor barriers limit the transfer. The fluid dynamic studies focus on power generation in zero gravity conditions.

Students will conduct tests in the spring of 2006 to determine the effect of liquid condensation on vapor flow in a reduced-gravity environment.

This HERCULES experiment, or Heat Exchange Research and

Condensation Evaluation by Utilizing a Liquid/Fog Experimental Set-up, studies the effects of the micro-gravitational environment on the Rankine cycle.

According to the HERCULES project proposal, the Rankine cycle describes the cycle of a steam engine found in most power generation plants and relies on a two-phase flow of energy through evaporation and condensation.

Under the force of gravity, the condensate is pulled to the floor of the energy-producing machine. Without gravity, the condensed vapor fixes itself to the mechanism wall and creates a liquid film build-up and slows the vapor flow through the pipe

See Science on page 6

## Science

continued from page 1

"You know if you have a pipe, and the pipe has water or some other fluid flowing through it, it flows by certain principles, but a lot of it has to do with gravity," Taylor said. "What does this do at zero gravity?"

Both the HERCULES and MAMMOTH experiments attempt to answer that question. On a larger scale, the projects study the effects of microgravity on generating large amounts of energy, which may run potential spacecraft, space colonies and other extraterrestrial activities, according to the HERCULES project proposal.

The team that will conduct its research in the spring will head to the Johnson Space Center in Texas for about ten days for physiological training in classroom and hypobaric chambers, which prepares students for the pressure changes in flight, according to Naoumov.

The team must review all of the safety and procedural rules, and the students conducting the experiments fly for two consecutive days to collect data.

"The Reduced-Gravity Student Opportunities Program provides a unique academic experience for undergraduates to successfully propose, design, fabricate, fly and evaluate a reduced-gravity experiment of their choice," Naoumov said.

Proposing an experiment and riding on the Vomit Comet used to be voluntary on the part of the students, but in 2002, the project was integrated into a senior capstone-design course. Two senior capstone courses exist: One is the proposal, design and test of a microgravity experiment, and the other is the design, construction and race of a lunar moon buggy.

Both of these experiences are meant to show the students how to put theory to practical use," Taylor said.

"Surprisingly we get a lot of good comments from

professors and from students because it may actually be the first time that they used a wrench or a pair of pliers or welded something."

Taylor and Naoumov agreed that the experience taught the importance of teamwork, and the project requirements push students to prepare for a professional career in science. Naoumov said that students research deeply into aerospace problems and gain a lot of new knowledge, and they obtain better understanding of aerospace issues.

The students have a lot of communication with NASA engineers and scientists, bridging the gap between the university and the work force.

After conducting their research, the students present their results, just as a scientist would, through public lectures and discussions.

"They present their projects to high schools and middle schools, where school children could be exposed to the project activity," Naoumov said. "These activities involve a new, young generation in the aerospace issues."



Figure 29 – Daily Beacon Article, November 8, 2005