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SCIGUY 'FLIES'



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SCIGUY: Weightless at last.

What's zero gravity like? **ERIC BERGER** joined Rice University students in NASA's "Weightless Wonder" to find out. First there's skepticism, followed by liberation, queasiness, and the urge to spin again and again. **PAGE A10**

Out-of-this-world rides draw students to NASA

■ As space loses luster, the agency bets a few minutes of zero gravity can have a lasting pull

By ERIC BERGER
HOUSTON CHRONICLE

NASA has an image problem with the kids.

So last week, the space agency took a few dozen of the country's best and brightest engineering students on the plane ride of their lives — soaring from 24,000 to 34,000 feet, and then screaming back down again in little more than a minute.

The immediate goal was exposing the students to weightlessness; the longer term goal was infecting them with a hunger for human spaceflight.

A survey of 18-to-24-year-

 **chron.com**

VIDEO: Watch SciGuy Eric Berger and Rice students go weightless aboard NASA's "Weightless Wonder" airplane. chron.com/space

olds published last year by Dittmar Associates found that half of young adults viewed the space agency as "irrelevant or very irrelevant," and nearly three-quarters said money spent on NASA could be better used elsewhere.

That's not the response NASA officials want, considering that the Vision for Space Exploration, which would take America back to the moon and on to Mars in the next four decades, is a program whose tax burden would be carried by this younger generation.

There's also the matter of
*Please see **NASA**, Page A10*

NASA: Rice engineering students get choice spot for experiment

CONTINUED FROM PAGE A1

the aging work force at NASA, with an average age of 46.3 years. Michael Griffin, the agency's chief, said one-quarter of NASA's personnel reach retirement age in the next five years.

What's a space agency to do?

Every year, NASA holds a competition for college-age engineers and scientists to devise the most inventive experiments that could be conducted in zero gravity — that is, the weightlessness of outer space.

The carrot is that the best proposals actually get flown, and the students themselves conduct the experiments.

OK, they don't actually fly

into space. But they come as close as possible, flying roller coasterlike parabolas in a military version of the DC-9 that produces, for 20 to 25 seconds at a time, zero-gravity conditions.

Hometown team

This year, a Rice University team of mechanical engineers won one of the coveted spots. They showed up in a drafty hangar at Ellington Field in late April, their experiment in tow.

In between safety lectures — "This is not an amusement ride, this is a research aircraft," test director John Yaniec told them in a clipped tone — the real rea-

son for their visit became clear.

"Welcome to NASA," Helen Lane, manager of University Research and Affairs for Johnson Space Center, said at one point. "This is the place where humans are put into space. We really hope you enjoy your time with us."

And we hope you come back one day.

That was the underlying message for senior Patrick Snyder and other members of Rice's team, whose experiment was a system for testing satellite performance in microgravity.

Since its inception in 1995, the space agency's Reduced Gravity Student Flight Opportunities Program has given more than 2,000 undergraduates the opportunity to fly. About four dozen teams fly aboard the "Weightless Wonder" each year. A typical flight for 10 students includes 30 parabolas, or about 10 total minutes of weightlessness. It costs NASA about \$22,440 per flight.

Desirable minds

In the big picture, this serves just a handful of students. But these are the type of young minds NASA almost certainly must attract if it is to remain at the forefront of spaceflight. Correspondingly, during their training, the students were bombarded with internship and co-op offers to work at NASA.

When it finally flew last week, the Rice team's experiment wasn't entirely a success — the compressed carbon dioxide used to propel the mock satellite wasn't powerful enough, even in zero gravity.

"We feel we took a 'giant leap' in the right direction, and that, with some modifications, control over the craft in two degrees of freedom could be demonstrated," Snyder said.

Those modifications probably won't happen, and that's not really the point. The four Rice team members who flew will graduate soon. Snyder plans to attend medical school, and another team member, Omar Nava, has lined up a job with General Motors.

But after the flight a seed had been planted in their minds.

Snyder recalled part of his two weeks at NASA when officers gave physiological training and prepared students for the effects of oxygen deprivation in the rare case that the aircraft became depressurized. "I could definitely see myself leading that kind of training," he said.

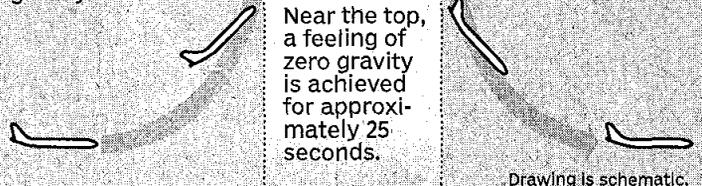
As for Nava, he wouldn't mind returning to graduate school after a few years in the private sector. It would be fun, he mused, to become an astronaut someday.

PERSONAL REPORT

ZERO GRAVITY FLIGHT MANEUVER

How NASA uses a KC-135, the military version of a DC-9 jetliner, to simulate the weightlessness of space:

The aircraft flies a parabola, climbing for approximately 20 seconds at a 45-degree angle, subjecting passengers to almost twice the force of gravity.



Source: NASA

ASSOCIATED PRESS

Weightlessness: It's unnatural — and fun

Feet down, coming out!

That was the message belated by John Yaniec, the lead test director on NASA's "Weightless Wonder." We were to point our feet toward the floor because it would soon come flying toward us. Such is the transition between weightlessness and nearly two Gs, or twice Earth's gravity.

I had just been weightless for the first time.

I hadn't really believed I'd go floating off upon reaching the "weightless" portion of the parabola. It's just not something intuitive, but it happened all the same after a slight push.

Within a second or so I bumped my head against the plane's ceiling. I didn't care. I was liberated. I floated. And then I remembered to point my feet to the floor.

As we pulled into higher gravity I felt my stomach churn

moderately. At nearly twice Earth's gravity it was difficult to stand upright. My insides were coming to the same conclusion.

In the old days, one-third of fliers got sick, one-third violently sick, and one-third got lucky during this tumultuous transition.

Now NASA has a motion-sickness medicine regimen that cuts the sickness way back. The agency frowns upon the plane's more familiar name, the Vomit Comet.

I didn't get sick then, or at any time during the next 30 parabolas. And I had a blast tagging along with Rice University's student engineers, doing everything from "flying" through the air to curling into a ball and being spun, end over end, half a dozen times. Yes, it's as cool as it sounds.

I'm ready to go again.

— ERIC BERGER

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After NASA accepted the students' proposal, the team spent March 8-16 at the NASA Johnson Space Center's Ellington Field in Houston to test their machine in a zero gravity environment.

Their project, they said, was to "influence the affect of vane notching on propellant management devices."

In other words, the college seniors spent their spare time developing a way to ensure space shuttle fuel tanks use every drop of liquid, because it presently pools and is wasted, they said.

From visiting the mission control center to meeting with astronauts, Mason said the entire experience was thrilling.

"It's incredible," Mason said. "It's a once in a lifetime thing for the most part."

For White, the most exciting aspect was shutting his eyes and suddenly finding himself staring at the ceiling of a C-9 aircraft that produces 18 to 25 seconds of weightlessness by flying steep climbs followed by free falls.

"I would definitely like to be the guy who flies that airplane every day," White said.

White described the feeling as riding a Kings Island roller coaster, but better. Mason said it was indescribable and "a very unique feeling."

The zero gravity simulation, Weightless Wonder, has been used to train astronauts as well as to conduct experiments.

Both students said NASA engineers liked their plan and may contact them for future information. White said it is his dream to work for NASA and it was one of the best ways to network.

While in the C-9, the two said they also tested a physics experiment designed by Lakota West students and will return to the district with video footage and results.

Contact this reporter at (513) 755-5067 or lhilty@coxohio.com.

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Tuesday, April 17, 2007

Lakota West graduate experiences zero gravity in NASA program

Contributed By Carrie Whitaker | The Enquirer

Zero gravity. It's indescribable, says Purdue University senior Josh Mason.

Most will never experience this scientific phenomenon, but at 22 years old, the student from West Chester Township has experienced it – not once – but twice.

"The closest thing I can compare it to, is being in a pool ... like buoyancy," Mason said. "I've tried to explain it, but I basically come down to telling people 'you have to try it to understand.'"

For the second year, the 2003 graduate of Lakota West High School has participated in the Reduced Gravity Student Flight Opportunities Program through NASA.

Mason is in the fourth year of a five year program to become an aeronautical and astronautical engineer. "Basically planes and rockets," he said.

Mason and four other teammates began putting together the proposal for the NASA program in July 2006. This year, two teams from Purdue were selected to participate in the program. Three team members graduated from high schools in Greater Cincinnati.

One of Mason's teammates, Brandon White graduated in 2003 from Fairfield High School. The other team included Alexandria Estes from Glen Este High School.

Basically, acceptance into the program means the students get to propose, design, build, fly and evaluate a



Stephan Shurn (left) and Lakota West graduate Josh Mason float in NASA's "Weightless Wonder," a C-9 aircraft that can produce periods of weightlessness. Mason and nine other aeronautical and astronautical engineering students at Purdue University were chosen to participate in a special program through NASA. (Photo provided.)

reduced gravity experiment.

The team tested their experiment aboard NASA's "Weightless Wonder," a C-9 aircraft that can produce periods of weightlessness lasting 18 to 25 seconds at a time. Thirty times, the plane would fly a series of 30 parabolas – a steep climb followed by a free fall – over the Gulf of Mexico. It was the same type of plane used to film "Apollo 13".

"You are doing two experiments at once, one is the one you designed and the other is how you are going to react to being weightless," Mason said. "It's an incredibly bizarre and awesome experience."

His team was in Florida on March 8-16 testing how to get every last drop out of fuel tanks in zero gravity. Fuel is often wasted or lost in space with current equipment, Mason said.

But while they were flying, the group also performed a number of experiments designed by elementary and high school students. As part of the team's proposal, they arranged to work with eight classes – including Lakota West's Advanced Placement Physics class, taught by Linda Noble.

"We would speak about space and science and technology," Mason said. "The students designed an experiment, we built it for them and it flew on the plane with us. We will be going back to each class in the spring to present the results. NASA's huge in educational outreach and (our project) helped get the word out."

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PRIOR CAMPAIGNS

MEDIA COVERAGE

ACC students board NASA plane to do experiments in zero gravity Team hopes to test ability to measure weight in space

Austin American-Statesman
By Katie Humphrey

It's not exactly sleek - a couple of mutilated classroom carts, Plexiglas, lots of duct tape and other salvaged classroom parts - but the device, handmade by Austin Community College students, is their ticket to the space program.

Four ACC students spent months designing and constructing a centrifuge, which they believe will help in measuring the mass of objects in space.

Today, they will report to Johnson Space Center in Houston to test their hypothesis aboard NASA's Weightless Wonder, a modified McDonnell Douglas DC-9 jetliner that takes 45-degree nosedives to simulate zero gravity.

Measuring mass is hard to do in a zero-gravity environment, said Christina Vasquez, 20, who studies engineering at ACC.

As the four float through about 30 free falls, each lasting about 18 to 25 seconds, the students will spin quarters and maybe a couple of small rocks in the centrifuge. The spinning will generate a measurable force, which will help them calculate the mass of the objects.

"Knowing how fast it's going around and knowing how far away it is from what's spinning - how hard it's pulling away - you know how heavy something is," said Danaan Thome, 19.

The ACC group was among 34 teams selected from about 50 that applied to participate in the 2007 Microgravity University program. The second team ever selected from ACC, they are the only community college represented in this year's program, which includes teams from Brown and Yale universities.

The students who visit Johnson Space Center will spend nine days learning about NASA, undergoing physical training and performing their experiments aboard the Weightless Wonder, said Debbie Nguyen, a NASA spokeswoman.

"The program is trying to put them through the same procedures as we would our full-time professional research scientists," Nguyen said. "It's an opportunity to give them a chance to do something themselves and to test it in a unique environment."

The students submitted their proposal at the urging of ACC physics professor John Allen Underwood, who serves as the group's faculty adviser.

Underwood supervised the 2002 ACC team. They tested the effects of applying force superficially to simulate gravity in a weightless environment.

Members of that team, all of whom went on to study science and engineering at four-year colleges and graduate schools, said that doing the experiment aboard the NASA plane was the highlight of their academic careers, Underwood said.

The current team's experiment is exciting because it tests technology that could be very useful for NASA and scientists who work aboard international space stations, Underwood said. And the students are so enthusiastic about the opportunity that the potentially stomach-churning flight doesn't seem to worry them much at all, he said.

"Youth is so wonderful, because they just charge full-steam ahead," Underwood said.

Although the cost of the flight is covered by NASA, the students will have to raise money to pay for their trip, hotel and supplies. They've raised about half of the \$5,000 they need, Underwood said.

NASA offers participants anti-nausea medication to quell side effects of the parabolic flight aboard the plane, jokingly referred to as the Vomit Comet, but the ACC students said they're much more focused on making their experiment work than worrying about the flight.

"I think it's really going to be incredible," said Ryan Prentice, 26. "It seems like such a cool thing that I haven't had time to worry about it."

Teammate Nick Wiz has a similar attitude: "I'm 18 years old. I can survive anything."

The most daunting part of the project has been finding the time to meet NASA's extremely detailed demands, Vasquez said.

Every nut, bolt and screw must be itemized. Tools have to be numbered and sorted. Every piece of equipment must be secured, and every gap between parts must be closed.

On Wednesday, the students put on the finishing touches and did a trial run before disassembling the centrifuge and piling into a pickup for the trip to Houston. Once they arrive at Johnson Space Center, they have to pass physical training and an inspection of their experiment and all materials before they're allowed to fly.

"I'll be floating next week," Vasquez said, tightening a bolt. "But I have a lot of stuff to do before I get there."

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Flying high | Viterbi students were weightless while researching for NASA's Reduced Gravity Student Flight Opportunities Program.

Engineering students defy gravity on break

Five students spent the week at NASA conducting high-flying experiments.

By: Radomir Avila

Posted: 3/23/07

When many USC students were busy making flights to distant locales for their spring breaks, one group of engineering students took some of the most memorable flights of their lives.

Five students ditched their bathing suits for flight suits, spending a little more than a week at the Johnson Space Center in Houston, better known as ground zero for NASA operations. They spent much of their time at more than 30,000 feet, attempting to conduct an experiment with their hands as the rest of their bodies floated in suspension above them.

Aerospace engineering majors Daniel Calvo, John Duncan and Emily Hedges, and mechanical engineering majors Quinn Freyermuth and Adriel Carreno spent the months before the flight preparing their experiment on flame combustion and successfully submitting it as part of NASA's Reduced Gravity Student Flight Opportunities Program.

The program allows undergraduate students to perform experiments in microgravity, also known as weightlessness or simulated zero-gravity environment - something difficult to recreate on solid ground.

In it, students take their experiments up with them in a specialized aircraft that flies parabola patterns up and down and shuts off its engine shortly before reaching its peak, allowing for 30 seconds of microgravity.

"The sensation is similar to that of a roller coaster," said Gene Bickers, physics professor and faculty adviser for the students' trip. "At the top, you feel a moment of weightlessness, and after you go down you feel as if gravity is pushing harder down on you."

Before actually getting to ride on the aircraft, the students trained for the experience and any potential emergencies. Though not as thorough and intense as some tests NASA has become known for, they did

include a test of mental ability in a hyperbaric chamber, in which one student had difficulty multiplying 12 by 4.

The group of juniors worked on an experiment to determine how fire burned in atmospheres of carbon dioxide and helium. Their hypothesis was that since carbon dioxide does not take heat away from the fire in a zero-gravity environment as it does with gravity, the flame will burn hotter when tested.

Duncan said because of this, the fire extinguishers currently used in space aircrafts contain carbon dioxide, as they do on Earth, and their use could actually exacerbate the problem instead of quenching the fire.

Even with 60 parabolas over two flight days, the crew found it difficult to produce a significant number of successful trials.

"Our apparatus broke down on the first day of flight," Duncan said. "We thought we had fixed it afterwards, but the second flight day saw many of the same problems, too."

The data they got, however, was consistent with their theory that CO₂ burns hotter than helium, Calvo said.

For Calvo, the leader of the USC group, the trip was about working with NASA and flying in microgravity, rather than the actual experiment itself.

"I had heard about the program over the summer," he said. "I knew that NASA only accepts you if there is a real reason to test in the zero-G environment ... so I got with this group and started working on the details of the project."

According to the students, disappointing apparatus performance did not prevent them from having fun in the novel environment. Each had a unique description of the so-called "vomit comet."

"It's kind of like the feeling of the ground be taken from under you, but you don't fall," Freyermuth said. "On a roller coaster you get that weird feeling in your stomach, but with this it really wasn't present for me."

"It's really a difficult experience to describe," Duncan said. "I can only stress that it was very disorienting. Sometimes you just confused the ceiling for the floor."

Though the students completed the flame project mostly by themselves, they received financial assistance from the Viterbi School of Engineering and the Office of Undergraduate Programs at USC. Paul Ronney, an aerospace and mechanical engineering professor at USC who has flown parabolas during his time with NASA, aided the students in the completion of their project.

The project is a work in progress, Calvo said. "In the end it was all definitely worth it, even with all the time that I spent on it. It was some of the most fun of my life and something few get to experience.

"We plan to gather a larger group, tweak are apparatus, and come back next year."



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Collegian ONLINE

NEWS

[Wednesday, Feb. 7, 2007]

Students to defy gravity in NASA's 'Vomit Comet'

By Cindy Hryszko (EMAIL)
Collegian Staff Writer

The Flyin' Lions will soon have the opportunity to experience something few people will ever get the opportunity to do -- feel weightless.

This March, Penn State's student microgravity team will travel to the Johnson Space Center in Houston for a week to fly and conduct an experiment in plasma physics on NASA's "Weightless Wonder" reduced gravity aircraft.

The "Weightless Wonder" is a modified McDonnell Douglas DC-9 that conducts parabolic flights allowing students to experience weightlessness. The plane does a steep climb, followed by an equally steep descent, giving them about 25 seconds of weightlessness out of 65 seconds of flight. Each team will have about 30 of these hills, called parabolas, to run experiments, according to a NASA press release.

The team of seven engineering students was one of 34 undergraduate student teams across the country selected to participate in NASA's Reduced Gravity Student Flight Opportunities Program. It is the third team from Penn State that will get the opportunity to participate in the program.

"Each year about 100 teams apply and the number

increases each year," Matthew Futterman (senior-mechanical engineering), team leader of The Flyin' Lions, said. The team spent about two months writing its proposal, he said, picking up where another Penn State team left off.

"Last year we spent a lot of time learning the background, and this year we were able to pull ourselves together and write an expansive proposal," Futterman said.

When the students arrive, they will spend several days preparing themselves physically for the flight.

"About a third of the people that go up for every flight usually puke. When the first team went up, they were the first Penn State team to not puke," Futterman said.

This is how the "Weightless Wonder" got its nickname the "Vomit Comet."

"They say you get sick, but I don't think I'll be one of them," Chad Gerdish, (senior-aerospace engineering) one of the four flyers, said.

Gerish said he thinks their experiment would work. The group is conducting ground tests to ensure proper function. He added that the team will get two flights, which will last about two hours.

"It's going to be a really good experience; it's pretty much the best roller coaster in the world," Gerdish said.



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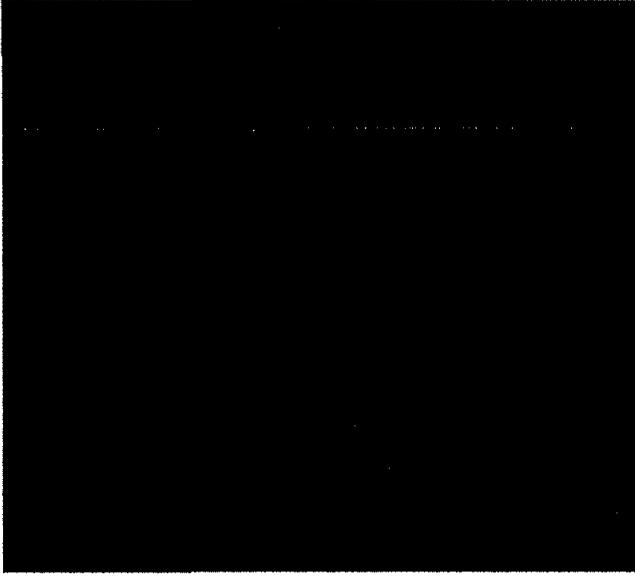
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Video: UT's Microgravity Team goes on NASA flight

February 20, 2007



The University of Tennessee's Microgravity Team proposed an experiment that has been selected by NASA for its Reduced Gravity Student Flight Opportunities Program. Thirty-four universities were selected for the program.

Six seniors and two juniors comprise the UT team. Four seniors, Adam Bowen, LaRuthie Holder, Michael Gay, and Paul Schrader will go on the actual flight above the Gulf of Mexico next month. All students involved are mechanical engineers. Basically, NASA's C-9 aircraft climbs high into the atmosphere and then, when it noses over, results in microgravity conditions or weightlessness, for the group's experiment. Two flight members for UT will go up at a time.

UT's Microgravity Team is exploring a phenomenon in microgravity called fluid entrainment. The research has applications in space-based nuclear reactors. Space programs are considering nuclear power to generate electricity for missions to the moon and Mars.

Video by Darren Dunlap/News Sentinel
Edited by Jigsha Desai/KnoxNews.com



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Engineering students set to fly NASA's 'Vomit Comet'

Tuesday, March 6, 2007

University Park, Pa. -- A team of Nittany Lions will learn what it feels like to defy gravity when they travel to the Johnson Space Center in Houston to fly and conduct an experiment in plasma physics and microgravity on NASA's "Weightless Wonder," a modified McDonnell Douglas DC-9.

The Flyin' Lions -- Jaci Croce, architectural engineering senior; Kel Elkins, aerospace engineering senior; Matthew Futterman, mechanical engineering senior; Chad Gerdish, aerospace engineering senior; Shannon Kolensky, aerospace engineering senior; Val O'Donnell, aerospace engineering freshman; and Jessica Tramaglino, aerospace engineering sophomore -- are one of 34 teams selected to fly in the "Vomit Comet." This is the third time Penn State has participated in the NASA program.

The "Vomit Comet" nickname stems from the fact that a large number of students who participate in the flight get sick from the weightlessness. But Futterman said he's not worried about that: "I'm so pumped! I can't wait to get up there."

The team departed Tuesday morning (March 6) and takes flight sometime during the week of March 12. They will be in Houston for two weeks getting ready for take off. Elkins said, "It's a little stressful right now -- we have a lot of things to get done before we can fly." But once all loose ends are tied, Elkins can concentrate on what he says is a "chance of a lifetime."

The Flyin' Lions have been preparing all year for the flight both academically and physically. Kolensky explained that "everyone has to pass a FAA flight physical first, which we all did." Like her teammates, Kolensky said she isn't worried about getting sick during the flight. "We've been practicing these procedures for so long that hopefully when we get up there it will be second nature."

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