

National Aeronautics and
Space Administration
Langley Research Center

News Researcher

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Pushing The Envelope

Remote Control Model Goes Where Pilots Won't

By **KATHY BARNSTORFF**
Langley Research Center

They can fly as fast as 200 mph and push the flight envelope to a place most pilots never want to go.

They are turbine-powered, dynamically scaled, remote-control models: a new research capability being developed at Langley Research Center.

The sponsors in the development of this unique testbed are conducting "refuse to crash" technology research for NASA's Aviation Safety and Security Program (AvSSP).

"Using a sophisticated flying transport model will allow us to evaluate technologies in a flight-test environment in regimes beyond normal envelope operations," said Christine Belcastro, head of the Control Upset Prevention and Recovery (CUPR) element of the AvSSP.

Belcastro and her team are developing control system technologies to reduce aircraft loss-of-control accidents caused by system and component faults and failures or other contributing

factors, such as extreme weather, vehicle impairment or pilot error. The control system technologies include failure detection, identification and accommodation algorithms as well as upset recovery algorithms.

The objective is to prevent airliners from going into steep dives and other extreme flight conditions, but the technology also would help aircraft automatically return to level flight if the on-board systems detect an upset condition. In the event of control component failures, the adaptive control system would use the remaining functioning control surfaces and components.

"It wouldn't be safe to put a real aircraft into upset conditions, and there are limits to wind tunnel testing," Belcastro said. "We needed to find a way to experimentally validate not only our CUPR systems research, but also to test in a realistic flight environment the enhanced vehicle dynamics models and simulation developed under CUPR to character-



Reggie Kidd, an employee in Langley Research Center's Guidance and Control Branch, oversees the Generic Transport Model (GTM) trainer as it taxis before a group of NASA and industry onlookers at a recent demonstration. Inset: A close-up look at the GTM's remote control.

Photos by Jeff Caplan

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Contrails May Account For Warming Trend

By **JULIA COLE**
SAIC

NASA scientists have found that cirrus clouds formed by contrails from aircraft engine exhaust are capable of increasing average surface temperatures enough to account for a warming trend in the United

States that occurred between 1975 and 1994.

"This result shows the increased cirrus coverage, attributable to air traffic, could account for nearly all of the warming observed over the United States for nearly 20 years starting in 1975, but it is important to acknowledge contrails would add

to and not replace any greenhouse gas effect," said Patrick Minnis, senior research scientist at Langley Research Center.

The study was published in the April 15 edition of the Journal of Climate.

"During the same period, warming occurred in many other areas where cirrus

coverage decreased or remained steady," Minnis said. "This study demonstrates that human activity has a visible and significant impact on cloud cover and on climate. It indicates that contrails should be included in climate change scenarios."

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NASA Vision: To improve life here, To extend life to there, To find life beyond
NASA Mission: To understand and protect our home planet • To explore the Universe and search for life
To inspire the next generation of explorers ... as only NASA can

Around the Agency

NASA LAUNCHES GRAVITY PROBE B MISSION

The NASA space vehicle designed to test two important predictions of Albert Einstein's Theory of General Relativity launched on April 20 from Vandenberg Air Force Base, Calif., aboard a Boeing Delta II expendable launch vehicle.

The spacecraft is being inserted into an almost perfect circular polar orbit around the Earth at an altitude of 400 statute miles. "The solar arrays are deployed, and we have received initial data that indicates all systems are operating smoothly. We are very pleased," said Gravity Probe B (GP-B) program manager Rex Geveden of Marshall Space Flight Center. "The Gravity Probe B space vehicle houses one of the most challenging science instruments ever devised and seeks to answer some of the most important questions about the structure of our universe," he said.

For information about the GP-B mission on the Internet, visit: <http://www.gravityprobeb.com>. NASA HQ RELEASE: 04-136

ARCTIC OZONE LOSS LINKED TO CLIMATE CHANGE

A cooperative study involving NASA scientists quantifies, for the first time, the relationship between Arctic ozone loss and changes in the temperature of Earth's stratosphere.

The results indicate the loss of Arctic ozone due to the presence of industrial chlorine and bromine in Earth's atmosphere may well be sensitive to subtle changes in stratospheric climate. Such ozone depletion leads to increased exposure to harmful, ultraviolet solar radiation at Earth's surface.

According to the study, the sensitivity of Arctic ozone to temperature is three times greater than predicted by atmospheric chemistry models. This leads to the possibility decreases in stratospheric temperatures may have significantly larger impacts on future Arctic ozone concentrations than have been expected in the past. Markus Rex of the Alfred Wegener Institute for Polar and Marine Research, Potsdam, Germany, led the study. It also included scientists from NASA's Jet Propulsion Laboratory.

For information about the research on the Internet, visit: http://www.jpl.nasa.gov/earth/air_ozone/air_ozone_index.cfm. NASA HQ RELEASE: 04-138

NASA HELPS FORECASTERS IN SEVERE WEATHER

NASA is providing new technology and satellite data to help forecasters at the National Oceanic and Atmospheric Administration (NOAA) create the best possible forecasts of severe springtime weather.

New NASA data gathered from satellites, a lightning ground-tracking network and unmanned vehicles that fly into storms are some of the many tools used by NOAA, the federal agency charged with issuing weather forecasts.

"It's an evolutionary process and partnership between NOAA and NASA," said Bill Patzert, oceanographer at NASA's Jet Propulsion Laboratory. "Together we're looking to the future to provide better and better service to the American public."

For more information about severe weather on the Internet, visit: http://www.gsfc.nasa.gov/topstory/2004/0316severe_weather.html. NASA HQ RELEASE: 04-110

Federal Employees Name NASA 'Best Place To Work'

The Partnership for Public Service and the American University Institute for the Study of Public Policy Implementation (ISPP) have released the second set of rankings of the "Best Places to Work in the Federal Government." Young people, women and minorities selected NASA as the best place to work in the federal government.

The rankings were compiled from an employee satisfaction survey administered to more than 100,000 federal employees by the U.S. Office of Personnel Management. With the new rankings, job seekers will be able to see, for the first time, which federal agencies are rated best by employ-

ees under 40, minorities, women and a variety of other groups.

"We're very proud and excited to learn of the rankings," said Vicki Novak, NASA's Associate Administrator, Office of Human Resources. "NASA values the diversity of thought, ideas and perspectives so essential to an R&D organization. We strongly believe an inclusive 'One NASA' environment, in which all employees are treated fairly, respected by management and their peers, and valued for their contribution to the agency's mission, is critical to success."

To view the rankings on the Internet, visit: <http://www.bestplacetowork.org/>.

Video Team Honored For 'SCI Files'

Langley Research Center's Video Services Team was honored during NASA's first Videographer of the Year Award ceremony.

The team, part of Langley's Media Services Branch, placed first in the production category for "The Case of the Galactic Vacation," an episode in the Office of Education's "NASA SCI Files" TV series.

Videographers **Ronald Beard** and **Franklin Fitzgerald** of Crewstone Technologies, Inc., accepted a trophy and certificate at the annual NASA Digital Television (DTV) Work Group Meeting on April 20.

DTV developed the award program to recognize and reward NASA's videographers for their achievements in furthering the objectives of documentation within NASA.

"It is an honor for the Video Services Team to receive Agency-level recognition for their outstanding work," said **Lillian Ross**, performance monitor for Langley's video services contract. "I believe the team should continue to raise the bar of excellence in the delivery of its products and services."



Beard



Fitzgerald

OEOP Names Robinson Disability Program Manager

Vivian Merritt, head of Langley Research Center's Office of Equal Opportunity Programs (OEOP), recently announced that



Robinson

Venita Robinson has been named Disability Program Manager. She replaces **Geraldine Rankin**, who served in the position from 1998 until her retirement from NASA on March 31.

Robinson also manages the Affirmative Employment Program, the Federal Women's Program and the Hispanic Employment Program. Her office is located in Bldg. 1183, Room 204A. She can be reached at 864-2560.

Elias T. Freeman Jr.

Elias Thomas Freeman Jr. died on April 24 at the age of 81. Freeman, a native of Poquoson, served in the U.S. Navy and was a veteran of World War II. He went on to work for NASA, retiring after 40 years of service.

Marjorie J. Mikula

Marjorie J. "Margie" Mikula died on April 19 at the age of 64. Mikula, a native of Carrolltown, Pa., retired from NASA in 1995.

Mary Turgeon

Mary "Patty" Turgeon died on April 23 at the age of 74. Turgeon, a native of Portland, Maine, worked as a procurement technician for NASA. She retired in 1992.

In Memoriam

Dorothy R. Carlson

Dorothy Roberts Carlson died on April 18 at the age of 79. Carlson, a native of Arkansas, worked as a stenographer at the Pentagon and the Langley Field Liaison Office during World War II. She went on to work as a secretary in the 7x 10 Wind Tunnel office for NACA and NASA.

News Researcher

The Researcher News is an official publication of Langley Research Center, National Aeronautics and Space Administration, Hampton, Va., 23681-2199. It is published every other Friday in the interest of all Langley staff, contractors and retirees and has a circulation of approximately 8,100. It is distributed to all Langley civil service employees, contractors, retirees and on-site university personnel, with limited distribution to NASA Headquarters, other NASA centers and, by special request, to other non-NASA individuals and organizations. Questions related to the content and distribution of the Researcher News should be addressed to Keith Henry, Mail Stop 115, (757) 864-6120. Submit contributions/SDL 026, 055, 110 changes to the editor via e-mail <j.r.roberts@larc.nasa.gov>, fax (757) 864-6477, telephone (757) 864-8150 or Mail Stop 293. Articles, photos and announcements are due at noon the Monday following the date of this issue.

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The privilege of listing announcements in this publication is restricted to the employees, contractors and retirees of the Langley Research Center. Articles must be offered without regard to race, color, religion, sex or national origin. All materials are subject to editing.

Researcher Now Available In PDF

The *Researcher News* is now available in portable document format (pdf) format on the *Researcher News* web site: <http://researchernews.larc.nasa.gov>. The pdf file, like the hard copy, is tabloid-size (11 inches wide by 17 inches tall) but can be scaled to fit on a standard printer. Adobe Reader is required to view the file. It can be downloaded for free at: <http://www.adobe.com/products/acrobat/readstep2.html>.





Brzowski



Cassidy



Cruz



Dutton



Evans



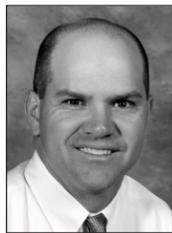
Fairlie



Foss



Harvin



Killough



Kludze



Parsons



Smeltzer



Stevens



Taleghani



Vann



Wallace



Whitley

Employees Earn Advanced Degrees

Nineteen Langley Research Center employees have earned advanced degrees over the last 18 months through the Center's Advanced Study Program (ASP).

Established in the 1940s, the ASP provides Langley scientists, engineers and administrators an opportunity to improve their proficiency in aeronautical and space research and earn graduate credit while at Langley. Employees that participate in the program receive tuition support for approved job related programs of study. Nearly 1,600 employees have earned degrees through the program.

■ **Matthew B. Brzowski** of the Structural and Thermal Analysis Branch earned a master of science in mechanical engineering from the University of Pennsylvania;

■ **James P. Cassidy** of the Information Systems Branch earned a master's certificate in project management from George Washington University;

■ **Juan R. Cruz** of the Exploration Engineering Branch earned a doctor of

philosophy in aerospace engineering from Virginia Polytechnic Institute and State University;

■ **Kevin E. Dutton** of the Guidance and Control Branch earned a doctor of philosophy in electrical engineering from Ohio University;

■ **Lloyd Evans** of the Office of Education earned an education specialist degree in higher education from Old Dominion University;

■ **Duncan Fairlie** of the Chemistry and Dynamics Branch earned a master of arts in geophysics from Harvard University;

■ **Richard A. Foss** of the Systems Integration and Test Branch earned a master's in business administration from St. Leo University;

■ **Stephen F. Harvin** of the Research Facilities Branch earned a professional engineering degree from George Washington University;

■ **David A. Hinton** of the Airborne Systems Competency earned a master of science in engineering and management

from Massachusetts Institute of Technology;

■ **Brian D. Killough** of the Earth and Space Science Technology Office earned a doctor of philosophy in applied atmospheric science from the College of William and Mary;

■ **Ave K. Kludze** of the Systems Engineering Branch earned a doctor of science in systems engineering from George Washington University;

■ **Peter A. Parker** of the Advanced Model and Sensor System Branch earned a master of science in statistics from Virginia Polytechnic Institute and State University;

■ **Vickie Parsons** of the NASA Engineering and Safety Center earned a doctor of philosophy in engineering management from Old Dominion University;

■ **Stanley S. Smeltzer III** of the Mechanics and Durability Branch earned a doctor of philosophy in mechanical engineering from North Carolina State University;

■ **William L. Stevens** of the Research

Facilities and Management Office earned a master of science in mechanical and aerospace engineering from George Washington University;

■ **Barmac K. Taleghani** of the Structural Dynamics Branch earned a master in engineering management from George Washington University;

■ **Lelia Vann** of the Atmospheric Science Competency earned a doctor of philosophy in atmospheric science from the University of Arizona;

■ **Terry A. Wallace** of the Metals and Thermal Structures Branch earned a doctor of philosophy in materials science and engineering from the University of Virginia; and

■ **Karen S. Whitley** of the Mechanics and Durability Branch earned a master of science in engineering mechanics from Virginia Polytechnic Institute and State University.

■ *For more information about Langley's Advanced Study Program, call George D. Allison at 864-2594.*

Model

Continued from Page 1

ize extreme/upset conditions.

"The enhanced simulation capability developed under CUPR will ultimately be used in improving upset recovery training for pilots, so validation is very important," Belcastro said.

The AvSSP is working with Langley's Aerodynamics, Aerothermodynamics and Acoustics Competency, Airborne Systems Competency and Systems Engineering Competency and airfields outside the gate to make the research testbed a reality.

"The team is developing a unique testbed, not just for Langley, but for NASA," said Butch Watkins, project manager in Langley's Advanced Model and Sensor Systems Branch. "We are creating a cost-effective capability to do research that can't be done in wind tunnels or with full-scale aircraft."

Langley technicians built the Generic Transport Model (GTM) trainer, a 5.5 percent scale version of a commercial airliner that weighs 50 pounds. It has an 82-inch wingspan, is remotely piloted and

"It wouldn't be safe to put a real aircraft into upset conditions, and there are limits to wind tunnel testing."

Christine Belcastro

has turbine engines.

"Building a dynamically scaled flying transport model is quite a challenge," Watkins said. "It has to have the same attributes as the real plane. That includes scaled weight and dimensions and accurate inertia characteristics of roll, pitch and yaw. The design itself requires more exacting science. Actually building it is even tougher because it's so difficult to meet the inertia criteria in such a lightweight structure."

Once the Advanced Model and Sensor Systems Branch conquered the complexities of construction, the team turned to Langley aerodynamics engineers. Four of them have spent hours learning to fly the sophisticated machines.

"We started our training with commercial remote control propeller models,"

said Jeff Hill, flight systems safety pilot. "We have worked our way up to off-the-shelf jets. The next step is to modify these off-the-shelf jets so they have very similar high wing loading and inertial flight characteristics to the GTM model. And then this summer we plan to conduct the first flights with the first Generic Transport Model trainer. That's in preparation for the full-up instrumented research flight tests of the Generic Transport Model trainer number two that's under construction."

The research flights will be conducted using ground station facilities that are currently being developed.

The extensive training program is one thing the team is doing to decrease risk.

Managers also have secured the cooperation of facilities outside Langley to advance the model program. Pilots do their practice flying at Fentress Field in Chesapeake and at Smithfield Foods' private airfield in Smithfield. The team plans to do its flight tests at a newly developed runway at the Wallops Flight Facility on the Eastern Shore.

Kathy Barnstorff is an employee in Langley's Public Affairs Office.



Steve Geissinger, a technician in Langley's Composite Applications Development Section, hooks up the GTM trainer's engine micro-computer to get ready to start the model.

Photo by Jeff Caplan

NBA Champions Announced

Langley Research Center's NASA Basketball Association (NBA) recently announced the league champions from the 2004 season, which ran from January to March. For final team standings and more information, visit the NBA web site at: <http://larc-exchange.larc.nasa.gov/lea/bball/index.htm>.

Photos courtesy of Brian Killough



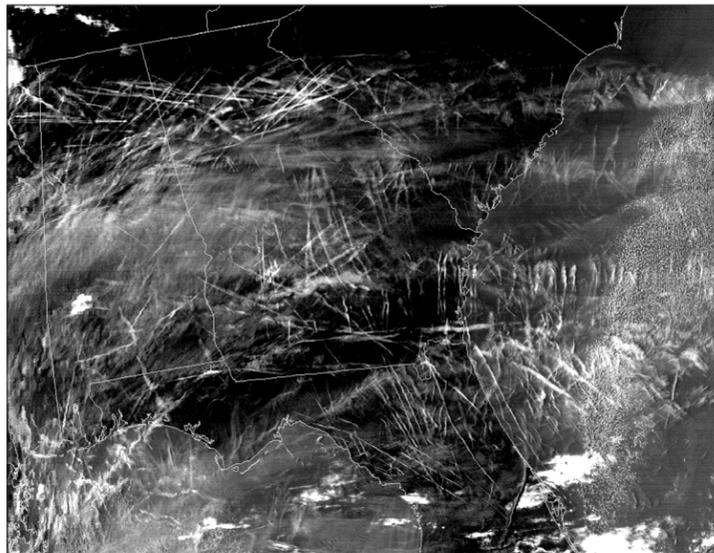
The A-League champions were TNT: (left to right) Brian Killough, John Costulis, Dana Gould, Paul Danehy, Rudy King and Sean Kenney. Team members Sam James, Jeff Royster and John Simmons are not pictured.



The B-League champions were Buckets: (left to right) Mark Cagle, Chris Brown, Kevin Jones, Rodney Russell, Doug Nark, Brian Davis, Aaron Reimann and Jeff Viken.



The C-League champions were Hypersonics: (left to right) Rock Allen, Glenn Bobskill, Peter Pao, Ben Meyer, Chuck Leonard, Jeff Robinson, Tom Jentink and Scott Gallimore. Team member Rick Burdick is not pictured.



This enhanced infrared image from NASA's Terra satellite shows a widespread outbreak of contrails over the southeastern United States on the morning of Jan. 29. The criss-crossing white lines are contrails that form from planes flying in different directions at different altitudes.

NASA photo

Contrails

Continued from Page 1

Minnis determined the observed 1 percent per decade increase in cirrus cloud cover over the United States is likely due to air traffic-induced contrails. Using published results from NASA's Goddard Institute for Space Studies, Minnis and his colleagues estimated contrails and their resulting cirrus clouds would increase surface and lower atmospheric temperatures by 0.36 to 0.54 degrees Fahrenheit per decade. Weather service data reveal surface and lower atmospheric temperatures across North America rose by almost 0.5 degree Fahrenheit per decade between 1975 and 1994.

Minnis worked with colleagues Kirk Ayers, Rabi Palinkonda and Dung Phan from Analytical Services and Materials, Inc. They used 25 years of global surface observations of cirrus clouds, temperature and humidity records from the National Centers for Environmental Prediction (NCEP) reanalysis dataset. They confirmed the cirrus trends with 13 years of satellite data from NASA's International Satellite Cloud Climatology Project.

Both air traffic and cirrus coverage increased during the period of warming despite no changes in the NCEP humidity at jet cruise altitudes over the United States. By contrast, humidity at flight altitudes decreased over other land areas, such as Asia, and was accompanied by less cirrus coverage,

except over Western Europe, where air traffic is very heavy.

Cirrus coverage also rose in the north Pacific and north Atlantic flight corridors. The trends in cirrus cover and warming over the United States were greatest during winter and spring, the same seasons when contrails are most frequent. These results, along with findings from earlier studies, led to the conclusion that contrails caused the increase in cirrus clouds.

"This study indicates that contrails already have substan-

tial regional effects where air traffic is heavy, such as over the United States," Minnis said. "As air travel continues growing in other areas, the impact could become globally significant."

Humidity is the amount of water vapor in the air and determines how long contrails remain in the atmosphere. Contrails

that persist for an extended period of time are most likely to impact the climate.

Contrails form high in the atmosphere when the mixture of water vapor in the aircraft exhaust and the air condenses and freezes. Persisting contrails can spread into extensive cirrus clouds that tend to warm the Earth, because they reflect less sunlight than the amount of heat they trap. The balance between Earth's incoming sunlight and outgoing heat drives climate change.

NASA's Earth Science Enterprise funded the research.

Julia Cole works for SAIC in support of Langley's Atmospheric Sciences Competency.

"This study demonstrates that human activity has a visible and significant impact on cloud cover and on climate."

Patrick Minnis

'Hallmarks of Success'

Little Company, Big Customers

C&R Software Sets The Standard For Thermalhydraulic Analysis

By SHERI BEAM
Langley Research Center

How does a small, high-tech business become a success?

It's not an exact science, because success comes in many different forms. This is the second in a series of articles about small, high-tech, high-risk companies that have partnered with NASA through the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. Each one is different — different sizes, different locations, different technologies — yet all have become successful and are considered to be "Hallmarks of Success."

A small company in Littleton, Colo., has a unique story to tell. It's about how eight people working from eight different locations successfully take on the challenges of their business and of being a virtual team.

The company is Cullimore & Ring, Inc. (C&R), started by just two people: Brent Cullimore and Steve Ring. Both men originally worked for Martin-Marietta, now Lockheed Martin. Today, they have eight employees.

Cullimore said it takes a certain kind of person to thrive in their virtual office. "We certainly have a lot of independent, type-A folks," he said. "It's almost a job requirement. You have to be self-supervising. You have to care about what you're doing."

All of the C&R employees live in the Denver area. To keep up-to-date on the firm's projects — and to remind themselves they are actually part of a team — they meet about once a month. Sometimes it's at a conference table in Cullimore's home, but more often than not, meetings take place at a nearby restaurant that's convenient for everyone. Sometimes the meetings get loud when they're trying to get a consensus, but Cullimore thinks not agreeing on everything also contributes to their success.

"We can't be so cohesive that we're of one mind, or chances are it's the wrong mind," he said. "We have to have some disagreement, some amount of someone questioning."

Cullimore also thinks that engineers want to be trusted that left alone, they will do the right thing. The staff members make their own decisions and purchase what they need to complete projects.

"The ability to just go off and do what you think is right is half the satisfaction," Cullimore said.

C&R thrives on this philosophy, which is perfect for their virtual setting.



Ruth Amundsen of Langley Research Center's Structural and Thermal Analysis Branch uses C&R software for missions that need both space radiation analysis and a thermal solution. "We are able to import a 3D model from the mechanical design software, mesh it, apply materials and boundary conditions, and solve for both the space radiation viewfactors, solar and planetary flux, and thermal responses from each component," she says.

Photo by Jeff Caplan

Along the way, this unique company has successfully managed to perfect a big toolbox for engineers — a software toolbox that has evolved from a code called SINDA/FLUINT.

SINDA/FLUINT actually began with funding from Johnson Space Center, through the Small Business Innovation Research (SBIR) Program. The software is primarily used for thermalhydraulic analysis, specifically targeting the growing demand for the design and analysis of thermal control and liquid propulsion systems. But it's so flexible that it has even been used to analyze windshield wipers, a model of a human heart and a pig's trachea.

Through SBIR funding from Marshall Space Flight Center, C&R also created software codes that were the genesis for two of the company's current front-end products: ThermalDesktop and RadCAD. ThermalDesktop is a geometric, graphical-user interface (GUI) that enables concurrent engineering for thermal analysis by providing full access to CAD-based geometry, as well as data exchange to and

from structural codes without compromising traditional thermal modeling practices. RadCAD calculates radiation exchange factors for input to SINDA/FLUINT.

Because the C&R software products are so flexible and adaptable, they are now being used at all 10 NASA centers as the standard tool for thermalhydraulic analysis.

Ruth Amundsen of Langley Research Center's Structural and Thermal Analysis Branch uses C&R software for missions that need both space radiation analysis and a thermal solution.

"We are able to import a 3D model from the mechanical design software, mesh it, apply materials and boundary conditions, and solve for both the space radiation viewfactors, solar and planetary flux, and thermal responses from each component," she said.

Amundsen has used the software for the aerobraking heating on the solar arrays for the Mars Global Surveyor, the Mars Odyssey and the Mars Reconnaissance Orbiter missions.

Jet Propulsion Laboratory is also a C&R customer. The company's software was used to analyze the Mars Exploration Rover (MER) and was exclusively used to model the Rover warm electronics box (WEB) during the design development phase.

Glenn T. Tsuyuki, the Project Element Manager for the MER thermal subsystem, considers C&R's contributions invaluable to the project.

"We intend to use the SINDA/FLUINT Rover system thermal model until the end of mission," Tsuyuki said.

"SINDA/FLUINT is a tool in JPL's standard thermal workplace, and it will be used on current projects such as CloudSAT and future projects such as Mars Mobile Science Laboratory."

Cullimore said working with NASA gave him and Ring an opportunity to move their business forward. "What NASA allowed us to do through the SBIR Program is to generate, or at least start on, these next bold ideas that turned out to be very successful," he said.

C&R now has more than 4,000 customers in aerospace, automotive, electronics packaging and more, with NASA as its number one customer. General Motors actually has a global license, allowing every one of their engineers access. One-third of C&R's customers are overseas. The majority are in Japan, at the Japanese Space Agency, Mitsubishi and Kawasaki. In the future, the company plans to expand in the electronics packaging area and expand its overseas base.

Everyone at C&R firmly believes that one of the main reasons this eight-person company has been successful is because of their emphasis on giving excellent customer service — something they decided from the start.

The company really likes the challenge they present of being up against a problem that no one has had before. If a customer requests something, C&R usually gets them a Beta version within a week.

"The fact that they can ask for something and we turn it around and do it, they find absolutely incredible," said Cindy Beer, C&R's marketing director.

Cullimore goes on to say, "It's almost a very strong feeling of fiduciary responsibility that these people trusted us to help them, and we really ought to make sure they're happy."

And, the virtual team of C&R will continue to take on the challenge of making their customers happy.

Sheri Beam is in charge of marketing and media relations for Langley's Small Business Partnership Team.

"What NASA allowed us to do through the SBIR Program is to generate, or at least start on, these next bold ideas that turned out to be very successful."

Brent Cullimore

CLASSIFIED

FOR SALE: Vacation in Myrtle Beach, S.C., June 6-13 Presidential Villas (Gold Crown Resort), 2 BR with full kitchen, sleeps six, on-site golf, indoor/outdoor pool, plus other amenities; 1 mile to beach, \$1,000. Call 876-6684.

FOR SALE: 1995 Snapper rear-engine riding mower, good condition (needs spring tune-up), with bagger, \$500. Homelite gas-powered blower/vacuum, \$30. Call 930-4709 between 6 and 9 p.m.

FOR SALE: Rainbow 375 sailboard, good condition, \$300 or best offer. Call 223-1444.

FOR SALE: One Cooper LifeLiner Touring SLE tire, P225/50R17, brand new, only used 3,500 miles, excellent condition, \$80. Call 867-7319 after 5 p.m.

FOR RENT: Studio apartment on Chesapeake Avenue in Hampton, renovated with all new appliances and fixtures, water view, \$525 per month, utilities included. Call 245-4854.



The deadline for the May 21 edition is May 10. Send submissions to <j.r.roberts@larc.nasa.gov>.

VASC Hosting Space Day Activities

The Virginia Air & Space Center (VASC) will host National Space Day activities from 11 a.m. to 3 p.m. **May 8.** Activities will include hands-on space science demonstrations, "make and take" activities for children and special presentations of the IMAX film "Space Station 3D."

Former NASA Astronaut Tom Jones, who has logged more than 1,272 hours in space, will be on-hand to sign autographs from noon to 2 p.m.

The VASC is the official visitor center for Langley Research Center and Langley Air Force Base. For more information, call 727-0900 or visit the VASC web site at: <<http://www.vasc.org>>.



Jones

LAA To Meet On May 11

Langley Research Center's Alumni Association will meet from 10 a.m. to 1 p.m. **May 11** at the Newport News/Williamsburg International Airport for a tour of the Virginia Aviation Academy. Lunch will be provided for \$2.50.

RSVP to Bill Reed at 851-5322 or <whreed1@cox.net>.

Blood Drive On May 19

The American Red Cross will host a blood drive on **May 19** in Langley Research Center's H.J.E. Reid Conference Center. Langley employees, contractors and retirees are invited to participate. Civil servants may charge their time to FCS 23-090-20-BE.

Future blood drives are scheduled on **July 14, Sept. 15** and **Nov. 24.**

For more information, contact Connie Small at 864-2564 or <Connie.J.Small@nasa.gov>.

J-Lab Hosting Summer Physics Fests

Jefferson Lab will host "Summer Physics Fests" from 10 a.m. to noon **June 9, June 30, July 28, Aug. 11** and **Aug. 25** in the CEBAF Center auditorium in Newport News.

The "Physics Fests," designed for families and student groups, include an interactive summary of the research conducted at the Jefferson Lab followed by the popular "Deep Freeze" and "Hot Stuff" presentations.

The presentations are free and open to the public, but reservations are required. For reservations or more information, contact Stacy Ring at 269-7560 or <ring@jlab.org>.

'Aero' Art Show Moves To D.C.

The "Aerospace Design" art show that was featured last year at the Art Institute of Chicago has moved to the Octagon Museum in Washington, D.C., and will remain on display through **Dec. 5.**

The exhibit, subtitled "The Art of Engineering from NASA's Aeronautical Research," explores the power and beauty of aerospace design, from early wind tunnel models to modern aeronautical engineering. It features 65 NASA artifacts, including many from Langley Research Center.

The Octagon Museum is open from 10 a.m. to 4 p.m. Tuesday through Sunday. For more information, visit: <<http://www.arch-foundation.org/octagon/>>.

Annual Air Show Planned May 21-23

Langley Air Force Base will host the annual "Air Power Over Hampton Roads" air show from 5 to 10 p.m. **May 21** and from 9 a.m. to 5 p.m. **May 22-23.**

This year's highlights will include a concert by country singer Aaron Tippin, a night-time air show and a fireworks display on May 21 and a performance by the U.S. Air Force Thunderbirds at 4:30 p.m. May 23.

Langley Research Center will provide its OV-10 research aircraft and a general aviation aircraft for static display, and the National Consortium for Aviation Mobility (NCAM) will provide a mobile trailer with information on new technologies in avionics, airframes, engines and advanced pilot training techniques for small aircraft. Langley also will partner with the Virginia Air & Space Center (VASC) to provide a variety of other educational displays and demonstrations.

NASA employees, contractors and retirees are needed to staff the exhibits. To volunteer, contact Jim Meehan at 864-1592 or <J.J.Meehan@larc.nasa.gov>.

For more information about the event, visit: <<http://www.langleyairshow.com/>>.

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News
Researcher

National Aeronautics and
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Center Snapshot

The Brontos, a class of 3-, 4- and 5-year-olds at Langley Research Center's Child Development Center, planted a pink dogwood on Lindbergh Way on Earth Day, April 22. The class also started a garden by planting lettuce, tomatoes, corn, squash and pumpkin.

Photo by Jeff Caplan