National Aeronautics and Space Administration

MARSHALL STAR

Serving the Marshall Space Flight Center Community

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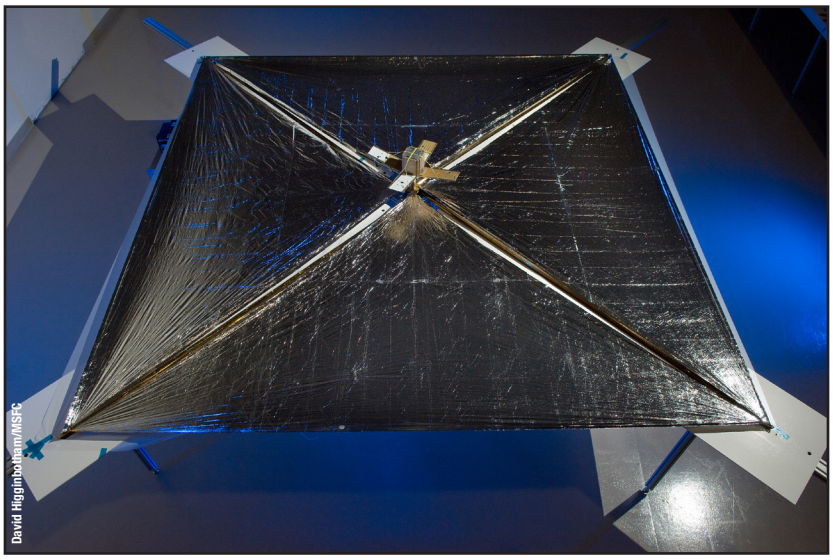
Sailing among the stars

By Nick Brown

This fall, NASA researchers will move one step closer to sailing among the stars.

Engineers at the Marshall Space Flight Center and the Ames Research Center in Moffett Field, Calif., have designed and built NanoSail-D, a "solar sail" that will test NASA's ability to deploy a massive but fragile spacecraft from an extremely compact structure.

Much like the wind pushing a sailboat through water, solar sails rely on sunlight to propel vehicles through space. The sail captures constantly streaming solar particles, called photons, with giant sails built from a lightweight material. Over time, the buildup of these particles provides enough thrust for a small spacecraft to travel in space.



A blue-tinged image of a fully unfurled solar sail.

NanoSail-D, managed by the Marshall Center, will be the first NASA solar sail deployed in low Earth orbit.

Many scientists believe that solar sails have enormous potential. Because they take advantage of sunlight, they don't require the chemical fuel that spacecraft currently rely on for propulsion. Less fuel translates into lower launch weight, lower costs and

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HIRAD instrument to provide unique view of hurricane wind speeds

By Nick Brown

NASA researchers are furiously preparing for late summer when they will fly a series of unique hurricane instruments, including a brand new instrument that will take two-dimensional wind speed measurements over some of the world's fiercest storms.

The instrument will be part of a six-week NASA mission to study tropical cyclones, which began Aug. 15. The Genesis and Rapid Intensification Processes mission, or GRIP, will study the creation and rapid intensification of hurricanes. The campaign involves three planes with 15 instruments that will work together to create the most complete view of hurricanes to date.

Scientists and engineers at the Marshall Space Flight Center, along with their partners from across the country have built the Hurricane Imaging Radiometer, or HIRAD, to contribute to the effort. HIRAD will help determine the strength and structure of hurricanes by looking at wind speeds deep within the storm. This August and September, HIRAD will fly in the belly of a WB-57 airplane at about 60,000 feet, about twice the altitude of a commercial airliner.

Researchers across the world, including scientists at the National Oceanic and Atmospheric Administration who have joined in HIRAD's development, hope it will provide key insight into some of nature's most puzzling questions. By allowing researchers to measure wind speeds inside the storm, HIRAD will give scientists some clues about why hurricanes behave like they do.

"The main thing we hope to do is improve the forecasts of intensity of a hurricane," said Dr. Tim Miller, HIRAD

*See **HIRAD** on page 6*

'Up All Night with NASA' chatting Perseid

During the Aug. 12 all-night, live chat about the Perseid meteor shower, Bill Cooke, right, the lead of NASA's Meteoroid Environment Office at the Marshall Space Flight Center, received 3,800 questions from 1,750 individuals logged in to the chat. For most of the night, the chat room at Marshall was full with 250 people waiting to have their questions answered. Cooke gave tips on how to view the meteor shower, answered questions about the origin of the meteor shower, and discussed how long the shower would last. During the peak of the Perseids, Marshall provided a live Ustream view of the skies over the center, and the stream received more than 350,870 unique visitors. Brooke Boen, left, of the Public and Employee Communications Office, moderated the chat and typed Cooke's responses to the questions. The meteor shower occurs each year in August when the Earth passes through a cloud of the comet's debris.

Marshall receives 2010 Ethics Program Award

By Jessica Wallace Eagan

The Marshall Space Flight Center recently received the 2010 Ethics Program Award from the U.S. Office of Government Ethics for outstanding achievements in the management of the center's ethics program in the Office of the Chief Counsel.

The award recognizes federal agencies for achievements ranging from effectively administering each element of the overall ethics program to creating model practices that advance the program beyond compliance with ethics laws and regulations.

The Office of Government Ethics audited the Office of the Chief Counsel's written ethics opinions, the process and content of ethics counseling at the center, the financial disclosure review process and the quality of ethics training. During this review, Marshall was cited for numerous model practices.

"This award is a reflection of our center leadership's commitment to maintaining an excellent ethics program at Marshall," said Bill Bierbower, Marshall's chief counsel. "Every team member at the center should take pride in this acknowledgement of the strong ethics culture they have created."

The award was presented at the 17th National Government Ethics Conference in Chicago. Johnson Space Center in Houston and Langley Research Center in Hampton, Va., also received this honor.

The Office of Government Ethics, established in 1978,

From left, Kathy Shelton, Marshall ethics attorney; Robert Cusick, director of the U.S. Office of Government Ethics; and Pam Bourque, Marshall's assistant chief counsel for general law.

exercises leadership to prevent or resolve conflicts of interest on the part of government employees. Partnering with other executive branch agencies and departments, the office works to foster high ethical standards for employees, and to strengthen the public's confidence that the government operates its business with integrity. For more information, visit http://www.usoge.gov.

Eagan, an AI Signal Research Inc. employee and the Marshall Star editor, supports the Office of Strategic Analysis & Communications.

Marshall engineers 'met cool' through NASA Cooperative Education Program

By Rick Smith

It's not uncommon for young couples to "meet cute." Thanks to NASA's Cooperative Education Program, two engineers at the Marshall Space Flight Center also got to "meet cool" – and embark on rewarding careers in aerospace engineering.

Jennifer DiBello was 20 in 2008, a mechanical engineering undergraduate at Penn State University in University Park, when she took a chance on her dream job – a NASA co-op program halfway across the country at the Marshall Center. Designed to combine academic studies with on-the-job experience, the NASA Cooperative Education Program put her to work in Marshall's Engineering Directorate, testing water and air recycling systems bound for the International Space Station.

Marshall Center engineers Jennifer DiBello Pruitt, left, and Matthew Pruitt met while participating in the NASA Cooperative Education Program, and married this summer in Huntsville.

"It was hands-on work with actual flight hardware," she recalled. "It reinforced what I'd known since my senior year in high school – I really enjoyed physics and engineering, and it was my dream to be a rocket scientist, to contribute my skills to the space program."

That first semester in the program also introduced her to fellow co-op Matthew Pruitt, a Huntsville native studying mechanical engineering at Auburn University in Auburn, Ala. He knew his way around town – and thanks to previous summer work for the U.S. Army, he even knew Redstone Arsenal. So he was a valuable resource to transplants like DiBello. The co-ops ate lunch together, hung out on weekends, took hikes and regional sightseeing forays.

Their relationship really blossomed that March, when they traveled to NASA's Kennedy Space Center, Fla., for the launch of space shuttle Endeavor on the STS-123 mission. It was an unforgettable spectacle, both agreed.

They returned to their respective universities in May. "We talked every day for hours," he said. "We had a good phone plan."

"It's weird when you don't see someone for awhile, so video chat is wonderful!" she added. "Distance made things harder, but it didn't throw off any of our plans." That might reflect an unusually mature resolve for college undergrads separated by hundreds of miles, but it also reflects the grown-up mix of pragmatism and romance that drew each of them to work for NASA.

They reunited at Marshall that fall, and did a third co-op rotation in summer 2009, when they announced their engagement. They married this June, and held a gala reception beneath the titanic Saturn V rocket at the Davidson Center for Space Exploration in Huntsville.

Jennifer Pruitt, who graduated from Penn State in December 2009, is now a full-time Marshall Center employee, still supporting the Engineering Directorate. She develops next-generation environmental control and life support systems, or ECLSS technologies, seeking to provide future explorers with air and water reclamation and recycling tools – technologies essential to long-duration spaceflights.

When Matthew Pruitt's fourth and final co-op rotation – also as part of Marshall's ECLSS team – comes to a close in August, he will return to Auburn to complete his mechanical engineering degree. He will graduate in May 2011. They both hope he can return to Marshall soon after.

"Even if we don't both end up here, the co-op experience has been so rewarding," Jennifer Pruitt said. "Matthew can interview anywhere and say, 'I was a NASA co-op.' That carries a lot of weight."

"Whatever the future brings, the Cooperative Education Program has been a huge benefit and learning experience for both of us," he agreed. "It would be nice to keep having lunch every day with my wife."

The NASA Cooperative Education Program is open to undergraduate and graduate students across the nation. For more information on the program at Marshall, visit http://mscid.msfc.nasa.gov/COOP/index2.cfm.

Smith, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.

Off to the sun

On July 30 at 1:21 CDT, a black brant rocket carrying the Solar Ultraviolet Magnetograph Investigation, or SUMI, telescope lifted off from White Sands Missile Range, N.M. Marshall Space Flight Center's solar physicists and engineers designed SUMI to learn more about the sun and to take the first measurements of the magnetic field in the transition region. This region is a thin layer of the solar atmosphere tucked between the surface and its outermost level. Post launch, Dr. Jonathan Cirtain, SUMI principal investigator and astrophysicist at the Marshall Center, said, "All of the systems performed perfectly. We met our fully successful mission criteria with no anomalies." Cirtain and his team are currently evaluating the science results from the mission. To read more about the SUMI mission, visit http://www.nasa.gov/topics/solarsystem/features/sumi.html.

MARS coed volleyball season to start Aug. 23; players wanted

The MARS coed volleyball season begins Aug. 23 and runs until Nov. 22. Games will be played at the Marshall Space Flight Center's Wellness Center in Building 4315.

Anyone who has access to Redstone Arsenal is invited to participate. If there are enough teams, two divisions will be formed based on skill level. Skill and referee clinics may be offered. The cost is free for Wellness Center members and $5 for nonmembers.

For more information, contact Dennis Gallagher at 961-7687 or at dennis.gallagher@nasa.gov.

Classified Ads

To submit a classified ad to the Marshall Star, go to Inside Marshall, to "Employee Resources," and click on "Marshall Star Ad Form." Ads are limited to 15 words, including contact numbers. No sales pitches. Deadline for the next issue, Aug. 26, is 4:30 p.m. Thursday, Aug. 19.

Miscellaneous

Havanese female, 18 months old, AKC champion bloodlines, silver/cream/black, $650. 931-455-7303

Conn 23H Student trombone, $450 firm. 256-797-3086

New Samsung TV remote, BN59-00852A, $40; Sansa e250 2GB MP3 player, video, FM, $10. 256-325-6000

Trek 1500, upgraded drivetrain, campy shifters, $1,000. 256-232-9293

Two tickets, Mississippi State versus Memphis, Sept. 4, $32 each. 256-574-5098

Wedding dress, size 12, $200. 256-694-4792

Car bandpass speaker box for 10" subs. 256-886-0716

Select Comfort sleep number bed, king size, Ultra 5000 Series with pillowtop, $650. 256-880-6544

27 inch Panasonic flat screen CRT TV, $100. 256-244-2961

Pool table, Kasson, fruitwood, Queen Anne feet, leather pockets, cover, accessories, $1,950. 256-880-6563

Magnavox 24" color TV, not a flatscreen, includes remote, $50 obo. 313-655-7966

Early American crystal, prelude silver, Metlox poppy trail dinnerware. 256-881-7096

Rascal scooter, needs batteries, $450; 1958 three-piece walnut bedroom, $395; 4 ft. folding tables, $20. 256-603-5279

Two complete desktop computers, monitors, keyboards, speakers, $400. 256-541-1043

360 games; Grand Theft Auto IV, Prototype, Armored Core, Assassin's Creed II, $20 each. 256-777-7746

China, eight place settings, sugar, creamer, bowl, platter; calla lily pattern, photo available, $500. 256-653-4835

Vehicles

2007 Honda CBR1000RR, 3,800 miles, $6100. 205-807-7841

2007 VWJetta GLI, black, warranty, 25/32mpg, 6 speed manual, sunroof, leather, 40k miles, $18620. 256-392-9626

2005 Ford Mustang GT, white, manual, leather, 78,800 miles, $14,900. 256-682-5455

2005 Jeep Wrangler X, hard top/bikini top, automatic, 6 cylinder, 75k miles, $11,900. 256-723-3803 or 256-572-3567

2004 Smokey Gold Harley Road King Special Edition, pictures available, 19k miles, $11,500. 256-990-6215

2004 Yamaha 48volt golf cart, 2006 batteries, minor scratches on paint, $1,800. 256-783-3814

2003 Honda CBR 954RR, under 20,800 miles, $3,800/best offer cash. 256-509-9983

2001 Ford Windstar, ABS, captain chairs, CD, cruise, 100k miles, $4,000. 256-715-0412

1998 Stingray RS180 Bowrider, seats seven, bimini covers, fish/ski, new 140 I/O, $9,500. 256-640-6427

1998 GMC LWB pickup, white, 178k miles, $4,500. 256-468-9377

Wanted

Students interested in obtaining beginner to advanced SUBA diver certification. 256-651-9909

Houses/offices to clean, available evenings and weekends, 256-777-8595 leave message

Used Summit Viper tree stand. 256-655-0393

Lost

Cash fell out of wallet, 4200 complex area. 256-797-7829.

NanoSail-D *Continued from page 1*

fewer logistical challenges. Solar sails accelerate slowly but surely, capable of eventually reaching tremendous speeds. In fact, most scientists consider solar sailing the only reasonable way to make interstellar travel a reality.

Of course, it's not as easy as it sounds.

For scientists to really make use of solar sails, the sails must be huge. Because the particles emitted by the sun are so tiny and the spacecraft is so large, the sail needs to intercept as many particles as possible. It's almost like trying to fill up a swimming pool with rain drops; the wider the pool, the more rain it captures. The same is true with solar sails and the sun's energy. In fact, a NASA team in the 1970s predicted it would need a solar sail with a surface area of nearly 6 million square feet – about the size of 10 square blocks in New York City – to successfully employ a solar sail for space exploration.

That's where NanoSail-D comes in. As the first NASA solar sail deployed in low-Earth orbit, NanoSail-D will provide valuable insight into this budding technology.

"One of the most difficult challenges solar sails face is trying to deploy enormous but fragile spacecraft from extremely small and compact structures. We can't just attach a giant, fully spread sail to a rocket and launch it into space. The journey would shred the sail to pieces," said Dean Alhorn, NanoSail-D principal investigator and aerospace engineer at the Marshall Center.

"Instead, we need to pack it in a smaller and more durable container, launch that into space and deploy the solar sail from that container," Alhorn said. "With NanoSail-D, we're testing a technology that does exactly that."

One objective of the NanoSail-D project is to demonstrate the capability to pack and deploy a large sail structure from a highly compacted volume. This demonstration can be applied to deploy future communication antennas, sensor arrays or thin film solar arrays to power the spacecraft.

NanoSail-D will be deployed 400 miles up after it's launched this fall aboard a Minotaur IV rocket, part of the payload aboard the Fast, Affordable, Science and Technology Satellite, or FASTSAT. The relatively low-deployment altitude means drag from Earth's atmosphere may dominate any propulsive power it gains from the sun, but the project represents a small first step toward eventually deploying solar sails at much higher altitudes.

When fully deployed, NanoSail-D has a surface area of more than 100 square feet and is made of CP1, a polymer no thicker than single-ply tissue paper. The first big challenge for researchers was to pack it into a container smaller than a loaf of bread and create a mechanism capable of unfolding the sail without tearing it.

"Think of how easily I can rip a piece of tissue paper with my hands," Alhorn said. "Designing a mechanism to unfurl a space sail about that thick without tearing is no easy task."

To accomplish their goal, engineers tightly wound the NanoSail-D sail around a spindle and packed it in the container.

During launch, NanoSail-D is stored inside FASTSAT. Once orbit is achieved, the NanoSail-D satellite will be ejected from the satellite bus and an internal timer will start counting down. When the timer reaches zero, four booms will quickly deploy and the NanoSail-D sail will start to unfold. Within just five seconds the sail will be fully unfurled.

"The deployment works in the exact opposite way of carpenter's measuring tape," Alhorn explained. "With a measuring tape, you pull it out, which winds up a spring, and when you let it go it is quickly pulled back in. With NanoSail-D, we wind up the booms around the center spindle. Those wound-up booms act like the spring. Approximately seven days after launch, it deploys the sail off the center spindle."

After a few months, NanoSail-D will begin to move out of orbit. This de-orbiting process will provide NASA researchers with information about how systems like NanoSail-D might one day be used to bring old satellites out of space. This will provide a means for future satellites to de-orbit after their mission is complete – keeping them from becoming space junk.

Brown, a communication of science and technology student from Vanderbilt University, was a summer intern working in the Public and Employee Communications Office.

Gene Goldman to speak at Marshall Retirees Association luncheon

Gene Goldman, deputy director of the Marshall Space Flight Center, will be the speaker at the Marshall Retirees Association luncheon Sept. 2. The luncheon will be held at noon at The Ledges, 32 Castle Down Drive in Huntsville.

Those interested in attending must RSVP to Linda Posey at linda.m.posey@nasa.gov or 544-0118 by Aug. 30.

The cost is $20 and may be paid at the door. Spouses are invited.

You do not have to be a member of the association to attend. However, if you would like to join, contact Mary Spaulding at 883-2228.

HIRAD *Continued from page 1*

principal investigator and atmospheric scientist at Marshall. "Will it intensify? Will it maintain its intensity? Will it weaken? That's the hardest part of predicting hurricanes. Of course, all science is incremental, but HIRAD hopes to make a fairly strong improvement to such forecasting."

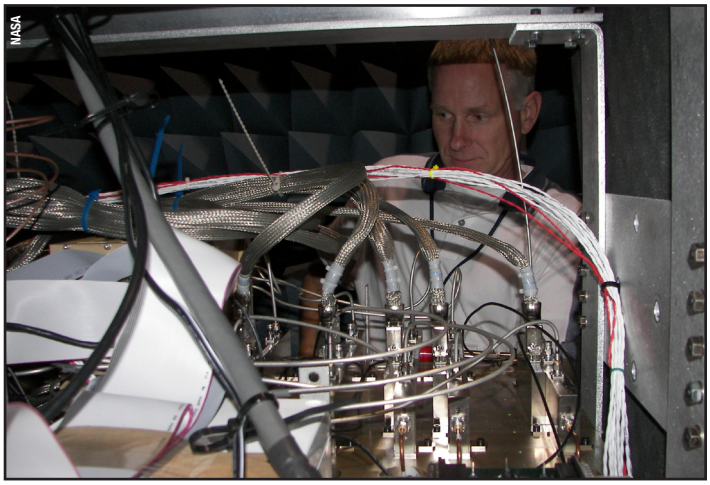
Better predictions mean better preparations. Better predictions help people figure out when to evacuate, and when not to, as poor predictions and false alarms cost millions of dollars. More importantly, accurate forecasting builds credibility with the public so that they take evacuation warnings seriously.

HIRAD collects wind speed data by using a large antenna to measure the activity on the ocean's surface. The antenna is similar to a common radio antenna, but instead of detecting radio waves from a manufactured transmitter, it measures microwaves emitted from the ocean surface. As winds move across the surface of the sea they generate white, frothy foam. That sea foam causes the ocean surface to emit increasingly large amounts of microwave radiation, similar to the type of energy emitted by a typical home microwave oven. HIRAD captures that microwave energy and, in doing so, allows scientists to deduce how powerfully the wind is blowing.

Using the information provided by HIRAD, along with lots of other data, scientists can construct a more complete and detailed representation of the hurricane.

"We get lots of little pieces of information to figure out what's happening inside the storm," Miller explained. "We combine HIRAD's data with information from weather balloons, weather satellites and other instruments flying in the hurricane campaign, we put it all together, and we can potentially predict how a hurricane will behave."

HIRAD measures not only directly under the plane, but also out to each side. "You can imagine if we just got a single line of measurements, we wouldn't see the full image of the wind speed," said Miller. "But because of HIRAD's design, we get the full, two-dimensional picture. Even though we're only measuring the ocean's surface, computer models can take that information and use it to help develop a three-dimensional structure of the hurricane."



A scientist examines the inner workings of HIRAD. The radiometer is small, lightweight, relatively inexpensive, and has no moving parts, giving it a big advantage as it flies through hurricanes.

Designing and building HIRAD hasn't been easy. Engineers had to find the perfect materials to insulate the antenna elements and form the elements into the precise sizes and shapes that capture microwaves at the exact frequencies required. Fortunately, the HIRAD team's hard work is paying off. A successful flight in early 2010 revealed HIRAD is prepared to fly in NASA's upcoming study of hurricanes. Because a single flaw could mean failure, the HIRAD team works daily to keep the instrument in good shape and to reduce the risk of any problems that might arise.

During the hurricane study, HIRAD and the other instruments will likely fly several times over major storms in the Gulf of Mexico and the Atlantic. Each mission will last roughly six hours, and Miller and his team from Marshall, NOAA and the University of Michigan will monitor incoming data from the ground. Once the plane lands, the team will pull the remaining data from the plane and began its analysis.

Brown, a communication of science and technology student from Vanderbilt University, was a summer intern working in the Public and Employee Communications Office.

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