



# MARSHALL STAR

Serving the Marshall Space Flight Center Community

Nov. 30, 2006

## *STS-116 mission will power up the International Space Station*

By Sanda Martel

Space Shuttle Discovery will launch in December on its STS-116 mission to the International Space Station to deliver another truss segment and begin the intricate process of reconfiguring and redistributing the power generated by two pairs of U.S. solar arrays.

The shuttle will launch with seven astronauts — six shuttle and one long-duration station crew member. This will be the first crew member rotation in four years involving a shuttle rather than a Russian Soyuz.

The first three days of the mission will nearly mirror those of the previous three shuttle flights. Primary activities will include the inspection of thermal protection system tiles and wing leading edge reinforced carbon-carbon panels, followed by the rendezvous and docking with the space station.

The primary assembly hardware Discovery will deliver to the space station is the \$11-million Port 5, or P5, integrated truss segment. The nearly square-shaped truss is about the length of a small compact car. It will provide structural spacing and utility connections between the P4 and P6 solar arrays after the P6 solar arrays are relocated during a shuttle mission next year. The P4 truss segment was delivered and installed during the STS-115 mission in September. The station eventually will have 11 integrated truss segments. Joined together, they will stretch 356 feet end to end to support four solar array assemblies and radiators to power and cool the station.

*See STS-116 on page 5*

## **Advanced Health Management System will debut on STS-116**

By Sanda Martel

An upgrade to the space shuttle's main engine, the Advanced Health Management System, will make its first flight in monitor-only mode on the STS-116 mission. Developed by engineers at the Marshall Center, the upgrade is a modification of the existing main engine controller — the on-

engine computer that monitors and controls all main engine operations.

Changes include the addition of advanced digital signal processors, radiation-hardened memory and new software. These changes provide the capability for completely new monitoring and insight into the health of the two most risky components of the space

shuttle main engine — the high-pressure fuel turbopump and the high-pressure oxidizer turbopump.

"The Space Shuttle Main Engine Project has, for many years, pursued a reliable means to monitor high-

*See Main engine on page 6*



With the Atlantic Ocean on the horizon, Space Shuttle Discovery stands at Launch Pad 39B at the Kennedy Space Center, Fla., where launch preparations continue. Discovery is set to begin its journey to the International Space Station no earlier than Dec. 7.

## Teamwork is what NASA is truly about

The last several weeks have been busy with all the special events and meetings inside and outside the center. Our annual Safety Day was a great success. Many of you participated throughout the entire day, and I appreciate your focus on ensuring that mission safety continues to be our top priority. A few weeks ago, I had the opportunity to present a center update to our Marshall retirees. They are extremely supportive of our role as the systems developer and integrator for both exploration and scientific missions — a significant contribution to the agency's overall work. Getting to spend time with the folks who first led the way for America to land on the moon is very rewarding. They truly are some of the best ambassadors we could ever have.



**David King**

It's hard to believe the holiday season is officially here because it seems like only yesterday that we watched Stardust return with cometary and interstellar particles, and applauded the launch of New Horizons from the Kennedy Space Center. The entire year seems to have flown by because so much was accomplished. I have an overwhelming sense of gratitude when I look at the amount of work that

took place simultaneously: shuttle flights, organizational changes, the restart of building the International Space Station, developmental work on new launch vehicles and landers, and discovering new science.

July's shuttle flight, and the one that is just around the corner, are demonstrations of how a team can face huge challenges and find solutions — together. Delivering the Oxygen Generation System to the station was a huge milestone in many respects, as was the fifth anniversary of round-the-clock service to the station by the Payload Operations Center. Our work on Ares I continues to move forward with systems requirements and with a variety of testing such as the wind tunnel model testing, the first stage parachute test and engine component testing. The Vision for Space Exploration is being transformed from ideas, development and design to actually building hardware. We are on our way!

You made this happen and I hope you are extremely proud. This kind of teamwork is what NASA is truly about: working for a unique agency with a unique mission to achieve extraordinary things. We have an enormous workload in the coming new year. I know you will continue to bring your talent and dedication to bear to meet our commitments.

I hope you will spend quality time with your family and friends during the holiday season. Use it as a time of renewal because next year holds many more opportunities for accomplishment.

*David A. King*

*Director, Marshall Space Flight Center*

## 'Focus on Marshall' looks at Reusable Solid Rocket Motor Project and Marshall's OCIO

*By Lori Meggs*

"Focus on Marshall," a program highlighting the capabilities at the Marshall Center, heats up beginning Dec. 5 with a segment on the latest night test of a reusable solid rocket motor.

The segment features the firing of a full-scale, full-duration reusable solid rocket flight support motor Nov. 16 at a Utah test facility. You'll find out why flight support motors are tested annually by the Reusable Solid Rocket Motor Project Office at the Marshall Center, and how the office is working toward future exploration goals to return humans to the moon.

The program also features the Marshall Center's Office of the Chief Information Officer, exploring the diverse office and its goals for the immediate future. The segment also includes a tour of the IT Security monitoring center in Building 4629 to show how that area monitors the IT security of the entire agency, and how Marshall responds to possible breaches in security or policy violations.

"Focus on Marshall" airs on Marshall TV and on Desktop TV the first and third Tuesday and Thursday of each month at 11 a.m., noon and 1 p.m. The program also will be posted on Inside Marshall and the Marshall home page within the NASA portal Web site.

*The writer, an ASRI employee, supports the Office of Strategic Analysis and Communications.*



# Japan 'home away from home' for Marshall astrophysicist supporting Hinode, an international mission to study the sun

By Sherrie Super

To study our nearest star, Dr. Alphonse Sterling, a Marshall Center astrophysicist, is going the distance — not to the sun itself, but to Japan.

There, he'll spend several years supporting Hinode, the international satellite mission to study the sun. A big change? Not for Sterling, who has made Japan his home away from home for nearly a third of his life.

This time around, Sterling's focus will be a solar observatory that unites international partners in pursuit of one common goal, studying explosive activity on the sun. Known as Solar-B before reaching orbit, the spacecraft Hinode, which is Japanese for sunrise, launched Sept. 22 from Uchinoura Space Center in Kagoshima, Japan — nearly three decades after Sterling launched his own personal campaign to learn Japanese.

Now fluent in the language, Sterling has spent 12 of the last 17 years in Japan, immersing himself in his solar physics research and in Japanese culture. For most of the 1990s, Sterling supported satellite and science operations for Yohkoh, an orbiting observatory that studied the sun in X-rays and gamma rays. Like Hinode, Yohkoh was a Japanese-led mission with international partners including NASA.

Beginning in January 2007, Sterling again will be living in Japan, working in the Tokyo suburb of Sagami-hara — the site of the Japan Aerospace Exploration Agency facility that controls the Hinode spacecraft. He will be part of a team that acts as a liaison between the instrument technicians who gather scientific data and the operations team that flies the spacecraft.

For Sterling, a typical day at the Japanese facility might include reviewing proposed satellite commands, supporting scientific data collection, and speaking an always-varied blend of English and Japanese. "Most Japanese people have taken several years of English," he says. "And most scientific papers — even those authored by Japanese scientists — are written in English." As a result, the language spoken at the Hinode operations center is a unique blend of English and Japanese.

Looking back, Sterling identifies two factors that fueled his initial interest in the Japanese language. "I had a friend whose parents were missionaries in Japan," he says. "And in high school, the letters of the Japanese alphabet reminded me of



Dr. Alphonse Sterling at the Uchinoura Space Center in Kagoshima, Japan

mathematical symbols. They were mysterious, and I wanted to learn more about them." Sterling also has studied Chinese, but always returns to Japanese as his primary second language.

"Long ago, I made a big mistake," he jokes. "I said I'd continue learning Japanese until I became satisfied with my level of proficiency. But I'm never satisfied."

Sterling first visited Japan in 1979, between semesters at the California Institute of Technology in Pasadena. Over the next few years, Sterling returned to Japan repeatedly as part of his academic and professional pursuits. This included a two-year stay from 1989 to 1991 as a postdoctoral research fellow at Kyoto University in the historic city of Kyoto, the seat of Japanese emperors for more than a thousand years.

On this excursion, Sterling is set to remain in Japan for at least three years, conducting solar physics research while supporting Hinode operations. The author or co-author of more than 40 research publications, he'll use data from Hinode to further his solar physics research.

Hinode is an ideal tool for that pursuit. Together, its three instruments — the Solar Optical Telescope, the X-ray Telescope and the Extreme Ultraviolet Imaging Spectrometer — will observe how changes in the sun's magnetic field spread through different layers of the solar atmosphere. These observations are expected to help Sterling and fellow scientists better understand solar disturbances, which can

*See Japan on page 6*

## Science and STS-116

# Marshall scientists supporting Discovery launch, key space station payloads

By Rick Smith

When Space Shuttle Discovery lifts off next week, it will carry two high-profile Marshall Center science payloads — and an extra set of “eyes in the sky” to watch its ascent to space, thanks to another Marshall science team.

Both Marshall payloads, bound for the International Space Station, are designed to make living and working in space safer and healthier in the future.

Developed by a team led by Marshall’s Science and Mission Systems Office, the Lab-On-a-Chip Application Development Portable Test System, or LOCAD-PTS, is a unique, state-of-the-art science instrument that could revolutionize the way astronauts conduct chemical and biological research in space. The portable detection system will help astronauts perform biological studies necessary for an extended human presence in space, from crew health and spacecraft environmental studies to the search for life on other worlds.

The space station crew will test the system in spring of 2007, checking surfaces throughout the station for the presence of select bacteria. As the system evolves in coming years, it will enable station crews to monitor their environment for more problematic

contaminants — yeast, mold and even E. coli and salmonella. The results of these early studies will help NASA researchers refine the technology for future moon and Mars missions.

Once LOCAD-PTS reaches the space station, the Marshall team will continue to manage the experiment, monitoring the study from a console in the Payload Operations Center at Marshall. The lab-on-a-chip flight experiment is funded by NASA’s Exploration Systems Mission Directorate in Washington.

### A breath of fresh air

While the portable LOCAD system is helping station crews maintain a cleaner facility, the space station’s Water Delivery System — also flying next week on Discovery — will help provide the crew with fresh air and water.

Developed at Marshall by the Environmental Control and Life Support Systems, or ECLSS, team, and incorporating components supplied by other NASA centers and industry partners, the Water Delivery System is a vital component of the space station’s Oxygen Generation System. Delivered to the station in July during STS-121, the Oxygen Generation System is the core of the station’s air-and-water recycling and reclamation system. To function properly, it requires a steady water supply. Because the station’s large Water Recovery System racks — which will fulfill that need on a long-term basis — aren’t scheduled to launch until 2008, NASA tapped Marshall’s ECLSS team to develop an interim solution that will enable station crews to begin testing the Oxygen Generation System next year.

The Water Delivery System stores water and feeds it into the Oxygen Generation System for the separation and extraction of oxygen molecules — providing 12 pounds of oxygen daily during

normal operations, enough to support six crew members. The system also will help replace oxygen lost during experiments and airlock depressurization.

The innovative system includes a potable water reservoir provided by NASA’s Johnson Space Center in Houston, and a mounting structure and water hoses developed by the Boeing Company of Huntsville. Marshall researchers teamed with Hamilton Sundstrand Space Systems International of Windsor Locks, Conn., to develop the delivery system.

*See Payloads on page 6*

During a DC-9 test flight, Dr. Jake Maule, left, project scientist, and Dr. Norman Wainwright, principal investigator, test the Lab-On-a-Chip Application Development Portable Test System, or LOCAD-PTS, which is a unique science instrument that could transform the way astronauts conduct chemical and biological research in space.



Charles River Laboratories

# STS-116

*Continued from page 1*

Three spacewalks are planned on flight days four, six and eight, with each spacewalk estimated to last 6.5 hours. Crew members include:

**Commander Mark Polansky** will lead the STS-116 crew on the mission to the space station. Polansky served as the pilot on the STS-98 mission in 2001. He will be making his second spaceflight and has logged more than 309 hours in space. He has overall responsibility for the on-orbit execution of the mission, orbiter systems operations and flight operations including landing the orbiter. In addition, Polansky will fly the shuttle in a procedure called the rendezvous pitch maneuver. This maneuver will occur before docking, while Discovery is 600 feet below the station — a position that will enable the station crew to photograph the orbiter's heat shield. Polansky will then dock Discovery to the station. Polansky also will be heavily involved in shuttle robotic arm operations for inspecting the orbiter's heat shield and transferring cargo to the station during the docked phase of the mission.

**Pilot William Oefelein**, who has logged more than 3,000 hours flying more than 50 aircraft, will make his first journey into space as pilot of the STS-116 mission. He was selected as an astronaut by NASA in 1998. During the mission, he will be responsible for orbiter systems operations and assisting in the rendezvous and docking to the International Space Station.

**Mission specialist Nicholas Patrick** will be making his first spaceflight. He will serve as primary operator of the shuttle's robotic arm to unberth the orbiter boom sensor system and survey Discovery's thermal protection system on flight day two. He will be responsible for the shuttle's video and computer networks.

**Mission specialist Robert Curbeam** is a veteran of two space shuttle flights, STS-85 in August 1997 and STS-98 in February 2001. He will conduct three spacewalks during the mission, on

flight days four, six and eight.

**Mission specialist Christer Fuglesang** is making his first spaceflight. A European Space Agency astronaut, Fuglesang is a member of the European Astronaut Centre in Cologne, Germany. He will conduct two spacewalks, on flight days four and six.

**Mission specialist Joan Higginbotham** will be making her first flight into space. Her primary task is operation of the station's robotic arm. She will use the arm to install the P5 truss onto the P4 truss attachment on flight day four.

**Mission specialist/Expedition 14 flight engineer Sunita Williams** will be making her first spaceflight to join Expedition 14 in progress to serve as a flight engineer. She is scheduled to stay on board the station for six months. She will conduct a spacewalk on flight day eight.

**European Space Agency flight engineer Thomas Reiter** flew to the space station on board Discovery in July 2006 and became a member of the Expedition 13 crew. He will return to Earth on board Discovery with the STS-116 crew. Reiter is the first crew member to serve on two expeditions, expeditions 13 and 14.

Discovery's launch from the Kennedy Space Center, Fla., will occur no earlier than Dec. 7 for the 12-day mission. Landing is at the Kennedy Center.

*The writer, an ASRI employee, supports the Office of Strategic Analysis and Communications.*



Front row from left: William Oefelein, pilot; Joan Higginbotham, mission specialist; and Mark Polansky, commander. Back row: Robert Curbeam, Nicholas Patrick, Sunita Williams and the European Space Agency's Christer Fuglesang, all mission specialists. Williams will join Expedition 14 in progress to serve as a flight engineer on board the International Space Station. The crew members are attired in training versions of their shuttle launch and entry suits.

## Main engine

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### *Continued from page 1*

pressure turbomachinery health in real time," said Jeff Spencer, project leader for the Advanced Health Management System. "The system upgrade provides that capability and, in doing so, will significantly improve shuttle flight safety."

The system will fly first on STS-116 with a single controller in monitor-only mode on one engine. This will limit new hardware and software to the least possible risk, preclude the risk of an erroneous shutdown and allow integration risks to be evaluated, Spencer added.

Plans are to fly with three AHMS controllers — one on each shuttle engine — in monitor-only mode on STS-117 and in

active mode on STS-118.

Shuttle main engine high-pressure fuel and high-pressure oxidizer turbopumps rotate at approximately 35,000 revolutions and 28,000 revolutions per minute, respectively. Operating at such extreme speeds, the high-pressure turbopumps use highly specialized bearings and precisely balanced components. The AHMS upgrade uses data from three existing sensors, or accelerometers, mounted on the high-pressure turbopumps to measure how much each pump is vibrating.

With the AHMS, output data from the accelerometers is routed to the new digital signal processors installed in the main engine controller. The processors analyze the sensor readings 20 times per second, looking for vibration anomalies that indicate

impending failure of rotating turbopump components such as blades, impellers, inducers and bearings. If the magnitude of any vibration anomaly exceeds safe limits, the upgraded main engine controller immediately shuts down the unhealthy engine.

In monitor-only mode, the AHMS will collect and process the turbopump accelerometer data, or vibration data, and continuously monitor turbopump health but cannot shut down an engine. Data from the STS-116 flight will be collected and examined to ensure AHMS operates as intended prior to future flights in active mode.

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## Japan

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### *Continued from page 3*

interfere with satellite communications and electric power transmission grids, and threaten the safety of astronauts traveling beyond the safety of the Earth's magnetic field.

Hinode is a collaboration between the space agencies of Japan, the United States, the United Kingdom and other European nations. The mission is part of the Solar Terrestrial Probes Program within the Heliophysics Division of NASA's Science Mission Directorate in Washington. NASA, supported by academia

and industry, prepared major instrument components for the spacecraft, with Marshall managing development of all scientific instrumentation provided by NASA.

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## Payloads

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### *Continued from page 4*

#### **Extra eyes in the sky**

Marshall also is responsible for helping NASA monitor Discovery's flight to orbit — tracking it with the innovative WB-57 Ascent Video Experiment, or WAVE.

Named for the pair of NASA WB-57 jets that carry it, this advanced optical imaging system is designed to capture unprecedented details of the space shuttle's flight during the critical early minutes. Developed by Marshall optics engineers and their partners at the Johnson Center, the twin imaging systems are designed to augment the work of hundreds of cameras on the ground and in and on the shuttle itself.

Marshall Center video technicians and optics specialists built and tested the high-definition camera and imaging system in 2005.

Mechanical engineers from the University of Alabama in Huntsville built the housing, and programmers from San Diego-based SAIC, a NASA contractor, helped develop software that would enable each plane's back-seat operator to control the camera. Southern Research Institute of Birmingham, Ala., built a pair of rotating gimbals, enabling the systems to be mounted in the jets' nosecones to continuously track the shuttle during its ascent.

The WAVE imaging systems will track the shuttle for approximately 2.5 minutes, from liftoff to separation of the Solid Rocket Boosters — the power systems that provide the main thrust to lift Discovery off the pad.

For more information about STS-116, visit [http://www.nasa.gov/mission\\_pages/shuttle/shuttlemissions/sts116](http://www.nasa.gov/mission_pages/shuttle/shuttlemissions/sts116).

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# Classified Ads

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

## Miscellaneous

Hardware cloth, 12' sections, 36" wide, 1/4" holes, one piece approx. 20 feet, all \$40. 931-427-8205

Sixty vinyl LPs, classical music, varying condition, \$20. 885-2448/Chuck

Nintendo game cube, controller, memory card, 4 games, \$80; ping pong table w/net & paddles, folds, \$75. 722-9274

AKC champion bloodline Bichons, ready Dec. 3, males, \$500, females, \$600. 931-0481

Tires for 4-wheeler, New ITP mud lites, wheels, lug nuts, centerpieces, fits Honda 450 & up. 256-259-1523

Chromcraft circular dinette table w/4 swivel chairs, \$250. 881-1249

Solid oak oval breakfast table with lion's paw legs and 4 wooden chairs, \$200. 655-4405

Leather recliner, \$450; couch, \$125; bunk bed, \$150; kitchen table and 6 chairs, \$45. 355-3550

Manual treadmill, air resistance cushion deck, folds for storage, quiet, not motor, \$69. 961-1603

Martin ventless propane logs, 30"x22"x16", five logs, 40K BTU, thermostat, \$75. 256-810-9104

Engagement ring, 14K, approx. 1-CT-TW, round center stone w/baguette accents, appraised \$2,360, asking \$1,200. 852-2219

Solid oak table w/ceramic tile tabletop insets, seats six, two armchairs, \$300. 325-9264

Two adjacent 5th row seats, Broadway Theatre League Production, "The Producers," Jan. 12, 8 p.m., \$100. 325-0085

Bruce oak hardwood flooring in box, 400 sq. ft., 3/4 inch nail down, \$3/ft. Various baby items. 256-431-7755

Sony PS2 with games, accessories, and Gameboy, \$220. 864-2629

Chest freezer, \$100; GE side-by-side refrigerator, \$100; Frigidaire washer & dryer, \$150 for set. 256-931-4678

King-size bedroom suite w/table, dresser, highboy, \$2,000; free weight gym w/pec deck, smith machine, etc. 721-7607

Daniel Moore Alabama football print, "The Winning Connection," signed and numbered, professionally framed, \$250. 423-4217

Tonneau truck bed cover, Extang snap-on, \$100. 651-3064

Kenmore washer/dryer, \$300/set; Christmas tree, 7-1/2', \$75; table, 4 chairs, \$50; Gazelle, \$75. 337-7943

Wood burning stove, Appalachian 9036 fireplace insert, you pick up, \$100. 883-2757

Trailer, fits canoe or 14' John boat, wench, lights, 1-7/8 ball, \$200. 534-8418

Office desk w/faux wood top, corners chipped, 30"Dx60"Wx29"H, \$30. 882-0133

Ping pong table w/net and paddles, folds for storage, \$75. 722-9274

Xbox, 9 games, 3 extra controllers, wireless network adapter, many extras, \$300. 256-353-9020

Baldwin Acrosonic piano, \$500; 12-volume collection of music for piano, \$200. 417-2654

Computer desk, black, w/hutch, wheels, assembled, 36"Wx20"Dx53"H, \$25. 895-6722

iPod Remote Interactive Dock DS-A1, works with Onkyo stereo/home theater systems, new, \$50. 256-828-1234

HD-ready TV, Samsung, 32" CRT w/remote, \$720. 655-1986

## Vehicles

1998 Cadillac Eldorado, 2 door, red, 58K miles, \$10,000. 885-2293

1986 Ford E350 15-passenger van, 70K original miles, front/rear a/c, \$2,200. 227-0339/Dave

1994 Dodge Intrepid, 3.3L/V6, auto, one owner, power doors/windows/locks, CD, 166K miles, new tires, \$1,200. 489-4483

2006 Honda CRF230F dirt bike, \$2,700. 256-776-4741

1995 Toyota 4Runner SR5, 4x4, green w/tan

leather, new tires, auto, 135K miles, \$5,350. 256-457-4006

1981 Corvette, white w/tan leather, 350/4bbl automatic, 82K miles, \$12,000. 882-1566 after 4 p.m.

2004 Honda Civic EX, gray. 233-6197

1996 Ford Explorer, 4 door, blue, leather, tow package, all power, 192K miles, \$4,275. 880-6335

1994 Dodge Caravan LE, blue, auto, 128K miles, one owner, \$1,900. 656-5745

## Wanted

Deck furniture, portable roll-a-round fire pit. 256-694-2363

Two or more tickets for SEC football championship game. 417-5265

Men's mountain bike, good shape, cheap. 256-665-3422

Chevy OEM chrome rear step bumper, fits 73-87 pickup. 683-9364

## Free

To good home: Small, very cute mixed breed puppy, 3-4 months old. 497-3500

## Marshall Retirees Association to host 2006 Christmas Social

The 2006 Christmas Social for the Marshall Retirees Association will be held Thursday, Dec. 7, at the Valley Hill Country Club. The social begins at 6:30 p.m. with dinner at 7 p.m. Dress is casual and there will be a cash bar. The cost is \$17 per person and can be paid at the door. Those planning to attend must contact Linda Posey at lbposey@comcast.net or call 532-2120 on or before the day of the social.

For association membership information, call Posey or write to 4836 Cove Creek Drive, Brownsboro, Ala. 35741.

## Marshall's 2005-2006 NASA Leadership Development Program graduates are honored



Five Marshall employees recently completed the 2005-2006 Leadership Development Program at NASA Headquarters. The vision of the program is to create powerful leaders who align with NASA's vision, mission and values and who create results that matter to the American people. Charles Scales, NASA associate administrator for the Office of Institutions and Management, spoke at the graduation. From

left, Teresa Danne, Office of the Chief Financial Officer; Chryssa Kouvelioutou, Science & Mission Systems Office; Scales; Bill Lapenta and Steve Noneman, both of the Science & Mission Systems Office; and Joe Sanford, Engineering Directorate. In his address, Scales said that for NASA to meet the Vision for Space Exploration, leaders must first steer a new direction for the agency here on Earth.

## Marshall Center holiday reception and tree lighting ceremony to be held Nov. 30

Marshall team members are invited to join Center Director David King on Thursday, Nov. 30, for a reception to kick off the holiday season. The celebration will be from 1 to 3 p.m. in the Activities Building 4316. Part of the Marshall Center's annual festivities, a tree

lighting ceremony will be held the same day at 4:15 p.m. in front of Building 4200.

The bus schedule is available at [http://inside.msfc.nasa.gov/announcements/holiday\\_reception\\_ie.html](http://inside.msfc.nasa.gov/announcements/holiday_reception_ie.html).

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