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Space Launch System Engine Installed at Stennis for Testing

By Rebecca Strecker

Engineers have taken a crucial step in preparing to test parts of NASA's Space Launch System (SLS) rocket that will send humans to new destinations in the solar system. On July 17, they installed an RS-25 engine on the A-1 Test Stand at Stennis Space Center.



RS-25 rocket engine No. 0525 is positioned onto the A-1 test stand July 17 at NASA's Stennis Space Center. Four RS-25 engines will power the core stage of NASA's Space Launch System (SLS), the most powerful rocket in history for deep-space missions, including to an asteroid and ultimately to Mars. (NASA)

The Stennis team will perform developmental and flight certification testing of the RS-25 engine, a modified version of the space shuttle

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The Making of the Chandra X-ray Observatory

By Brian Odom

For the past 15 years, NASA's Chandra X-ray Observatory has been using its unique capability for producing sub-arcsecond X-ray images to reveal stunning discovery after stunning discovery.

When it launched July 23, 1999, Chandra marked the culmination of decades of improvements in detector and mirror technology demonstrated by pioneers in X-ray Astronomy such as Bruno Rossi,

Nobel Prize-winner Riccardo Giacconi and Herbert Gursky. But the road to Chandra's launch was long, winding and full of surprises. It would take the leadership of Program Manager Fred Wojtalik and Deputy Program Manager Jean Olivier of NASA's Marshall Space Flight Center, as well as the dedicated efforts of the integrated team of civil servants, contractors and scientists, to accomplish the launch of this particular "Great

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Space Station Astronauts to Visit Marshall Space Flight Center on July 29

By Bill Hubscher

Astronauts Michael Hopkins and Richard Mastracchio, who lived and worked for six months each as flight engineers on the International Space Station, will present mission highlights and sign autographs at the Marshall Space Flight Center on July 29 starting at 1 p.m. in Morris Auditorium. They will share highlights of their overlapping missions in space from September of 2013 through May 2014, covering Expeditions 37, 38 and 39, and their varying perspectives on spaceflight. The expedition was Hopkins' first spaceflight and Mastracchio's fourth.

They will also participate in a plaque-hanging

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In the International Space Station's Kibo laboratory, NASA astronauts Rick Mastracchio, left, and Michael Hopkins, both Expedition 38 flight engineers, conduct a session with a pair of bowling-ball-sized, free-flying satellites known as Synchronized Position Hold, Engage, Reorient, Experimental Satellites, or SPHERES. (NASA)

SLS Engine *Continued from [page 1](#)*

main engine that powered missions into space from 1981 to 2011. The SLS core stage will be powered by a configuration of four RS-25 engines, like the one recently installed on the A-1 stand.

“This test series is a major milestone because it will be our first opportunity to operate the engine with a new controller and to test propellant inlet conditions for SLS that are different than the space shuttle,” said Steve Wofford, SLS Liquid Engines Element manager. “This testing will confirm the RS-25 will be successful at powering SLS.”

Early tests on the engine will collect data on the performance of its new advanced engine controller and other modifications. The controller regulates valves that direct the flow of propellant to the engine, which determines the amount of thrust generated during an engine test, known as a hotfire test. In flight, propellant flow and engine thrust determine the speed and trajectory of a spacecraft. The controller also regulates the engine startup sequence, which is especially important on an engine as sophisticated as the RS-25. Likewise, the controller determines the engine shutdown sequence, ensuring it will proceed properly under both normal and emergency conditions.

“Installation of RS-25 engine No. 0525 signals the

launch of another major rocket engine test project for human space exploration on the A-1 Test Stand,” said Gary Benton, RS-25 rocket engine test project manager at Stennis.

The SLS is designed to carry astronauts in NASA's Orion spacecraft farther into space than ever before, to destinations including an asteroid and Mars. NASA is using existing and in-development hardware and infrastructure, including the RS-25 engine, to the maximum extent possible to enable NASA to begin deep space missions sooner.

Testing of engine No. 0525 begins in the coming weeks on a test stand originally built in the 1960s for Apollo-era engines that helped launch the lunar missions. The stand has since been used for several major testing projects, and NASA spent almost a year modifying the structure to accommodate the RS-25 engine.

The SLS Program is managed at NASA's Marshall Space Flight Center. Aerojet Rocketdyne of Sacramento, California, is on contract with NASA to adapt the RS-25 engines for SLS missions.

For information about NASA's SLS Program, visit [here](#).

Strecker is a public affairs officer at NASA's Stennis Space Center.

Marshall Exchange to Host Ice Cream Social July 29

In commemoration of the 45th anniversary of the lunar landing, the Marshall Exchange will host an ice cream social on July 29 from 11:30-1 p.m. under the covered sidewalk area in front of Building 4203.

Ice cream, toppings, and even some ice cream sandwiches will be available to all employees and contractors compliments of the Marshall Exchange. Come out and enjoy a cool treat and celebrate a milestone in NASA's history!

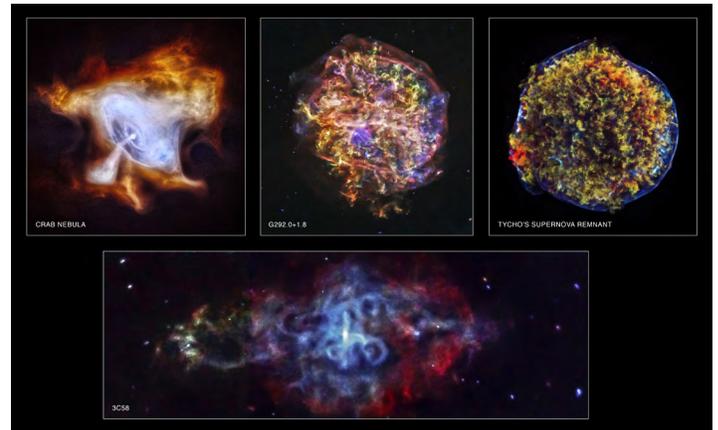
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Observatory.”

In 1976, Giacconi and Harvey Tananbaum, former director of the Chandra X-ray Center at the Smithsonian Astrophysical Observatory, submitted a proposal to NASA entitled “For the Study of the 1.2 Meter X-Ray Telescope National Observatory.” One year later, NASA approved funds for conceptual design and preliminary analysis of a mission then known as the Advanced X-ray Astrophysics Facility (AXAF), with NASA's Marshall Space Flight Center given overall program management responsibilities. The selection of Marshall as lead center was based on its previous work with the High Energy Astrophysics Observatory (HEAO) missions and the Hubble Space Telescope, which was then under development.

Soon thereafter, a decision was made to hire an expert from the field of X-ray astronomy to oversee the scientific requirements of the mission and serve as liaison between the scientific community and program management. To fill this position, Marshall turned to Dr. Martin Weisskopf from Columbia University in New York City. In the next 22 years until AXAF's launch in 1999, Weisskopf shepherded the observatory through all its ups and downs, and along the way became synonymous with the observatory.

The year 1992 was a major turning point in the development of AXAF. After the successful demonstration of the complex mirror technology in Marshall's world-class X-ray Calibration Facility, the team received word from Charles Pellerin, then-director of the astrophysics division at NASA Headquarters, that a shrinking budget would



To celebrate Chandra's 15th anniversary, four newly processed images of supernova remnants have been released. (NASA/CXC/SAO)

require de-scoping. After a year of what Weisskopf called “grueling” discussions and handwringing, the decision was made to cut two of the mirror pairs, divide AXAF into two missions, place the observatory in a higher orbit and eliminate the previously planned Hubble-style servicing with the space shuttle.

The period between de-scoping in 1992 and launch in 1999 saw the development and integrated testing of AXAF's mirror assembly and scientific instruments. On Nov. 30, 1996, the mirror assembly arrived at Marshall for what would be round-the-clock, comprehensive testing in the X-ray Calibration Facility -- a process that continued into early 1997. The effort took a tremendous toll on the team of scientists and engineers, but what emerged was confirmation that the mirrors were indeed capable of producing images 50 times sharper than those produced by any previous X-ray telescope.

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Huntsville Community Celebrates Apollo 45th Anniversary, Looks Forward to the Next Giant Leap



On July 18, several hundred people gathered for the Space Exploration Celebration to mark the 45th anniversary of the Apollo 11 mission -- which landed humans on the moon for the first time on July 20, 1969. During the event at the U.S. Space & Rocket Center, NASA's Associate Administrator Robert Lightfoot reminisced about a time when he and his father, who was a teacher, built a model of the Saturn V before the Apollo 11 launch and how the Apollo missions inspired him to become an engineer. Lightfoot told the audience that NASA is making progress toward the next giant leap in space -- the human exploration of Mars. (NASA/MSFC/Emmett Given)

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ceremony in the Payload Operations and Integration Center in Building 4663. A member of the payload operations team is chosen to hang each crew's mission logo plaque recognizing the collaboration between the orbiting astronauts and the Huntsville-based team.

Hopkins and Mastracchio worked daily with the Marshall-based Payload Operations and Integration Center staff on hundreds of research experiments and science investigations that will have benefits for future human spaceflight and life on Earth.

The two astronauts worked on hundreds of research experiments and science investigations that benefit future human spaceflight and people on Earth. During their time on the station, Hopkins and Mastracchio teamed up for two spacewalks, conducted multiple protein crystal growth experiments, and helped trigger the Optical Payload for Lasercomm Science, or OPALS investigation, testing the use of laser optics to transfer information

to the ground. Both were also involved in the transfer of command of the station to Koichi Wakata, the first Japan Aerospace Exploration Agency astronaut to helm the orbiting laboratory.

Hopkins's biography and Twitter account are available at <http://www.jsc.nasa.gov/Bios/htmlbios/hopkins-ms.html> and <https://twitter.com/AstroIllini>

Mastracchio's biography and Twitter account are available at <http://www.jsc.nasa.gov/Bios/htmlbios/mastracc.html> and <https://twitter.com/AstroRM>

For more information on the space station, visit <http://www.nasa.gov/station>

Follow space station research on Twitter at https://twitter.com/ISS_Research

Hubscher, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.

Following integration at TRW facilities at Redondo Beach, California, AXAF was shipped to NASA's Kennedy Space Center in the spring of 1999 for integration with the inertial upper stage (IUS) and into the cargo bay of the space shuttle Columbia. By now, AXAF had been given a new name, Chandra, in honor of one of the foremost astrophysicists of the 20th century -- Subrahmanyan Chandrasekhar. Another major milestone was achieved when astronaut Eileen Collins was named mission commander for STS-93. Collins would be the first female commander in the history of the U.S. space program.

As launch approached, the scene at Kennedy spoke to the exceptionality of the observatory. Attendees at the launch included then-First Lady Hillary Clinton; Chandrasekhar's widow, Lalitha; singer Judy Collins; and male model Fabio. After two scrubbed launch attempts, Chandra launched July 23, 1999. On Aug. 7, after two burns from the IUS and five burns from an internal propulsion system, Chandra entered its operating orbit which ranges from a perigee of around 6,000 miles to an apogee of about 86,500 miles.

Since launch, Chandra has explored the high energy universe, in the process deepening and, in some cases, revolutionizing our understanding of a whole range of astronomical topics that includes massive stars, supernova explosions, pulsars, black holes, neutron stars, dark matter and dark energy. The incredible scale of Chandra's impact is found in the fact that as of last January, more than 3,600 individual principal investigators and co-investigators have participated in successful Chandra proposals and nearly 5,700 papers have appeared in refereed journals.

For related Chandra images, podcasts, and educational materials, visit [here](#).

For additional information on Chandra from the Harvard-Smithsonian Center for Astrophysics, visit [here](#).

Odom, an ASRC Federal/Analytical Services employee, supports the Marshall Center History Office, part of the Office of Strategic Analysis & Communications.

Pass the Torch Lecture to Celebrate 15 Years of Science from Chandra X-ray Observatory

Explore the X-ray technology behind the Chandra X-ray Observatory and see the universe in a new and dynamic way during a panel discussion July 24 celebrating 15 years of science from the telescope.

The discussion, part of the Pass the Torch Lecture series at the U.S. Space & Rocket Center, will be at 5:30 p.m. in the Digital Theater of the center's Davidson Center for Space Exploration.

The panel, consisting of former Chandra Program Manager Fred Wojtalik, former Chandra Deputy Program Manager Jean Olivier and Chandra Project Scientist Dr. Martin Weisskopf, will describe the development and testing of the telescope, discuss the discoveries behind the Chandra Observatory, and detail the observatory's current status and future. The panel will be moderated by Keith Hefner, Chandra Program manager from 2002-12. He now serves as associate program manager of the Space Launch System.

On July 23, 1999, space shuttle Columbia – with NASA's first female commander, Eileen Collins -- launched into orbit and deployed the Chandra X-ray Observatory.

Fifteen years later, Chandra continues to deliver spectacular results to the scientific community and the public. With its unrivaled sensitivity and resolution in X-ray light, Chandra's telescope observes the debris of exploded stars, matter falling into black holes, hot gases pervading galaxy clusters and much more.

NASA's Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate. The Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, controls Chandra's science and flight operations.

NASA Honors 17 Marshall Team Members with Silver Snoopy Award

Seventeen NASA Marshall Space Flight Center team members were honored July 17 with the [NASA Silver Snoopy award](#), presented by the [NASA astronaut corps](#) to individuals whose outstanding achievements in service to the center and to the agency reflect the highest dedication to human flight safety and mission success.

The awards were presented by Marshall Center [Deputy Director Teresa Vanhooser](#) and [NASA astronaut T.J. Creamer](#), a former flight engineer and NASA science officer aboard the [International Space Station](#) during Expeditions 22 and 23, and now a payload operations director supporting the space station in Marshall's [Payload Operations Center](#).



From left, astronaut T.J. Creamer; honorees Amy Cardno, Engineering Directorate; David Kincaid, Engineering Directorate; Jonathan Carlson, Engineering Directorate; Edward Bermea, Engineering Directorate; Rosalind Cylar, Office of the Chief Counsel; Amy Hemken, Engineering Directorate; Laura Prater, Engineering Directorate; Diedra Williams, Office of Human Capital; and Marshall Center Deputy Director Teresa Vanhooser. (NASA/MSFC/Emmett Given)



From left, Creamer; honorees Amy Floyd, Space Launch System Program Office; Alicia Kidd, Space Launch System Program Office; Karen Gelmis, Space Launch System Program Office; Charles Hall, Engineering Directorate; Michael Self, Space Launch System Program Office; Neal Scott, Flight Programs & Partnerships Office; Nicole Prince, Space Launch System Program Office; Shawn Kelly, Office of the Chief Information Officer; James Good, Office of the Chief Information Officer; and Vanhooser. (MSFC/Emmett Given)

Watch the Summer Skies! 2014 Delta Aquarids Peak on July 29-30

On the night of July 29-30, a dim new moon will favor viewing of the 2014 Delta Aquarid meteor shower -- the Southern Delta Aquarids. Although this is considered a minor shower with projected peak rates of 15-to-20 meteors an hour, the darker skies will help even faint meteors shine more brightly.

Most of the world can see the Delta Aquarids, with best viewing in the tropics of the Southern and

Northern hemispheres. With clear, dark skies away from city lights, you can see meteors any time after full dark, with peak viewing times in the two hours before dawn, local time.

Beginning at 7:30 p.m. July 29, NASA's Marshall Space Flight Center will offer a live Ustream view of the skies over Huntsville, weather permitting. To watch, visit Marshall's Ustream page: <http://www.ustream.tv/channel/nasa-msfc>



At the July 18 Space Exploration Celebration, the U.S. Space & Rocket Center awarded special plaques commemorating the 45th anniversary of Apollo 11 to, from left, Gene Goldman, executive director of space programs for Aerojet Rocketdyne and a former director of the Marshall Center; Patrick Scheuermann, director of NASA's Marshall Space Flight Center; and Robert Lightfoot, NASA's associate administrator. Each participated in the celebration and discussed NASA's intent to build on the legacy of Apollo with human missions to Mars supported by the Space Launch System, managed by Marshall. (NASA/MSFC/Emmett Given)

Marshall Center engineers share their stories and experiences of testing rockets of all shapes and sizes during the panel discussion "City of Smoke and Fire, A Panel on the History of Propulsion in Huntsville" July 18 as part of the Space Exploration Celebration at the Davidson Center for Space Exploration. Each of the panelists has played a key role in Marshall propulsion testing of a variety of launch vehicles including the Redstone rocket, Saturn rockets, the space shuttle and the Space Launch System -- a new heavy lift rocket being developed by Marshall to carry humans on deep space missions. Participants included, from left, James Odom, a former NASA engineer and senior manager who worked on almost all of NASA's key programs; Steve Cash, head of Marshall's Safety and Mission Assurance Office; and Alex Priskos, manager of the Space Launch System Boosters Office. Odom said Marshall test facilities -- being used to test propulsion systems for the SLS today -- were a key NASA asset built during the Apollo era and used for subsequent propulsion testing of the space shuttle and commercial vehicles. The Space Exploration Celebration's propulsion history program was made possible through a grant from the Smithsonian's Lemelson Center for the Study of Invention and Innovation and the National Science Foundation. (NASA/MSFC/Emmett Given)

