AEROSPACE Orbiter

Print May Article Archive

Article Archive for May 1st to May 31st.
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Aerospace PicoSats Take Their Place in History

Last photo of the space shuttle Atlantis in space, taken by the Aerospace nanosat PicoSat Solar Cell Testbed Satellite-2 (PSSCT-2) on Wednesday, July 20, 2011.

Posted May 30, 2013 · Feature

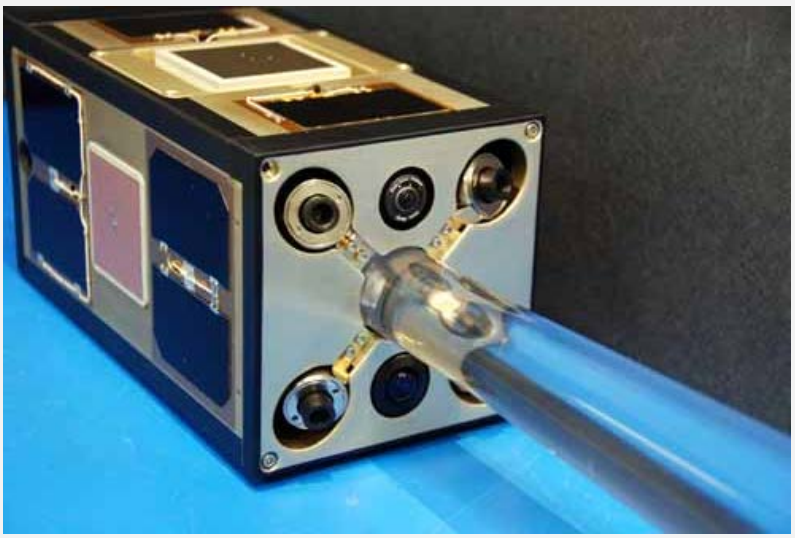
History came knocking for the Aerospace PicoSat program last December with a request from the Space Test Program (STP) at the Johnson Space Center in Houston: Could Aerospace provide a lifelike model of the PicoSat Solar Cell Testbed Satellite-2 (PSSCT-2) for the permanent space shuttle Atlantis display that was being assembled at the Kennedy Space Center Visitor Complex?

The Aerospace Corporation's PSSCT-2 was the 180th and final satellite launched by the space shuttle program, and seconds after it was launched, an onboard camera took the last picture of a shuttle in orbit.

David Hinkley, Geoff Maul, and Petras Karuza of the Mechanics Research Department accepted the task and constructed the model using spare parts from the original satellite build. The model was sent to STP in Houston on May 10 and was well received.

From July 20 to Dec. 8, 2011, when it naturally deorbited, the PSSCT-2 performed three experiments. First, it tested a new miniature GPS radio occultation sensor that measured the density of the ionosphere and the presence of scintillation. Ionospheric density structures and variability can adversely affect a variety of DOD systems including ground and satellite communications, over-the-horizon radar, and GPS navigation. Second, it characterized new, unflown solar cells by measuring their current and voltage curves. Third, PSSCT-2 carried four small solid rocket motors for the purpose of rapidly changing orbit altitude — PSSCT-2 was thereby the first picosatellite able to raise its orbit.

The PSSCT-2 model will be suspended next to the Atlantis and connected (for purposes of the display) to a Space Shuttle PicoSat Launcher (SSPL), the box that holds the PicoSat until it is time to launch the satellite. This is done by means of a hefty spring that pushes the satellite into space, away from the shuttle. In the display, the satellite will look like it is being launched from the Atlantis.



Model of the Aerospace PicoSat Solar Cell Testbed Satellite-2, which will be displayed with the space shuttle Atlantis. (Aerospace image.)

Delta IV Boosts WGS-5 to Orbit

Posted May 28, 2013 · Feature

Image courtesy United Launch Alliance LLC

A Delta IV launches on Friday, May 24, carrying the WGS-5 satellite to orbit.

A Delta IV rocket lofted the fifth Wideband Global SATCOM (WGS) satellite to orbit on Friday, May 24.

The rocket lifted off from Cape Canaveral's Launch Complex 37 at 8:27 p.m. ET (5:27 p.m. PT) in the opening seconds of the mission's launch window. It flew in the medium-plus (5,4) configuration with a five-meter payload fairing and four strap-on solid rocket motors. It is the most powerful Delta IV version aside from the triple-barreled Delta IV Heavy.

Following several months of orbit-positioning, testing, and checkout, the WGS advanced military communications satellite will become operational in a geostationary orbit off the East Coast of the United States where it will provide coverage of the Americas.

Now Boarding WGS-6

Bill Slutter

The WGS-6 satellite is loaded into a C-17 transport plane at Los Angeles International Airport.

Posted May 21, 2013 · Feature

The WGS-6 satellite departed Los Angeles International Airport on Thursday, May 16, aboard a Boeing-built C-17 cargo plane bound for Cape Canaveral AFS.

The satellite is scheduled to launch on Aug. 7. The WGS-5 satellite is scheduled to launch on Thursday, May 23.

The Wideband Global Satellites are high-capacity military communications satellites built in El Segundo by Boeing Satellite Systems. A total of 10 WGS satellites are planned.

All the WGS satellites are built in the Boeing Satellite Development Center, a complex that spans between Nash Street and Selby Street and Imperial Highway to Maple Avenue. With more than one million square feet of floor space, it is the world's largest satellite factory.

The factory boasts a storied history, having been constructed in 1948 as a production facility for Nash Motors, makers of the Nash Rambler. Cars came off the assembly line at the end of the original building that opened onto Nash Street. The reclusive Howard Hughes bought the property in 1955 for $3 million, eventually forming a division of Hughes Aircraft to build satellites, starting in 1961. Boeing bought Hughes Space and Communications in 2000 and currently builds both commercial and military satellites in the El Segundo plant.

The WGS-6 satellite arrives at LAX from the Boeing Satellite Development Center. (Photo by Bill Slutter.)

Workers are almost finished loading the WGS-6 onto the C-17 transport. (Photo by Bill Slutter.)

Atlas Is Back With GPS

Image courtesy United Launch Alliance, LLC

An Atlas V carrying the GPS IIF-4 lifts off from Cape Canaveral AFS on Wednesday, May 15.

Posted May 16, 2013 · Feature

“Go Atlas.”

“Go Centaur.”

“Go GPS.”

With those words, the launch team completed its final status check at T-minus 20 seconds. Moments later, for the first time in 28 years, an Atlas rocket powered a Global Positioning System satellite to orbit.

The Atlas V, flying in the the 401 configuration with a standard four-meter-diameter fairing and no strap-on solid rocket motors, lifted off from the Cape Canaveral Complex 41 pad as its launch window opened at 5:39 p.m. ET (2:39 PT) on Wednesday, May 15.

The rocket’s first stage is powered by a single RD-180 engine that burns kerosene and liquid oxygen in two thrust chambers, producing 860,000 pounds of thrust on liftoff. The engine of the Centaur upper stage, to which the GPS spacecraft is attached, burns liquid hydrogen and oxygen.

Ray Johnson, vice president for Space Launch Operations, reported the successful separation of the GPS IIF-4 spacecraft 3½ hours into the mission.

“There were no significant problems or issues,” Johnson said. “I want to congratulate the entire Atlas launch team and the GPS satellite team on this very successful launch.”

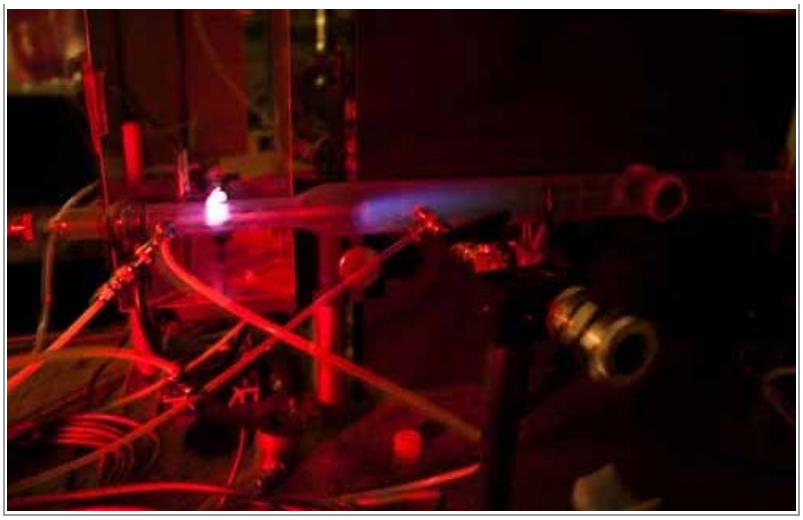
Johnson noted that this was the first GPS launch on an Atlas V. Earlier Atlas boosters were used to launch 11 Block 1 series GPS satellites from February 1978 through October 1985. These satellites were used to test the navigation system concept. The current operational GPS satellites have all been launched with Delta rockets, beginning in February 1989.

Rocket Plume Analysis Ready for Takeoff

Posted May 10, 2013 · Feature · By Matthew Kivel

If rocket plume analysis doesn’t sound like a familiar concept, well, it shouldn’t. Aerospace scientists are among the very few — and in some areas, the only — researchers studying and dissecting the fiery plumes that shoot from the base of launched rockets.

With all of the iconic images of glorious, fire-spewing rocket ships that have graced our televisions, computer screens, and newspapers over the years, surprisingly little has been done in the way of researching what these spectacular launches leave behind. Aerospace’s Patti Sheaffer and Dr. Martin Ross are working to change that by deeply examining the makeup and environmental impact of rocket plumes. Their groundbreaking research is laying



Elisa Haber

Rocket plume testing equipment

a strong foundation for intensive rocket emission analysis for years to come.

When a rocket is launched, it typically burns off two-thirds of its propellant in the lower atmosphere and one-third of its propellant in the upper atmosphere (stratosphere and mesosphere). It's the exhaust trapped in the upper atmosphere that concerns scientists and climatologists since it typically lingers in that region of the atmosphere for three to four years. This rocket launch exhaust usually consists of soot particles, aluminum particles, water vapor and other chemical remnants that can affect the atmosphere's properties in a substantial way. With the growing international concern over climate change, Ross and Sheaffer's emission analysis is becoming increasingly timely and relevant.

Sheaffer, who has worked at Aerospace for more than 30 years, handles most of the nuts and bolts experimental operations. She has built a one-of-a-kind testing facility at Aerospace for simulating rocket launches and a larger rocket simulator for testing in the field. The research that she's carried out for more than a decade has led to a clearer understanding of the chemical composition of rocket plumes and the definitive characteristics that they exhibit. "There is a big chunk of the atmosphere that we just can't examine to make measurements," explains Sheaffer, "so we have to use models and that's what started a lot of our lab."

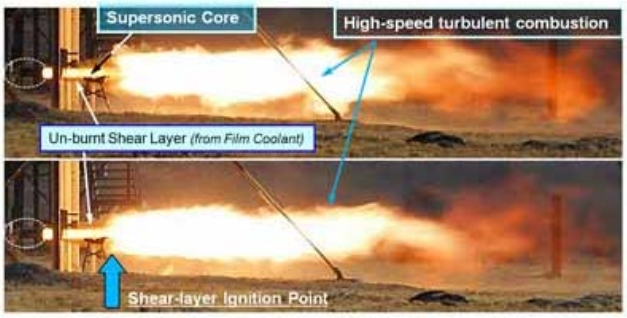
Patti Sheaffer with equipment used for simulating rocket launches. (Photo by Elisa Haber.)

With years of controlled experimentation and data analysis, Sheaffer has developed unique computer models that are capable of analyzing the emissive qualities of rockets. Her labyrinthine, in-lab simulator reproduces the rocket-induced chemical reactions that take place in the upper atmosphere and tests the accuracy of the models. Once the integrity of the models is assured, Sheaffer will often head out to launch sites in order to collect data from the rocket plumes. The data is obtained with infrared instruments that allow for a very detailed depiction of the chemical species and aerothermodynamics contained within the plume.

"Molecular species can be excited in three different ways" says Sheaffer. "Electronic excitation, vibrational excitation, and rotational excitation. The flame is very very hot, so these things are vibrationally excited so they emit in certain characteristic wavelength bands." By examining where a given plume fits in the wavelength spectrum, Sheaffer can diagnose its emissive qualities. This information not only adds significantly to a more well-rounded portrait of a given rocket launch, but can be useful in gauging the potential environmental impacts of a specific engine or rocket type. In essence, Sheaffer has developed a highly accurate method of analyzing rocket exhaust, which can be applied to nearly any rocket in the public and private sector.

Dr. Martin Ross has been monitoring and examining rocket exhaust at Aerospace since the early 1990s. His initial research was sparked by the international distress surrounding ozone-depleting chemicals, which eventually resulted in the signing of the Montreal Protocol in 1987. In the wake of that landmark treaty, Ross and his research team concluded that rockets were not significant contributors to overall ozone destruction. More than 20 years later, Ross is still exploring the effects of releasing rocket emissions into the Earth's atmosphere. He currently sees rocket emissions as a small part of the global climate change picture, but believes that climate change can have significant impacts on spacecraft operations as the atmosphere evolves in the coming decades.

"As time goes on, space operations will be increasingly affected by the changing climate — and in ways that may not be obvious," says Ross. "We think there's a whole spectrum of things that climate change will affect when it comes to national security space. For example, when rockets deposit water vapor in the ionosphere it changes the ionosphere. And GPS signals have to go through the ionosphere and they may change a little bit. And maybe it's just a little bit, but when it comes to dropping ordnance, a little bit may determine whether or not you are successful in your mission." This straightforward approach to analyzing the potential hazards of climate change lends a practical appeal to an issue that



A rocket engine in operation during a static-firing experimental data collection. (Aerospace image.)

is often clouded by political banter and posturing.

Overall, the chemical footprint of the rocket industry is much smaller than that of the aviation or auto industries, but seems poised for expansion as it continues to grow and enmesh with the private sector. Space tourism and other concepts that open the skyways to the masses may lead to a large increase in the amount of emissions we see in the upper atmosphere. It's already happening on a small level, but some day soon, ordinary people may be able to travel out of our Earthly atmosphere for entertainment and personal pleasure. If so, the research of Ross and Sheaffer will undoubtedly stand among the pioneering efforts in examining the way these rocket launches will affect our environment.

United in Diversity: AAIANC

Posted May 2, 2013 · Article

May is Aerospace American-Indian and Alaskan-Native Council (AAIANC) month. This ongoing United in Diversity affinity group membership campaign highlights how affinity groups and their members are valued business partners with the corporation.

May Obituaries

Posted May 1, 2013 · In Memoriam

Sincere sympathy is extended to the families of:

- **Robert Dreizler,** manager finance planning, hired Nov. 17, 1974, retired March 1, 1986, died April 6.
- **Marvin Firmin,** project engineer, hired July 12, 1982, retired Nov. 1, 1991, died March 25.
- **Dolores McGee,** senior accounting clerk, hired Jan. 2, 1979, retired Oct. 1, 1989, died March 30.
- **Amelia Perkins,** office clerk, hired May 19, 1980, retired July 1, 1986, died March 9.
- **Barry Radowitch,** facility planner, hired July 10, 2000, retired Oct. 1, 2010, died March 23.
- **Donald Smith,** manager, hired Aug. 29, 1968, retired Aug. 1, 1991, died March 31.

- **Leona Sopko,** senior switchboard operator, hired April 12, 1972, retired Oct. 1, 1993, died April 9.
- **Douglas Staight,** member of the technical staff, hired Jan. 9, 1967, retired Nov. 1, 1993, died April 19.
- **David Thompson,** member of the technical staff, hired Sept. 13, 1965, retired Sept. 1, 1999, died March 10.
- **Robert Weebe,** project engineer, hired July 13, 1981, retired Aug. 1, 2003, died Feb. 24.
- **Richard Wong,** research specialist, hired Sept. 24, 1981, retired July 1, 1991, died March 24.

To notify Aerospace of a death and have it included in the Orbiter, please contact Cynthia Evans in Human Resources at 310-336-5806.

May Notes

Posted May 1, 2013 · In Appreciation

Sincere sympathy is extended to the families of:

- **Cathy and David Allen,** for the recent passing of their mother and mother-in-law, Fern Nelson.
- **Stephen Didziulis,** for the recent passing of his mother, Claudia Didziulis.
- **Mila Parnes,** for the recent passing of her father, Anatolio Ronquillo.
- **Darryl Webb,** for the recent passing of his father-in-law, Stanley Kowalski.

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May Anniversaries

Posted May 1, 2013 · Anniversaries

45 YEARS

Engineering and Technology Group: Ira Gura

35 YEARS

Engineering and Technology Group: Howard Katzman, Michael Rocha, Albert Young

Space Systems Group: Thomas Rehder

30 YEARS

Engineering and Technology Group: Alan Foonberg, Robert Francis, Neil Ives, Larry Jansen, John Martillo

Space Systems Group: Helen Miyake, Charles Priddy, Craig Smith

Systems Planning, Engineering, and Quality: Stephan Mazuk

25 YEARS

Engineering and Technology Group: Marvin Simon

National Systems Group: Donald Yang

Operations and Support Group: Xavier Galindo

Space Systems Group: William Emanuelsen

20 YEARS

Engineering and Technology Group: Mark Looper

Operations and Support Group: Timothy Faulkner

Systems Planning, Engineering, and Quality: Emerson Chivington

15 YEARS

Engineering and Technology Group: Mark Maier

National Systems Group: Andrea Von Kaenel

Operations and Support Group: Marsha Pradia

Systems Planning, Engineering, and Quality: Alan Hamm, Leslie Robinson

10 YEARS

Civil and Commercial Operations: Debra Emmons, Donald Pitman

Engineering and Technology Group: Eric Briggs, Prashant Doshi, Peter Hantos, Lesli Otake, Robert Sugino, Mark Zakrzewski

National Systems Group: Lesley Pearson

Operations and Support Group: Robert Hastings, Leonard Hutton

Space Systems Group: Gary Keludjian

Systems Planning, Engineering, and Quality: Melvin Broder

5 YEARS

Engineering and Technology Group: Bryan Canaan, David Cardoza, Gilda Fathi, Jesse Fowler, Michael Kaiser

National Systems Group: Bonnie Yeich

Operations and Support Group: Lisa Falk, Alan Lucero, Anita Polite-Wilson, Wing Yu

Space Systems Group: Jeffrey Belanger, Udeepta Ganguli, Mustafa Gunay, Wade Sakauye

Systems Planning, Engineering, and Quality: Guy Schaefer

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