



THE FRONT PAGE

KSC's front door to Business Development and Research and Technology

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Center Planning and Development (CPD) is the "front door" for partnerships with NASA's John F. Kennedy Space Center (KSC).

We are developing the world's premier spaceport for government and commercial space industries using comprehensive resource planning and partnerships.

For more information about CPD, visit <http://kscpartnerships.ksc.nasa.gov/>.

Transformation shows a future in focus

Multiple launch pads, one long runway and dozens of facilities tuned to specific needs of aerospace operations give NASA's Kennedy Space Center everything it needs to thrive following years of transformation work, said one of the architects of the ongoing transition.

The center, which at 144,000 acres is NASA's largest facility by far, recently named a contractor to begin the transition from the current, 1960s-vintage headquarters to a new one complete with modern office efficiencies and a footprint much kinder to the utility bills and environment.

The new headquarters will house a staff overseeing a much different space exploration scene than the one the original building was geared toward.

"Generally, big organizations take several years to change a culture and we're halfway through that," said Scott Colloredo, director of Kennedy's Center Planning and Development directorate. "I think we're embracing what we are doing as a center."

The biggest difference is that NASA itself is not the only customer anymore. There also is a renewed awareness that Kennedy is capable of carrying out a greater diversity of tasks than those related to launching and recovering spacecraft.

The center also unveiled its 20-year master plan recently to detail what the center could become. Three years after the retirement of the space shuttle, planners say the demolition of older structures that are surplus to anyone's needs and the reassignment of other facilities

allowed them to look farther down the road at what Kennedy could become.

With its vast amount of land, infrastructure already in place and a workforce geared toward technical, scientific and research duties, Kennedy can be thought of as the world's only super-spaceport.

That's where the multiple launch pads come in.

The vision of the center does not limit itself to Launch Complexes 39A and B, the pads used by Apollo and shuttles. The master plan points out the vast interest from companies wanting to use the Shuttle Landing Facility for space planes that would lift off on suborbital research and passenger-carrying trips. There is already a partnership with Starfighters Inc. to launch research experiment missions from the company's fleet of supersonic F-104s.

"The runway is a pretty good place to start," Colloredo said. "It takes more than that, but not much more than that."

The unique runway, which is not only long but inside a protected enclave of land and air-space, has room to add more hangars or other infrastructure, too.

At Launch Complex 39, pad B is deep into refurbishment so it can host NASA's Space Launch System deep-space rocket and Orion spacecraft beginning in a few years.

Pad A has been leased to SpaceX, the Hawthorne, California-based company behind the Falcon 9 rocket and Dragon spacecraft. SpaceX anticipates launching its Falcon Heavy

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Management Message

Kennedy Space Center's Planning and Development Office was established in 2010 and reported directly to the Center Director. When I look back at where Kennedy was four years ago, I am extremely proud of the changes the center has made. We have evolved to support NASA and other government programs, as well as commercial activity. Many of you have been instrumental in this transformation. You have demonstrated Kennedy's commitment to developing partnerships that will enable commercial space and effectively use our center's assets.

Every partnership development project is supported by Kennedy subject-matter experts who address every detail required for a successful partnership, such as: outreach, facilities, concepts of operations, safety, security, personal property, pricing, billing, legal documents, siting, surveys, appraisals, and provision of services. Every directorate has contributed significantly and substantially.

For a 'big picture' overview check out CPD's Partnership Website (<http://kscpartnerships.ksc.nasa.gov/>). In addition to partnership news, read about what we are offering as a center to our commercial partners. Kennedy has attracted more than 250 inquiries from potential partners over just the past few years. We currently have 46 active partnership agreements, with another 12 agreements in development. Kennedy is pioneering a historic space industry transformation. We are shaping the future of government and commercial cooperation in achieving affordable access to space and the future of the entire space industry. Given where we were just a few years ago, I'd say that's mighty fine work.

— Vicki Johnston
Chief, Partnership Development Office

rocket and human-carrying missions from 39A.

SpaceX also runs Launch Complex 40, where it has launched its Falcon 9 and Dragon cargo-carrying spacecraft to the International Space Station.

United Launch Alliance uses Launch Complex 41 for the Atlas V which has launched NASA interplanetary missions, commercial satellites and defense department assets. The pad is envisioned as the starting point for future human-rated spacecraft, too. Boeing and Sierra Nevada Corporation have signed on with ULA to launch their spacecraft on the Atlas V.

Launch Complex 37, home of ULA's Delta IV and Delta IV-Heavy, also figures into the plans because it can be used to launch science missions or flight tests like the one coming up later this year. A prototype Orion spacecraft will be launched on a Delta IV Heavy for a two-orbit mission to evaluate some of Orion's systems.

Many of these facilities have the potential to be used more by a greater number of programs and companies, Colloredo said.

Combining the capabilities of different Kennedy facilities would allow a company to perform every aspect of development, launch processing, launch and mission operations, recovery and evaluations without leaving the center's boundaries in some cases.

"There's a lot of synergy potential available for small launchers,"



Launch Complex 39B has been refurbished for use as the launch pad for NASA's Space Launch System rocket and Orion spacecraft. Photo credit: NASA/Kim Shiflett

said Tom Engler, deputy director of Center Planning and Development.

The potential of the center is known throughout a variety of industries, but most of the recognition comes from aerospace companies now.

The center has inked partnership deals for several facilities including the high bay of the Operations and Checkout Building where Lockheed Martin manufactures and processes the Orion spacecraft for launch. Hangar N, a NASA structure at Cape Canaveral Air Force Station, also is in use by another company now that its space shuttle-related efforts have ended.

Kennedy also is deep into negotiations for use of some of the iconic structures at Kennedy

including the 3-mile-long Shuttle Landing Facility.

"All of these interested parties that want to come to Kennedy," Colloredo said, "we want to make sure they can come here and grow together without working against each other."

Boeing anticipates using Orbiter Processing Facility-3, one of the space shuttle's former processing hangars, to process a new generation of spacecraft. The partnership for the building includes the company and Kennedy, along with Space Florida, an organization run by the state to advocate for Florida's unique interests in spaceflight.

"Each of these transitions makes the next one easier," Colloredo said. "OPF-3 is really a pathfinder in the whole transition

of Kennedy from a single government program to a multi-user spaceport supporting numerous programs and companies."

Changing Kennedy's facilities is one thing, but the planning office is well aware that the changes embody fundamental culture changes at the center and throughout NASA, too.

"When you're doing this kind of work, transforming not only Kennedy Space Center, but the whole way government works with industry partners, we have to be very careful how we do this so we can do it methodically," Colloredo said. "I'd say the biggest adjustment is to move at the pace commercial industry wants us to move but still be able to transition assets effectively that have been bought and paid for by the taxpayer."



The north end of the 3-mile-long Shuttle Landing Facility makes the area interesting to numerous potential users. Photo credit: NASA/Kim Shiflett



This aerial view shows the Vehicle Assembly Building and surrounding facilities at Kennedy Space Center. Photo credit: NASA/Kim Shiflett

MASTER PLANNING, CULTURAL RESOURCES, REAL PROPERTY FACE2FACE HOSTED AT KSC

Master planners, cultural resource management and real property management members from NASA's 10 field centers and headquarters met at Kennedy Space Center for four days beginning Tuesday, Aug. 19, to discuss best practices for handling the changes taking place throughout the agency.

The sessions came at a critical time for the agency since budget concerns and programmatic decisions are driving fundamental choices that will govern how the centers look and operate for years down the road. Officials stressed the importance of getting decisions correct now on matters ranging from foreseeing what land uses will be required during the next 20 years to facilities retirement to historic preservations.

The goal, said Kim Toufexis, lead master planner for NASA, was to make sure the transitions were done smartly so that each center does not give up the unique abilities needed to carry out the overall NASA goals.

Demanding budget situations have pressured centers to examine the best balance between older facilities that require more maintenance against the costs of building new structures that are much more efficient but come with the price of construction. Adding to the analysis is the fact that some facilities may be so unique or fit such a small technical need that they are basically irreplaceable.



Associate Deputy Director, Kelvin Manning, addresses the annual Agency Master Planning, Cultural Resources, Real Property and Facilities Utilization group hosted at Kennedy Space Center the week of Aug. 18.

Trey Carlson, master planner at Kennedy, detailed the goals for Kennedy in particular and showcased what goes into the unique realm of planning for a space agency during a presentation he called, "Blueprint for a Spaceport." In it, Carlson outlined the questions the planners had to consider as they laid out what commercial and government needs Kennedy would be asked to support during the next 20 years.

Additionally, David Cassedy of URS demonstrated some upgraded tools and

methods that centers throughout the agency can use to determine whether they have archaeological sites, historic areas or districts so they can be preserved or accounted for during transitions.

Real property officials are expected to continue their vital roles, presenters said, as field centers lease some of their lands or facilities for alternate uses. Everything from pricing to conditions for use to responsibility transfers is expected to be crucial to successfully expand NASA centers utility to their missions, the communities they are in and to the national interest.

Other attendees/presenters of note included Calvin Williams, HQ Assistant Administrator for Strategic Infrastructure; Cynthia Lodge, NASA Director Strategic Investments; Scott Robinson, Manager NASA Facilities Program; and Jennifer Groman, HQS Federal Preservation Officer. Presentations, during the four days, conveyed strategic infrastructure and integrated asset management issues; the process of transforming to a spaceport; NASA facilities concerns; as well as historical preservation items and leasing authorities. Overall, there were approximately one hundred people in attendance for this Kennedy hosted event.

By Steven Siceloff

KSC HOSTS 2ND PARTNERSHIP LANDSCAPE FORUM



Kennedy's Center Planning and Development Directorate hosted a Partnership Landscape Forum (PLF) on Sept. 11. This PLF was the second networking session between NASA Senior managers, Kennedy prime contractors and current KSC Partners, designed to assemble Kennedy leaders involved with the development and implementation of KSC Agreements. As Kennedy continues to evolve, it has made notable gains in transitioning from a historically government-only launch facility. The theme for this PLF was space-related capabilities of our partners, Kennedy, and our prime contractors; followed by an overview of the KSC Partnership website, (<http://kscpartnerships.ksc.nasa.gov/>) with emphasis on "Partnering Opportunities." Kennedy's environment has changed tremendously during the past few years and has made significant efforts to successfully collaborate with commercial entities.



Researchers from NASA at the Kennedy Space Center and the University of Central Florida jointly developed a tape that can detect hydrogen leaks. They were recently congratulated following announcement that the innovation has been selected for a prestigious R&D 100 Award. Photo credit: University of Central Florida FSEC/Nick Waters

Innovative hydrogen leak detection tape earns 2014 R&D 100 Award

A safety innovation developed jointly by the University of Central Florida (UCF) and NASA has been selected for a 2014 R&D 100 Award. The invention is a chemochromic sensor in a tape that can detect hydrogen leaks by changing color, a critical safety technology for the Space Shuttle Program. Its primary application is for use in industries such as oil and gas production.

Jim Nichols, licensing manager of the NASA Research and Technology Management Office in Center Planning and Development, endorsed the nomination for the R&D 100 Awards and noted that safety was the impetus for the innovation.

"NASA was looking for a safe, easy to use, effective and non-powered way of identifying hydrogen leaks," he said. "Working together, researchers from Kennedy and the University of Central Florida developed the tape matrix and hydrogen-sensing pigment that formed the basis of the hydrogen tape technology."

The international R&D 100 competition recognizes the 100 most technologically significant products introduced into the marketplace over the past year. The 52nd annual presentation is scheduled for Nov. 7 in Las Vegas, Nevada.

Known as the "Oscars of Invention," the recognition has been presented by R&D Magazine since 1963. The publication features news about advancements in research and development. Past technologies honored have included the automated teller machine in 1973, the halogen lamp in 1974, the fax machine in 1975, the liquid crystal display in 1980, the Kodak Photo CD in 1991 and high-definition television in 1998.

The NASA project that resulted in the invention of the tape that detects leaks by changing color was led by principal investigator Luke Roberson, Ph. D., a NASA research scientist, along with other inventor team members Drs. Janine Captain, Martha Williams,

Trent Smith and LaNetra Tate. Other team members included Drs. Robert Youngquist, Mary Whitten, Barbara Petterson, David Smith and, from QinetiQ North America at Kennedy, Robert DeVor. The University of Central Florida inventors were led by Ali Raissi, Ph. D., director of the Advanced Energy Research at UCF's Florida Solar Energy Center. Other UCF team members included Drs. Nazim Muradov, Nahid Mohajeri, Gary Bokerman and R. Paul Booker.

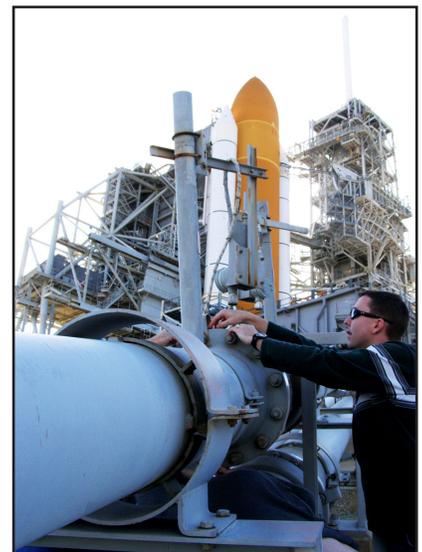
Roberson explained that, from time to time during the Space Shuttle Program tracking down the precise location of a hydrogen leak was a difficult challenge.

Liquid hydrogen is a lightweight and extremely powerful rocket propellant used extensively by NASA. Its characteristics also make it highly flammable and explosive, requiring close attention to avoid leaks.

NASA enlisted the assistance of University of Central Florida in developing a pigment that would change color when exposed to hydrogen. Chemochromic materials respond to the exposure to different chemicals with a change in color due to a chemical reaction within the substance.

The tape is easily applied to joints, flanges and other leak-susceptible areas of vessels transporting, storing or transferring hydrogen gas. Additionally, as the fuel cell market emerges, "Intelligment" can provide a simple and reliable safety check for applications such as vehicles, where owners or technicians easily can identify a leak.

By Bob Granath



As the space shuttle Endeavour stands on Launch Pad 39A on Feb. 3, 2010, Dr. Luke Roberson applies hydrogen detection tape on a connector joint on a cross-country feed line. The piping connects the liquid hydrogen storage tank with the lines to fill the shuttle's external fuel tank on launch day. Photo credit: NASA



A sensor just above this liquid hydrogen feed line at Launch Pad 39A can detect a leak, but the hydrogen detection tape on the connector on the right can, if needed, help pinpoint its exact location. Photo credit: NASA

AS 'SCENE' ON CENTER



SpaceX continues to make progress on modifications to Launch Pad A in support of its Falcon Heavy launch next year. Pictured are demo to the south portion of the main flame deflector in the flame trench (left) as well as Pad Terminal Connection Room (PTCR) asbestos abatement that is underway. Asbestos has already been removed from the flame trench walls. Numerous other areas are in the process of construction/modification such as the RP-1 fuel farm and LOX farm. Personnel requiring access to Pad A are reminded of the access process.



Partner Spotlight

Three hundred twenty-two members of the Kennedy Space Center government and contractor team supporting the Morpheus/Autonomous Landing and Hazard Technology (ALHAT) Project were recognized on Sept. 19 for their contributions to the overall success of the project. Morpheus is one of 20 small projects in the NASA Human Exploration and Operations Mission Directorate's Advanced Exploration Systems program.

Morpheus, a Johnson Space Center project, is a vertical test bed system that is designed to advance integrated capabilities needed for human exploration missions. The two primary technologies demonstrated in fiscal year 2014 free flight testing were:

1. A liquid oxygen or LOX/liquid methane propulsion system (using liquid natural gas or LNG).
2. The ALHAT Project's sensors and software which were added to the Morpheus vehicle as a tightly integrated payload.

The Morpheus project supports the NASA mission by conducting technology development activities for future exploration missions. The project promotes lean development, fosters innovative partnerships, and enables education and outreach activities. In addition, Kennedy gains experience in methane and LNG fueling operations in support of future multi-user launch complex LOX-methane systems, as well as other areas such as systems engineering and precision landing and hazard avoidance systems. JSC also gains opportunities to learn about Kennedy's ground operations.

Since a major goal of Morpheus is to fully simulate the final

Morpheus

approach and landing phases of a planetary surface entry, the Morpheus test team began putting the lander through its paces at the specially created hazard field located at the north end of the Shuttle Landing Facility. The hazard field, designed to mimic the surface of the moon, contains boulders, rocks, slopes and craters.

Greg Gaddis, NASA Test Director and KSC Morpheus/ALHAT Site Manager said it was difficult to turn the relatively flat, grassy area north of the landing facility into a crater-filled planetary scape for Morpheus to negotiate and land.

"But that's the kind of challenge that the Kennedy team thrives on," said Gaddis.

The team started with a tethered test near the north end of the runway to verify there were no issues with transport from Houston to Kennedy.

Morpheus was suspended by a crane 15 feet in the air and flew tethered for about 60 seconds. Morpheus' first free-flight test was Dec. 10, following a successful tethered test, data review, and vehicle inspection.

Since then, Morpheus has gone through a hugely successful series of tests; completing two tethered tests and 12 free flights, one of which was a nighttime flight.

The Morpheus and ALHAT project leadership is assessing the possibility of additional Kennedy testing in the next fiscal year.

These projects pioneer new approaches for rapidly developing prototype systems, demonstrating key capabilities and validating operational concepts for future human missions beyond Earth orbit.



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