NASAfacts

Space Shuttle Transition and Retirement

Three NASA space shuttles are undergoing an extensive transition and retirement (T&R) phase at the agency's Kennedy Space Center in Florida.

Technicians are removing some hardware for possible future use and technical and engineering studies. But the T&R work primarily is focused on making the shuttles safe and ready for public display.

Courtesy of Kennedy Space Center Visitor Complex

An artist's conception shows space shuttle Atlantis as the centerpiece of a new exhibit for NASA's Space Shuttle Program at the Kennedy Space Center Visitor Complex.

Public Display Sites

Atlantis

Shuttle Atlantis, which flew its final mission, STS-135, in July 2011, is the only shuttle NASA will keep and it will remain on Florida's Space Coast.

Atlantis will join NASA's rockets, capsules and artifacts from the Mercury, Gemini and Apollo eras at the Kennedy Space Center Visitor Complex in early 2013.

Plans call for the 87-ton spacecraft is expected to look like it's soaring through space when it is placed inside a new 65,000-square-foot facility that's being designed in the heart of the complex's Space Shuttle Plaza.

Anchored at an angle, guests will get an up-close view of Atlantis' belly and the thousands of black heat shield tiles that allowed the shuttle to safely re-enter Earth's atmosphere.

The display also is set to reveal the way shuttle crews performed science and research experiments in the weightlessness of space and how the shuttle was the go-to vehicle for transporting International Space Station laboratories, modules and solar panels to low Earth orbit.

For more on the complex's display plans, go to **www.kennedyspacecenter.com**.

Discovery

Shuttle Discovery, which flew its final mission, STS-133, in February/March 2011, will go to the Smithsonian's National Air and Space Museum Steven F. Udvar-Hazy Center in Chantilly, Va., for exhibition. Plans call for Discovery to be displayed as if sitting on the runway just after landing allowing visitors to walk around the perimeter of the spacecraft.

Discovery is targeted to be flown to Virginia in April 2012.

For more on the center's display plans, go to **www.nasm.si.edu/udvarhazy**.

Endeavour

Shuttle Endeavour, which flew its final flight, STS-134, in May/June 2011, will go to the California Science Center in Los Angeles. Plans call for Endeavour to be displayed in the vertical configuration similar to how it looked on launch day. Endeavour is targeted to be flown to California in the second half of 2012.

For more on the center's display plans, go to **www.californiasciencecenter.org.**

Enterprise

Shuttle Enterprise, which was the prototype vehicle and used in NASA's approach and landing tests in 1977, will move from the Smithsonian's Udvar-Hazy Center to the Intrepid Sea, Air and Space Museum in New York. At the Intrepid museum, plans call for visitors to be able to see Enterprise as if it were about to touch down on the runway during the landing tests that paved the way for future space shuttle flights. It also is expected to have a tailcone installed over the aft part of the shuttle, which was used to protect the space shuttle main engines and provide an aerodynamic shape when the shuttle was being flown on the back of a modified 747 jet called the Shuttle Carrier Aircraft (SCA).

Enterprise is targeted to be flown to New York shortly after Discovery is delivered to the Smithsonian.

For more on the museum's display plans, go to **http://www.intrepidmuseum.org/.**

Artifacts

Various shuttle simulators will go to the Adler Planetarium in Chicago, the Evergreen Aviation and Space Museum of McMinnville, Ore., and Texas A&M's Aerospace Engineering Department.

A full fuselage trainer will go to the Museum of Flight in Seattle. A nose cap assembly and crew compartment trainer will go to the National Museum of the U.S. Air Force at Wright-Patterson Air Force Base in Dayton, Ohio.

Orbital maneuvering system engines will go to the U.S. Space and Rocket Center of Huntsville, Ala., National Air and Space Museum in Washington, and Evergreen Aviation and Space Museum.

Artifacts available

NASA is offering space shuttle-related hardware and equipment artifacts for eligible education institutions, museums and other organizations. For more information, visit: **http://artifacts.nasa.gov/**. For more information about how to request other NASA space artifacts, visit: **https://gsaxcess.gov/NASAWel.htm**.

Space Shuttle Components

Space Shuttle Main Engines (SSMEs)

Although the three space-flown shuttles will go to museums, they will not take their space shuttle main engines (SSMEs) with them. Instead, the shuttles will have mock-up engine nozzles that will look like the real thing. NASA is going to keep the real engines for use with the new Space Launch System heavy-lift rocket.

Orbital Maneuvering System (OMS) Pods and Forward Reaction Control System (FRCS)

The Orbital Maneuvering System (OMS) pods and forward reaction control system (FRCS) will be removed from the shuttles at Kennedy and shipped to White Sands Test Facility in Las Cruces, N.M., for cleaning and deservicing.

The OMS pod and FRCS used hypergolic propellants, so any part or seal that could release harmful chemicals in the future will be cleaned or removed.

The 6,000-pound thrust engines in the OMS pods will be removed and replaced with replica nozzles after the shuttles arrive at their display sites

The FRCSs will spend about four months at

White Sands Test Facility before being returned to Kennedy and being reinstalled into the shuttles.

Space Shuttle Transportation

Each space shuttle will weigh about 175,000 pounds -- more than 87 tons -- when they are ready for public viewing.

When the shuttles are ready to leave Kennedy, they'll be placed onto the Shuttle Carrier Aircraft (SCA) using the mate-demate device at the Shuttle Landing Facility. The mate-demate device provides the lifting cabability via a sling that connects to the shuttle, as well as the stabilization required to ensure proper alignment with the SCA attach points.

To perform the complex maneuver of safely lifting Discovery, Endeavour and Enterprise off of the SCA at each display site, the function of the mate-demate device is accomplished using mobile dual heavy-lift cranes, a sling, and a specially designed wind restraint system. It will take about 45 workers to perform this delicate task.

The sling is almost identical to the one used as part of the mate-demate device and connects to the wind restraint system, which includes four masts and taglines to stabilize the orbiter during lifting operations. Workers will have to drill about 200 holes in the off-load ramp to anchor the wind restraint system elements firmly. With everything in place, they can perform the work in winds up to about 20 mph.

Since Atlantis is staying at Kennedy, it will be transported to the center's visitor complex via the Orbiter Transport System, which is a type of flat-bed truck. It was used to move the shuttles from their hangars, the Orbiter Processing Facility, to the Vehicle Assembly Building prior to being attached to the external fuel tank during launch preparations.

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NASA Facts

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