



**GSDO**  
GROUND SYSTEMS  
DEVELOPMENT & OPERATIONS

EXPLORATION BEGINS HERE



PROGRAM HIGHLIGHTS • DECEMBER 2014

At NASA's Kennedy Space Center in Florida, the Ground Systems Development and Operations (GSDO) Program Office is leading the center's transformation from a historically government-only launch complex to a spaceport bustling with activity involving government and commercial vehicles alike. GSDO is tasked with developing and using the complex equipment required to safely handle a variety of rockets and spacecraft during assembly, transport and launch. For more information about GSDO accomplishments happening around the center, visit <http://go.nasa.gov/groundsystems>.

## Orion Completes Flight Test to Earth Orbit and Return

A spacecraft built for humans left the domain of low-Earth orbit Dec. 5 for the first time in 42 years when NASA's first Orion soared 3,604 miles above Earth and returned safely hours later, having accomplished a flawless flight test as part of NASA's journey to Mars.

"We as a species are meant to press humanity further into the solar system and this is a first step," said Bill Gerstenmaier, NASA's associate administrator for the Human Exploration and Operations Directorate. "What a tremendous team effort."

It was just the kind of mission NASA hoped for, all the while knowing that the first mission by any spacecraft often turns up significant glitches. That was not the case this time though. The cone-shaped Orion held up to all the pressures of launch and ascent into orbit, then made two passes through the high radiation of the Van Allen belts before facing the searing plunge into Earth's atmosphere and splashing down under three billowing parachutes.

Watching the spacecraft descend through the sky over the Pacific Ocean in real time via an unmanned aircraft system dispatched from NASA's Armstrong Flight Research Center in California, Orion managers and NASA's senior leadership seemed to hold their breath until the first drogue parachutes deployed from the nose of Orion. Gasps turned quickly to applause and hugs moments later when the huge main parachutes opened to slow the capsule to a gentle 20 mph splashdown 270 miles west of Baja California.

Orion touched down about a mile away from the land-



A Delta IV Heavy rocket lifted off from Space Launch Complex 37 at Cape Canaveral Air Force Station on Dec. 5 carrying NASA's Orion spacecraft on an uncrewed flight test to Earth orbit. Liftoff was at 7:05 EST. Photo credit: NASA/George Roberts

ing spot controllers predicted before launch, achieving a statistical bulls-eye splashdown for something returning to Earth from 3,600 miles away.

Engineers will evaluate all the data recorded on the ground and on the spacecraft's onboard systems including readings from 1,200 sensors placed throughout the crew module to find out more details about all the elements of the spacecraft and the details of their performance.

To read the complete story, visit <http://go.nasa.gov/1BDD4Lj>.

# NASA, U.S. Navy Recover Orion after Splashdown in Pacific Ocean

Ships were deployed, helicopters circled above, weather balloons were launched, and U.S. Navy divers embarked in several small boats, about 600 miles southwest off the coast of San Diego, all to aid in recovery of NASA's Orion spacecraft Dec. 5. The planning, rehearsals and hard work paid off for the Orion Recovery Team, led by the Ground Systems Development and Operations Program at NASA's Kennedy Space Center in Florida.

"The recovery of Orion was flawless," said Jeremy Graeber, NASA recovery director. "We wanted to be patient, take our time. We didn't rush."

Earlier in the week, NASA, the U.S. Navy and Lockheed Martin personnel left Naval Base San Diego aboard the USS Anchorage, an amphibious ship, and the USNS Salvor, a safeguard class salvage ship, to make preparations and rehearse the

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The Orion crew module was recovered Dec. 5 after splashdown in the Pacific Ocean about 600 miles off the coast of San Diego, California. NASA, the U.S. Navy and Lockheed Martin coordinated efforts to recover Orion and secure the spacecraft inside the well deck of the USS Anchorage. Photo credit: Courtesy of U.S. Navy



U.S. Navy divers in Zodiac boats prepare to recover the Orion spacecraft and tow it in to the well deck of the USS Anchorage on Dec. 5. Photo credit: Courtesy of U.S. Navy

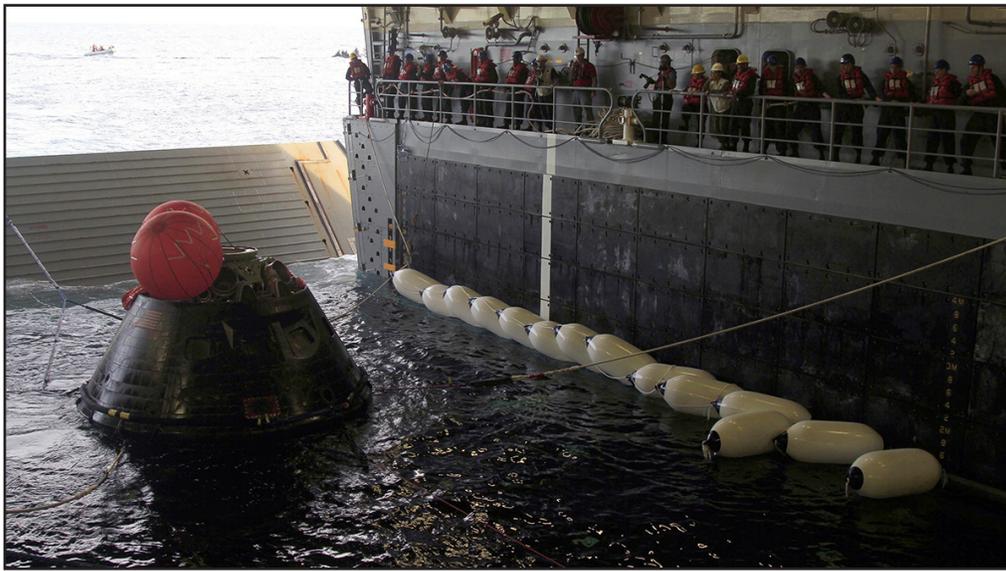


NASA's Orion spacecraft floats in the Pacific Ocean after splashdown Dec. 5 from its first flight test in Earth orbit. An H60-S Seahawk helicopter hovers above to communicate the spacecraft's location back to the USS Anchorage. Photo credit: Courtesy of U.S. Navy

## A Note from the Director

December 5, 2014 was a great day for NASA! The launch was beautiful. The Orion spacecraft performed superbly, and the GSDO team completed a successful recovery of the crew module into the well-deck of the USS Anchorage. It takes a cross-center, cross-program team to make it all happen, and I couldn't be prouder of our team and our role in the accomplishment. This is our program and this is a huge step forward on our mission to send human beings to Mars.





NASA's Orion spacecraft is secured with tether lines inside the flooded well deck of the USS Anchorage on Dec. 5 in the Pacific Ocean. Photo credit: NASA/Cory Huston



The USNS Salvor is nearby as the Orion spacecraft is being towed by a winch line into the well deck of the USS Anchorage on Dec. 5. Photo credit: NASA/Cory Huston



The Orion spacecraft is viewed by members of the media Dec. 19 at the Launch Abort System Facility at Kennedy Space Center. Orion made the 2,700 mile road trip from Naval Base San Diego in California back to Kennedy. Photo credit: NASA/Dimitri Gerondidakis



capture and recovery of the Orion crew module and main parachutes.

One hour after splashdown, the flight control team that saw Orion through its flight handed control of the vehicle off to the recovery team. Orion was powered down, put in a safe mode, and the recovery process began. U.S. Navy divers in several rigid hull and Zodiac boats proceeded to Orion.

Divers took underwater photos of Orion's heat shield. Then, they attached a collar and winch line to the spacecraft. A series of tending lines also were attached to help safely tow Orion into the flooded well deck of the USS Anchorage and position it over rubber "speed bumps."

Two of the three main parachutes were recovered and lifted onto the USS Anchorage.

As the ships headed back to land, the USS Anchorage's well deck was flooded again so Orion could be secured on its crew module recovery cradle, built by Orion prime contractor Lockheed Martin.

The ships returned to Naval Base San Diego on Monday, Dec. 8, and Orion and the ground support equipment were offloaded. The recovery team prepared Orion for transportation over land by truck back to Kennedy Space Center in Florida.

To read the complete story, visit <http://go.nasa.gov/13rVMXn>.



NASA's Orion spacecraft is offloaded from the well deck of the USS Anchorage at Naval Base San Diego in California on Dec. 8. Orion has been secured in its crew module recovery cradle and will be prepared for return to Kennedy Space Center in Florida. Photo credit: NASA/Amber Philman