NASA tests Orion's parachute performance over Arizona

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A test version of Orion descends under its three massive main parachutes, which together would cover almost all of a football field. Credit: NASA

(Phys.org) —The team designing the parachute system for NASA's Orion spacecraft has demonstrated almost every parachute failure they could imagine. But on April 23, they tested how the system would perform if the failure wasn't in the parachutes.

Orion is the safest spacecraft ever built to carry humans, and its Launch Abort System can take a good deal of the credit for that distinction. In an emergency on the launch pad or during the early stages of ascent, it can activate in milliseconds to pull the crew to safety. Once it has pulled the crew away from the emergency, it's up to the parachutes to bring them down for a safe landing.

"We hope we never have to use the parachutes this way," said Chris Johnson, project manager for the parachutes. "We want to see them deploy after a successful mission every time. But we need to know they can perform in an emergency, too."

In a pad abort or a low altitude launch abort, Orion's three main parachutes would be called on to lower the crew module to the ground without the help of the two drogues that normally precede them. The parachute system won't have as long to do the job since the spacecraft will be at much lower altitude than for a nominal reentry mission, and with the vehicle going slower, they won't deploy as quickly. And on top of all of these factors, the crew module will be flying sideways when the parachutes deploy, instead of falling straight down as it does during reentry.

To simulate those conditions, a test version of Orion was dropped from a C-17 at 13,000 feet above the U.S. Army's Yuma Proving Ground, with the main parachutes deploying soon after leaving the plane, before the capsule had a chance to straighten out. All the elements worked together and the parachutes reached a fully open state setting up a soft landing as expected. But the real value of the test will come with the data the engineers were able to gather from it.

"We wanted to record how long it took to inflate the parachutes in a launch pad abort scenario and collect data on how the different conditions affected the quality of the parachute deployment," Johnson

said. "With this test successfully completed, our next step is to dig into that information and use it to fine tune the launch abort trajectories for flight."

In addition to the new test conditions, this was also the first time that the steel risers connecting the parachute lines to Orion were replaced with the textile risers that will be incorporated into future Orion spacecraft after Orion's first flight this year. The new risers are lighter and more flexible – two qualities that will come in particularly handy when Orion is ready to carry humans into space.

Orion's parachutes deflate after a successful touchdown following a test at the U.S. Army's Yuma Proving Ground on April 23. Credit: NASA

While engineers continue to test Orion's parachutes for future missions, engineers at NASA's Kennedy Space Center in Florida continue to make

progress on the Orion spacecraft being prepared for its December trip to space. Inside the Operations and Checkout Building high bay, the crew module is positioned on a special portable test chamber for multi-point random vibration testing. Accelerometers and strain gauges have been attached to Orion in various locations. During a series of tests, each lasting only 30 seconds, Orion is being subjected to gradually increasing levels of vibrations that simulate levels the vehicle will experience during launch, orbit and descent. The data will be reviewed to assess the health of the crew module.

Orion's first flight will launch an uncrewed capsule 3,600 miles into space for a four-hour mission to test several of its most critical systems, including its parachutes. After making two orbits, Orion will return to Earth at almost 20,000 miles per hour and endure temperatures near 4,000 degrees Fahrenheit, before its parachutes slow it down for a landing in the Pacific Ocean.

Provided by NASA