NASA completes successful battery of tests on composite cryotank

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One of the largest composite cryotanks ever built recently completed a battery of tests at NASA's Marshall Space Flight Center in Huntsville, Alabama. The tank was lowered into a structural test stand where it was tested with cryogenic hydrogen and structural loads were applied to simulate stresses the tank would experience during launch. Credit: NASA/David Olive

NASA has completed a complex series of tests on one of the largest composite cryogenic fuel tanks ever manufactured, bringing the aerospace industry much closer to designing, building, and flying lightweight, composite tanks on rockets.

"This is one of NASA's major technology accomplishments for 2014," said Michael Gazarik, NASA's associate administrator for Space Technology. "This is the type of technology that can improve competitiveness for the entire U.S. launch industry, not to mention other industries that want to replace heavy metal components with lightweight composites. These tests, and others we have conducted this year on landing technologies for Mars vehicles, show how technology development is the key to driving exploration."

The demanding series of tests on the 18-foot (5.5-meter) diameter tank were conducted inside a test stand at NASA's Marshall Space Flight Center in Huntsville, Alabama. Engineers added structural loads to the tank to replicate the physical stresses launch vehicles experience during flight.

In other tests, the tank successfully maintained fuels at extremely low temperatures and operated at various pressures. Engineers filled the tank with almost 30,000 gallons of liquid hydrogen chilled to -423 degrees Fahrenheit, and repeatedly cycled the pressure between 20 to 53 pounds per square inch—the pressure limit set for the tests.

"This is the culmination of a three-year effort to design and build a large high-performance tank with new materials and new processes and to test it under extreme conditions," said John Vickers, the project manager for the Composite Cryogenic Technology Demonstration Project, which is one of the key technologies funded by NASA's Game Changing Development Program. "We are a step closer to demonstrating in flight a technology that could reduce the weight of rocket tanks by 30 percent

and cut costs by at least 25 percent."

The composite rocket fuel tank, which arrived at Marshall on March 26 aboard NASA's Super Guppy airplane, was built by the Boeing Company near Seattle.

"Never before has a tank of this size been proven to sustain the thermal environment of liquid hydrogen at these pressures," said Dan Rivera, Boeing program manager for the cryotank project. "Our design is also more structurally efficient then predecessors. This is a significant technology achievement for NASA, Boeing and industry. "We are looking at composite fuel tanks for many aerospace applications."

The project is part of NASA's Space Technology Mission Directorate, which is innovating, developing, testing and flying hardware for use in NASA's future missions. Over the next year, the directorate will make significant new investments to address several high-priority challenges in achieving safe and affordable deep space exploration. Next-generation technologies including composite systems have the potential to make rockets, including NASA's Space Launch System—a deep space rocket being developed at Marshall—more capable and affordable.

Provided by NASA