Nasa concludes wind tunnel testing to aid in SpaceX reusable launch system design

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(Phys.org) -- NASA's Marshall Space Flight Center in Huntsville, Ala., completed wind tunnel testing for Space Exploration Technologies (SpaceX) of Hawthorn, Calif., to provide Falcon 9 first stage re-entry data for the company's advanced reusable launch vehicle system.

Under a Reimbursable Space Act Agreement, Marshall conducted 176 runs in the wind tunnel test facility on the Falcon 9 first stage to provide SpaceX with test data that will be used to develop a re-entry database for the recovery of the Falcon 9 first stage. Tests were conducted at several orientations and speeds ranging from Mach numbers 0.3, or 228 miles per hour at sea level, to Mach 5, or 3,811 miles per hour at sea level, to gage how the first stage reacts during the descent phase of flight.

"Marshall's aerodynamics team has vast experience in launch vehicle design and development and our wind tunnel offers an affordable, quick-turn solution to companies who are looking to generate aerodynamic test data on early launch vehicle design configurations," said Teresa Vanhooser, manager of the Flight Programs and Partnerships Office at Marshall. "We believe that providing technical expertise enables development of new and innovative technologies that aid the industry as a whole and helps NASA to continue with our deep space exploration mission."

Marshall's Aerodynamic Research Facility's 14-square-inch trisonic wind tunnel is an intermittent, blow-down tunnel that operates from high-pressure storage to either vacuum or atmospheric exhaust. The facility is

capable of conducting tests in the subsonic, transonic, and supersonic mach ranges using its two interchangeable test sections. Subsonic Mach numbers are below Mach 1, the speed of sound, or 760 miles per hour at sea level, while transonic speeds approach and are slightly above Mach 1. The facility can achieve a maximum supersonic Mach number of 5, or five times the speed of sound.

In addition to wind tunnel testing, Marshall is providing propulsion engineering support to SpaceX in the development of the SuperDraco Launch Abort System (LAS) and on-orbit propulsion systems. Marshall is supplying SpaceX with Reaction Control Systems lessons learned that will be incorporated into the Dragon spacecraft's design for steering and attitude control. Marshall engineers also are providing technical insight in the development of materials and processes to support future improvements of the Falcon 9 and Dragon to be used in the SpaceX Commercial Crew Development Program.

"Since 2007, Marshall has supported the Commercial Orbital Transportation Services (COTS) Program by providing engineering expertise and technical insight to aid our commercial partners in developing their transportation capabilities," stated Vanhooser. "The Marshall Center has over 50 years of spaceflight experience and propulsion expertise to draw upon to help our commercial partners solve the complex challenges of space travel."

Marshall has been engaged throughout the development in evaluating the Falcon 9 launch vehicle and Dragon spacecraft systems' design under the Commercial Orbital Transportation Services Program led by the Johnson Space Center in Houston for the Human Exploration and Operations Mission Directorate (HEOMD) in Washington. The Marshall team supported various design reviews, flight readiness reviews, post-flight reviews and special studies.

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