NASAfacts

Propulsion Testing

At John C. Stennis Space Center

Under NASA Stennis Space Center's Engineering and Science Directorate, rocket engine propulsion test activities are conducted on one-of-a-kind national test facilities collectively valued at more than $2 billion. SSC is America's largest rocket engine test complex and is surrounded by a 125,000-acre acoustical buffer zone, which is considered a national asset. State-of-the-art facilities at SSC include the A, B and E test complexes, designed for rocket propulsion testing that ranges from component to engine to stage level.

SSC was established as a national testing center for flight-certifying all first and second stages of the Saturn V "Moon Rocket" for the Apollo manned lunar landing program.

The Moon Rockets and the Space Shuttle

The center conducted the first static test firing of the Apollo Saturn V second-stage prototype engine April 23, 1966, and less than a year later, began testing the first and second stages of the rocket. This testing led to one of humankind's most phenomenal achievements when, on July 20, 1969, Americans landed on the moon.

When the Apollo Program ended in December 1972, the test stands were converted from the Apollo/Saturn V configuration to accommodate space shuttle main engines, and on May 19, 1975, the first test of an SSME took place. On April 12, 1981, the first space shuttle, Columbia, lifted off from the launch pad at Kennedy Space Center in Florida, powered by engines tested at SSC.

Every SSME undergoes acceptance testing at SSC. The engine is installed vertically in SSC's A-2 Test Stand, where an acceptance test firing is performed. Once proven flight-worthy, the engine is transported to KSC for installation on an orbiter. SSC also conducts "green run" testing for major SSME components, ensuring all engine parts have been exposed to flight-like environments prior to use on a shuttle flight.

SSC also tests and certifies Pratt & Whitney Rocketdyne's RS-68 engines, and serves as a developmental rocket engine component and subscale test facility for future-generation rocket engines.

SSC is the home of NASA's Rocket Propulsion Test Management Board, which has total responsibility to manage all NASA rocket engine testing, including facilities at the Marshall Space Flight Center in Alabama, the White Sands Test Facility in New Mexico and the Glenn Research Center's Plum Brook Station in Ohio. SSC works directly with the

SSC's rocket engine test stands provide test operations for the development and certification of propulsion systems, engines, subsystems and components.

Rocket Propulsion Test Management Board and the National Rocket Propulsion Test Alliance to provide test services to a variety of customers, including NASA, the Department of Defense and commercial entities for the development of propulsion systems, engines, subsystems and components.

The Test Stands

Three stands, A-1, A-2 and the dual B-1/B-2, were built in the early 1960s to test the first and second stages of the Apollo Saturn V rocket that safely transported Americans to the moon.

The A Test Complex consists of two single-position, vertical-firing test stands designated A-1 and A-2. Configurations for the A Test Complex test stands have consisted of full flight-stage and main propulsion systems, and single-engine testing at sea level and altitude simulation.

The B Test Complex consists of a dual-position, vertical, static-firing test stand designated the B-1/B-2 Test Stand. First stages of the Apollo Saturn V rocket were static fired in the B-2 test position for acceptance testing from 1967 to 1970. SSC presently leases the B-1 test position to Pratt & Whitney Rocketdyne for testing of the RS-68 engine. As currently configured, B-1 has two engine test positions.

The E Test Complex was constructed as a result of several national propulsion development programs in the late 1980s and early 1990s. The versatile, three-stand complex includes seven separate test cells capable of testing that involves ultra high-pressure gases and cryogenic fluids.

A test of the Integrated Powerhead Demonstration liquid hydrogen turbopump is conducted on the E-1 Test Stand at SSC's E Complex.

SSC's A-1 Test Stand, site of the first space shuttle main engine test in 1975, conducted its final space shuttle main engine test in 2006. A-1 then began a new chapter in its legacy: conversion to testing J-2X engines, which will power the upper stage of NASA's new crew launch vehicle, the Ares I.

The test stands are linked by a 7½-mile canal system used primarily for transporting liquid propellants. Additional features of the test complex include test control centers, data acquisition facilities, a large high-pressure gas facility, a high-pressure industrial water facility served by a 66-million gallon reservoir and an electrical generation plant.

The Next Generation

In September 2006, the A-1 Test Stand conducted its final SSME test. The following November, the stand was officially turned over to NASA's Constellation Program to be converted from space shuttle main engine testing to test the J-2X engine. The J-2X will power the upper stage of NASA's next-generation crew launch vehicle, Ares I, and the Earth departure stage of the new cargo launch vehicle, Ares V. Those launch vehicles will help America fulfill its Vision for Space Exploration: to return to the moon by 2020, then travel to Mars and beyond.

As part of the Vision for Space Exploration, NASA plans to use the space shuttle, until its retirement in 2010, to help finish assembly of the International Space Station. To meet that goal, SSC is committed to rigorous testing, important to any flight program, to make sure today's SSMEs are safer, stronger and more reliable than ever.

The main stage of the Ares V will be powered by five RS-68 engines. Plans are under way for testing the Ares V main stage at SSC.

National Aeronautics and Space Administration

John C. Stennis Space Center
Stennis Space Center, MS 39529-6000
(228) 688-3333

www.nasa.gov