

Thirty Years And Counting

August 23 2005

The first was in 1975. Since then more than 2,200 tests on Space Shuttle Main Engines (SSME) have been completed at NASA's Stennis Space Center in south Mississippi.

Among the engines tested were the three that help push Discovery into orbit on its STS-114 Return to Flight mission. That flight was a new beginning for a process that could take humans back to the Moon, to Mars and beyond.

A reusable spacecraft and its reusable main engines were both firsts as the Shuttle moved from the drawing board toward its first orbital flight, launched April 12, 1981.

After that first main engine test more than 30 years ago, on May 19, 1975, nine more were conducted in the following two months. Their focus was fuel preburner, oxygen preburner and main combustion chamber ignition.

By 1978 test teams at Stennis were firing the Main Propulsion Test Article, the three-engine cluster that helps propel the Space Shuttle into orbit.

The 114 missions that began with Columbia's STS-1 flight used a total of 342 main engines. All were tested at Stennis.

The engines are fired on the A-1 and A-2 Test Stands, built in the 1960s to test the first and second stages of the Apollo Saturn V rocket that

safely transported Americans to the Moon. The stands were converted from the Apollo/Saturn V configuration to accommodate SSMEs.

During testing the engines are mounted vertically on the 185-foot-tall stands. Test firings usually last about 520 seconds (about 8-1/2 minutes), the amount of time it takes to lift the Space Shuttle into space.

Each SSME is 14 feet long and weighs about 7,000 pounds. Its nozzle is 7-1/2 feet in diameter. The engine operates at greater temperature extremes than any other mechanical system in use today. It is fueled by liquid hydrogen – at -423 degrees Fahrenheit, the second-coldest liquid on Earth.

The temperature in the Main Combustion Chamber is 6,000 degrees Fahrenheit, hotter than the boiling point of iron. The three SSMEs on a Space Shuttle produce the equivalent of more than 37 million horsepower.

Pratt & Whitney Rocketdyne, in Canoga Park, Calif., manufactures the SSME and its high-pressure turbo pumps. Marshall Space Flight Center in Huntsville, Ala., manages the Space Shuttle Main Engine Project for the Space Shuttle Program.

The engines are assembled at Kennedy Space Center in Florida and shipped to Stennis for testing. After passing flight acceptance tests, they are weighed and subjected to a formal acceptance review, then shipped back to KSC for installation.

After a Shuttle mission, the engines get post-flight inspections and maintenance at KSC. Then they may be shipped back to Stennis for a pre-flight acceptance test before another mission.

On Jan. 21, 2004, Stennis celebrated 1 million seconds of successful

Space Shuttle main engine firings, both in testing and flight operations. This milestone is a testament to the employees and to the engine itself, which has never experienced a major failure.

"The unmatched reliability and durability of the SSME serves as an enormous credit to the NASA/contractor teams that have manufactured and tested the engine for three decades," said Ronnie Rigney, SSME project manager at Stennis. "They've done an extraordinary job."

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