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Space Shuttle Main Engine Processing Facility

Space Shuttle Atlantis launches Sept. 8, 2000.

When a NASA Space Shuttle (above) lifts off the launch pad, it does so with the help of three reusable, high-performance rocket engines (center). The Space Shuttle Main Engine, developed in the 1970s by NASA's Marshall Space Flight Center, in Huntsville, Ala., is the world's most sophisticated reusable rocket engine.

Each of these powerful main engines is 14 feet (4.2 meters) long and 7.5 feet (2.25 meters) in diameter at the end of its nozzle, and weighs approximately 7,000 pounds (3,150 kilograms).

Preparing the engines for safe and reliable launches is the responsibility of the Space Shuttle Main Engine Processing Facility (SSMEPF). It is state-of-the-art, designed specifically for processing the Space Shuttle Main Engines in support of United Space Alliance (USA) and NASA flight operations.

Completed in June 1998, the SSMEPF is structurally attached to the east end of Operations Processing Facility bay 3 (OPF 3) and is a significant upgrade over the previous facility located in the Vehicle Assembly Building (VAB).

The 34,600 sq. ft. facility was designed and built to specifications provided to USA by Boeing-Rocketdyne's SSME team.

Incorporated in the design are many features that not only enhance the efficiency of engine processing, but also offer increased levels of safety to personnel and the reduction of opportunities for damage to flight hardware. Among the improvements are:

1. Increased floor space providing additional clearance for both personnel and hardware when repositioning engines.

2. Built-in plumbing and wire runs for pneumatic, hydraulic and electrical services.

3. Built-in sound-proofing to isolate hydraulic pumps, fan rooms and the shop floor, reducing noise levels for shop personnel.

4. Co-location of control panels and test stands facilitating communication between test directors and technicians during test operations.

5. Relocation of the SSMEPF outside of the VAB, thus removing the engine processing from the vicinity of handling and processing of solid fuel rocket motors.

This Space Shuttle Main Engine contains 50,000 parts, of which 7,000 are tracked periodically for replacement.

The facility provides the capability for post-flight inspections and maintenance as well as functional checkout of all engine systems prior to installation in the orbiter.

Each of the three main engines used for a Shuttle launch is composed of 50,000 parts. About 7,000 of those parts are tracked for periodic replacement. Other parts are replaced as needed. Currently the Shuttle Program works with a stable of 12 engines.

The design of the SSMEPF incorporated:

- special areas to accommodate engine drying to remove residual moisture (the by-product of the liquid hydrogen and liquid oxygen propellants),
- overhead cranes for lifting, rotating, loading and unloading of engines,
- workstands to facilitate access to the engines during processing, and
- specified clean areas for the inspection of critical turbo machinery.

Using a crane, technicians in the SSMEPF install a new turbocharged engine in the orbiter Atlantis.

It includes a low bay with six vertical engine stands and a 10-ton crane, and a high bay with a 15-ton crane, drying cells, pump room, ground support equipment storage and a workshop.

Each of the six vertical engine workstands is provided with pneumatic, hydraulic and electrical power to support engine system verification and functional checkouts that are directed from the avionics control room (adjacent to the workstands).

Each main engine's vital signs are measured 50 times per second during ascent. The avionics control room is connected by ground link to the USA Launch Processing System data recording center to provide both backup documentation and verification of engine checkouts.

Designed specifically for the SSME, but with the capability to accommodate future engines, the SSMEPF serves as the center for the coordination and integration of all main engine processing activities regardless of engine location.

Shuttle Main Engine Test Firing, Stennis Space Center

Efficiencies achieved through the activation of the SSMEPF provide not only an improved means of processing the Shuttle's main engines, but also a better and safer work environment for the engineers and technicians.

An additional, but equally important, result has been an increased level of confidence on the part of the NASA astronauts in KSC's ability to provide a safe and reliable set of SSMEs to support the most critical phase of their mission.

Related Information:

- FS-2001-10-171-MSFC Space Shuttle Main Engine (SSME) Enhancements
http://www1.msfc.nasa.gov/NEWSROOM/background/facts/ssme.pdf