NASAfacts

Launch Equipment Test Facility (LETF)

The Launch Equipment Test Facility, or LETF, provides NASA with a proving ground to safely assess machinery and designs intended to support the launches of the biggest rockets ever built.

A rocket leaving the launch pad subjects the launch structures to intense vibrations, staggering forces and prolonged blasts and flames from the exhaust. Even a small failure on the pad can cause the rocket to fail.

To reduce the chances of a failure, engineers build prototypes of their designs and try them out at the LETF on machinery that duplicates sections of a launch pad and simulates the pressures that will come during a launch. The connecting arms used for launches also are tested at the LETF before they are connected to the mobile launcher for use on a rocket.

Located at NASA's Kennedy Space Center in Florida, the LETF is a unique set of structures, equipment and tools built during the 1970s to test full-scale umbilical's and release mechanisms for the space shuttle. The facility includes workshops for rapid prototyping and precise manufacturing, along with huge launch support structures located outdoors.

The LETF is operated by Kennedy's Engineering and Technology Directorate in support of NASA's Ground Systems Development and Operations Program, or GSDO. GSDO engineers are expected to analyze numerous launch pad and processing structures and devices at the facility as new spacecraft and rockets are prepared for launch.Along with the extensive system testing required for shuttle ground support, the LETF also tested launch equipment for Delta IV and Atlas V rockets, along with payload fairings. Servicing systems and equipment for the International Space Station were also evaluated at the LETF.

The LETF continues to play a large role in designing and evaluating ground support systems and structures for the Orion multi-purpose crew vehicle and the Space Launch System, a heavy-lift rocket the size of a Saturn V and intended to carry astronauts on missions into deep space including asteroids and Mars.

Accurately simulating such large and exotic machinery requires a number of unique structures at the LETF, including:

Vehicle Motion Simulator

The Vehicle Motion Simulator, or VMS, emulates all the movements a rocket makes as it is rolled to the launch pad, and more importantly through the first 30 milliseconds of flight.

This allows exact simulations of the force and conditions umbilicals and other launch equipment must work in to become qualified for use. Procedures and clearances can also be evaluated using the VMS.

The vehicle motion simulator, or VMS, which simulates all of the movements a space vehicle could experience from rollout to launch at NASA's Kennedy Space Center in Florida. The VMS is part of the Launch Equipment Test Facility's (LETF) $35 million comprehensive upgrade that lasted four years. The LETF was established in the 1970s to support the qualification of the Space Shuttle Program's umbilical and T-0 mechanisms.

Workers receive training atop a mast climber that is attached to launch simulation towers outside the Launch Equipment Test Facility in February 2011. The training includes attaching carrier plates, water and air systems, and electricity to the climber to simulate working in Kennedy's Vehicle Assembly Building.

Launch Simulation Towers

There are two towers at the LETF built to mirror the launch towers used for rockets. The North tower is a 60-foot-tall structure and the East Tower stands 40-feet-tall. Umbilical and access arms can be attached to the towers and used with the Vehicle Motion Simulator to perform qualification testing. The simulation towers, while shorter than the structures seen at launch pads, are outfitted with the same features so engineers can evaluate launch pad designs before rolling out a rocket.

600-ton Test Fixture

The 600-ton Test Fixture is used to proofload and conduct experiments on massive hardware and ground support components to make sure they can meet their stringent demands.

Water Flow Test Loop

Fluid lines and components such as valves, pumps and meters are verified in the Water Flow Test Loop. The test apparatus can run parts and lines through high-flow tests to confirm them for operation and other uses.

Cryogenic System

The LETF is equipped with a cryogenic system for safely handling and using super-cold chemicals and propellants commonly used in rocketry. Liquid Nitrogen and Liquid hydrogen can be pumped to areas of the LETF to accurately simulate launch operations with the Vehicle Motion Simulator, simulator towers and other areas of the facility.

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Control and Data systems

The LETF is equipped with a full control room and the infrastructure to provide video and high-speed data information to controllers, along with feeds for detecting hazardous gas leaks and other systems necessary to safely operate launch support equipment.

Workshops

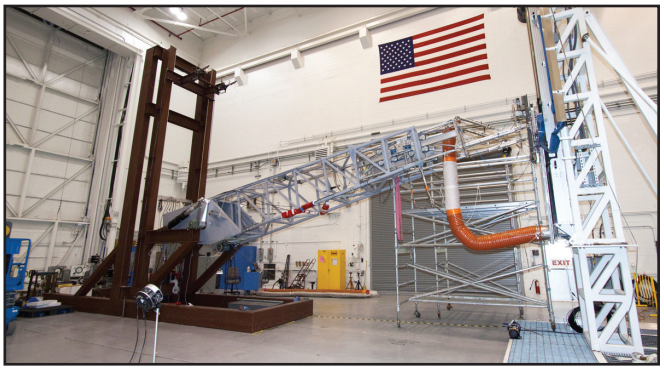
The LETF includes shops and technicians to make and assemble cables, pneumatic, hydraulic and gas pressure systems for use throughout Kennedy facilities. There are also machine and welding shops and an electrical shop.

High Bay

The LETF High Bay is an indoor structure large enough to host the assembly of the large ground support structures. It is equipped with environmental control systems and an overhead crane.

Many of the facilities and structures that make up the LETF were refurbished extensively following the retirement of NASA's space shuttle fleet.

As Kennedy Space Center transitions to new launch vehicles, the LETF is expected to remain central to the task of making sure launch pads and other facilities are able to safely launch them on future exploration missions.



Testing of the Tilt-Up Umbilical Arm (TUUA) prototype's Environmental Control System Quick Disconnect takes place in October 2012 in the Launch Equipment Test Facility's 6,000-square-foot high bay at NASA's Kennedy Space Center in Florida.

More information online

For more information on the Ground Systems Development and Operations Program, go to **http://go.nasa.gov/groundsystems**