National Space Week 2000, Oct. 4-7

Escape Velocity

On March 27, 1957, escape velocity–more than 25,000 miles an hour–was exceeded for the first time in tunnel Hotshot 2 above.

Titan

The Titan IIIC liquid-core rocket engine below was fired for 92 seconds at an altitude of 98,000 feet in the J-4 test cell to confirm altitude ignition reliability just prior to a spacecraft launch at Cape Kennedy in 1964.

The 470,000-pound-thrust engine above is the most powerful ever tested at AEDC. A little more than 30 years later, another liquid-propellant rocket engine supporting the Titan program was tested in J-4. The firing is shown below.

Above, this 100,000-pound LR91 thrust engine being test fired in J-4 is the second propulsion stage for Titan II engine. It is a 50-percent uprated version of the second stage engine on the Titan I.

Mercury/Apollo/Saturn

In 1959, the Mercury escape tower test in the 16-foot transonic wind tunnel improved stability to prevent tumbling in the event of an emergency abort during launch.

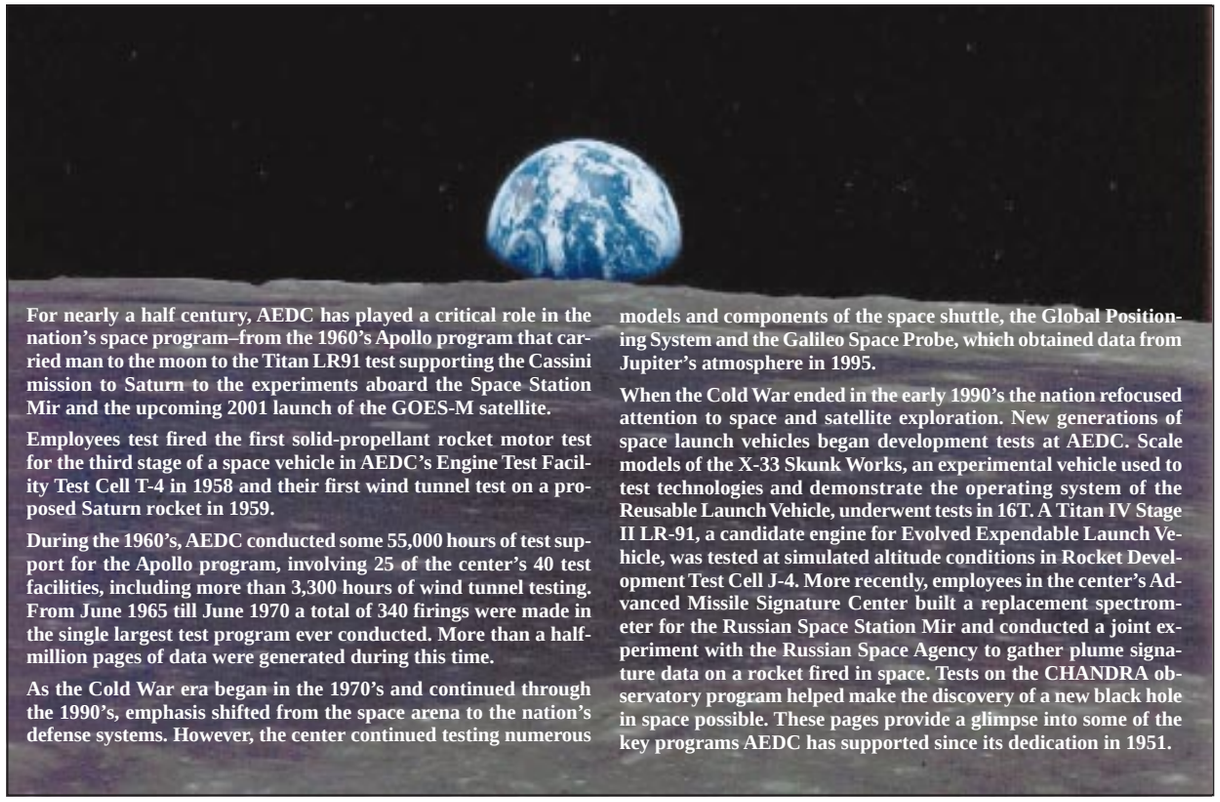
Initial AEDC testing in support of the NASA manned Apollo spacecraft began in the von Karman Gas Dynamics Facility in 1962. Below, craftsman E. N. Shelton adjusts the scale model of the Apollo's three-man capsule with jettison rocket and escape tower attached. The model was tested in VKF's 40-inch supersonic tunnel.

Saturn multi-stage rocket vehicle model tests at transonic speeds determined static stability. First stage of the Saturn V, which produced 100,000 pounds of thrust, must be slowed down after its propellants are consumed to permit the next stage to coast away prior to ignition.

Eight S1-C retro motors like the one shown above in J-5 were used for that task.

Apollo Lunar Excursion Module ascent engine designed to launch the LEM from the surface of the moon was tested in J-2A at near-space conditions.

Delta



For nearly a half century, AEDC has played a critical role in the nation's space program–from the 1960's Apollo program that carried man to the moon to the Titan LR91 test supporting the Cassini mission to Saturn to the experiments aboard the Space Station Mir and the upcoming 2001 launch of the GOES-M satellite.

Employees test fired the first solid-propellant rocket motor test for the third stage of a space vehicle in AEDC's Engine Test Facility Test Cell T-4 in 1958 and their first wind tunnel test on a proposed Saturn rocket in 1959.

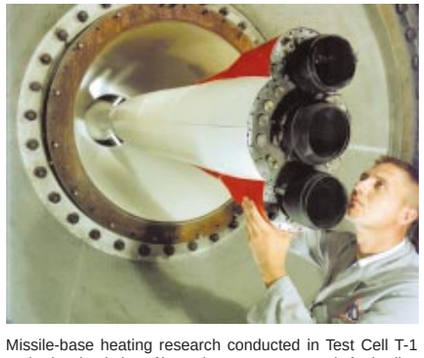
During the 1960's, AEDC conducted some 55,000 hours of test support for the Apollo program, involving 25 of the center's 40 test facilities, including more than 3,300 hours of wind tunnel testing. From June 1965 till June 1970 a total of 340 firings were made in the single largest test program ever conducted. More than a half-million pages of data were generated during this time.

As the Cold War era began in the 1970's and continued through the 1990's, emphasis shifted from the space arena to the nation's defense systems. However, the center continued testing numerous models and components of the space shuttle, the Global Positioning System and the Galileo Space Probe, which obtained data from Jupiter's atmosphere in 1995.

When the Cold War ended in the early 1990's the nation refocused attention to space and satellite exploration. New generations of space launch vehicles began development tests at AEDC. Scale models of the X-33 Skunk Works, an experimental vehicle used to test technologies and demonstrate the operating system of the Reusable Launch Vehicle, underwent tests in 16T. A Titan IV Stage II LR-91, a candidate engine for Evolved Expendable Launch Vehicle, was tested at simulated altitude conditions in Rocket Development Test Cell J-4. More recently, employees in the center's Advanced Missile Signature Center built a replacement spectrometer for the Russian Space Station Mir and conducted a joint experiment with the Russian Space Agency to gather plume signature data on a rocket fired in space. Tests on the CHANDRA observatory program helped make the discovery of a new black hole in space possible. These pages provide a glimpse into some of the key programs AEDC has supported since its dedication in 1951.

Half-Century of Support

In 1997, the J-4 test team fired this Pratt & Whitney RL-10B2 liquid rocket engine at a simulated altitude of 100,000 feet to obtain data to validate the engine's performance. The RL-10B2 is the upper stage of the McDonnel Douglas Delta III launch system.



Missile-base heating research conducted in Test Cell T-1 probed recirculation of hot exhaust gases around afterbodies of the Atlas, Titan and Polaris missiles and the Apollo Saturn Launch vehicle.

Ricky Bush watches the removal of the NASA/Goddard Space Flight Center's Microwave Anisotropy Probe from Mark I after a solar panel deployment test. The probe will be used to gather information on background radiation in space.

At left, this 35-foot-high Delta III payload fairing underwent testing in AEDC's Mark I Space Environmental Chamber. The fairing's two bisector segments separated at a simulated altitude of 225,000 feet at speeds reaching 18 feet per second.

Information and layout by Tina Barton; Photos by AEDC Photo Lab

Satellite Systems

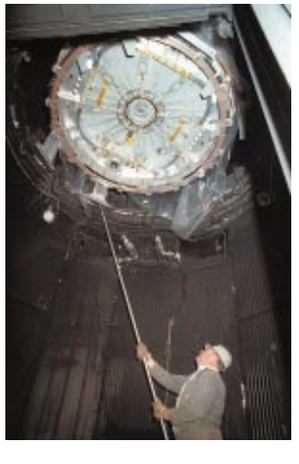
The Intel SAT II began testing in Propulsion Test Cell T-3 before the satellite was successfully placed into orbit in January 1967. Below, A. M. McCaskill, COMSAT Corp. and A. A. Cimino, T-3 project engineer look over the pre-fire COMSAT spacecraft assembly.

The full-scale prototype of a NAVSTAR Global Positioning Satellite below was tested in Mark I in early 1978. It was one of the most extensive and complex test series ever tested in the chamber.

Below, Mark I team members move the Loral Space System Geostationary Operational Environmental Satellite-M onto the handling cart for installation.

The GOES-M satellite is the first to be tested as part of a 10-year, $30-million contract between AEDC and Loral Space and Communications signed in 1999. Testing began earlier this month.

Space Station



At right, an AEDC rigger helped lower a space station component, called a common berthing mechanism, into AEDC's 12V Aerospace Thermal Vacuum chamber for simulated space environment testing in 1994. The mechanism was recently installed in the International Space Station.

Space Conditions

Above, simulated meteroid strike tests were conducted on samples of the wall of the Saturn IB second stage to determine how the empty propellant tankage can be used safely as a manned orbiting workshop.

Below, simulation of zero-gravity on a Minuteman penetration aid test was provided by dropping the test article 70 feet in the Mark I Space Environmental Chamber.

Space Exploration

Below, a scale model of NASA's Viking unmanned spacecraft designed to land on Mars was adjusted prior to testing in VKF's 40-inch supersonic wind tunnel.

One of the early tests in 4-T was on a model of a ship which was later to become the Space Shuttle. The 1971 test obtained interference-free data on blockage effects of the model at various angles of attack.

Data from a 1989 wind tunnel test on the space shuttle external tank was used by NASA to predict the altitude that the shuttle's external tank would break up following the separation from the orbiter.