



# *A-1 TEST STAND*

- The A-1 Test Stand is a **SINGLE-POSITION, VERTICAL-FIRING** facility, which means that it can accommodate one rocket engine at a time and that engines are fired in an upright position with thrust directed downward.
- Construction of the A-1 stand spanned a time from **DECEMBER 1964 TO FEBRUARY 1967**.
- Various articles have been tested on the A-1 stand – Saturn S- II rocket stage, J-2 engine, space shuttle main engine, aerospike engine, J-2X engine and RS-25 engine.
- Seven tests on five **SATURN S-II STAGES** (each with five J-2 engines) were conducted on the A-1 stand from Sept. 19, 1967 to Nov. 14, 1969.
- A total of 1,007 **SPACE SHUTTLE MAIN ENGINES** tests were conducted on the A-1 stand, including the first-ever test of a shuttle main engine on May 19, 1975. The final space shuttle main engine test on the stand was conducted Sept. 29, 2006.
- Thirty-five tests of the **XRS-2200 LINEAR AEROSPIKE ENGINE** was conducted on the A-1 stand, including the first powerpack test on Oct. 2, 1998, the first full-engine test on Oct. 7, 1999 and the final hot fire on Aug. 6, 2001.
- Nine tests of the **J-2X POWERPACK** were conducted on the A-1 stand from Dec. 18, 2007 to May 7, 2008. A second round of 13 powerpack test firings were conducted Feb. 15, 2012 to Dec. 13, 2012. Five gimbal tests of the J-2X engine were conducted on the stand from June 14, 2013 to Sept. 5, 2013. (**GIMBAL TESTING** involves rotating engines a few degrees in any direction, as they must move during flight to ensure proper trajectory.)
- The first test of an **RS-25 ROCKET ENGINE** was conducted on the A-1 stand on Jan. 9, 2015. On April 4, 2019, Stennis completed testing of all 16 RS-25 main engines that will help launch the first four Space Launch System missions, including flights to the Moon as part of NASA's **Artemis Program**.
- The A-1 Test Stand extends 58 feet below ground and 158 feet above ground. It can withstand rocket engine thrust up to about **1.1 MILLION POUNDS OF FORCE**; the thrust limit is known as the maximum dynamic load.
- The Stennis High-Pressure Industrial Water Plant delivers as much as **170,000 GALLONS OF WATER PER MINUTE** at 225 pounds per square inch to the A-1 Test Stand during a test. The water is primarily used to cool the flame deflector and keep it undamaged as it redirects thrust exhaust, which exceeds 6,000 degrees Fahrenheit, out of the stand.
- The flame deflector is made up of 21 stacked angular segments – or water boxes – each drilled with a pattern of holes to direct water as needed to cool the stand's flame deflector.
- Cooling the flame deflector with water creates steam that forms a billowing cloud often mistaken for smoke. Depending on conditions, the steam may condense after exiting the stand and create light raindrops.
- Propellants for engine tests are supplied by a **40,000-GALLON** liquid oxygen run tank and a **110,000-GALLON** liquid hydrogen run tank on the A-1 stand. Fully loaded, the tanks can supply enough propellant for a 350-second test.
- RS-25 engines are tested at full-duration, which means they are fired for the same amount of time they must fire during an actual flight to lift a vehicle into space. A **FULL-DURATION TEST** of more than eight minutes requires more propellant than the stand's run tanks can supply. Thus, the run tanks are resupplied during an engine test by a nearby propellant barge connected to the stand.
- Propellants needed for rocket engine tests are stored on site, then delivered at super cold temperatures – as low as minus 280 degrees Fahrenheit for liquid oxygen and minus 420 degrees Fahrenheit for liquid hydrogen. Test stand piping must be designed and structured to withstand such **EXTREME TEMPERATURES** without leaking or rupturing.