FRED HAISE TEST STAND

- The historic A-1 Test Stand at NASA's Stennis Space Center was designated the **Fred Haise Test Stand** in March 2020, in honor of the Apollo 13 astronaut and Biloxi, Mississippi, native.

- The stand is a **SINGLE-POSITION, VERTICAL-FIRING** facility, which means it can accommodate one rocket engine at a time and engines are fired in an upright position with thrust directed downward.

- Construction of the stand spanned a time from **DECEMBER 1964 TO FEBRUARY 1967**.

- The 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.

- Various articles have been tested on the 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 stand Sept. 19, 1967 to Nov. 14, 1969.

- A total of 1,007 **SPACE SHUTTLE MAIN ENGINE** tests were conducted on the 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** were conducted on the 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 **J-2X POWERPACK** tests were conducted on the stand Dec. 18, 2007 to May 7, 2008. A second round of 13 powerpack tests were conducted Feb. 15, 2012 to Dec. 13, 2012. Five gimbal tests of the J-2X engine were conducted on the stand June 14, 2013 to Sept. 5, 2013. (**GIMBAL TESTING** involves rotating engines a few degrees in any direction, just as they must move in flight to ensure proper trajectory.)

- The first **RS-25 ENGINE TEST** was conducted on the Fred Haise Test Stand on Jan. 9, 2015. On April 4, 2019, NASA Stennis completed testing of RS-25 engines for initial SLS (Space Launch System) launches. This included four engines that helped power the successful Artemis I mission in 2022.

- The NASA Stennis High-Pressure Industrial Water Plant delivers as much as **170,000 GALLONS OF WATER PER MINUTE** at pressures of 225 pounds per square inch to the 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 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. The run tanks are resupplied as needed during an engine test by nearby propellant barges 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.