SPACE

Test Labs Hold Space Secrets

By Jonathan Eberhart

➤ NO OTHER MAJOR scientific program in the United States is as exposed to the public eye as the race to the moon. But even that has its secrets.

But the few that remain are kept in 1,700 acres of steep, craggy hills, insulated from the rest of the world by miles of undrivable, winding roads, interrupted by several security check points.

In 18 huge test stands, literally carved out of the rocky hillside in Santa Susana, Calif., many of the engines that will carry the first Americans to the moon are developed and tested.

The three-stage Saturn V booster that will power the lunar flight will contain 92 rocket engines of various shapes and sizes. These will range from the tiny attitude control motors built into the Apollo spacecraft itself and capable of being turned on or off in one-sixtieth of a second, to the huge, first-stage main engines, three times as high as a man, which produce 1.5 million pounds of thrust.

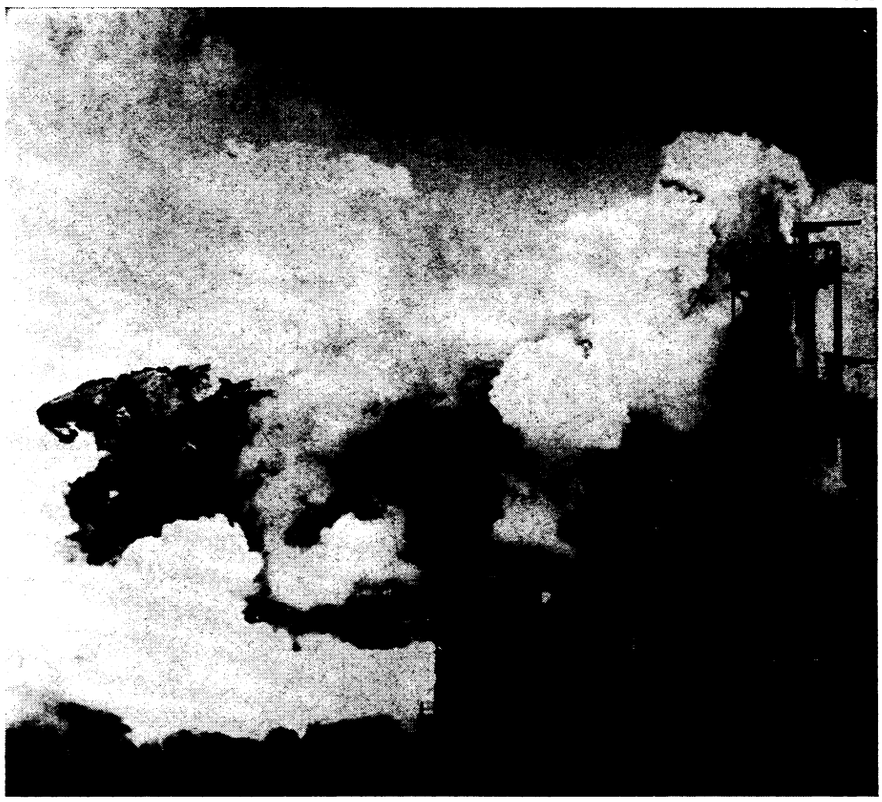
Scene of all this testing is the Santa Susana Field Laboratory of North American Aviation, Inc.'s Rocketdyne division. Since 1950 there have been some 270,000 test firings of engines and components.

The rocky crags are quite photogenic. In fact, the laboratory used to be a favorite setting for Hollywood movie crews, who regularly made the 30-mile trek from Los Angeles to film Westerns.

A test firing is quite a spectacle. Often the first sign visible to observers in blockhouses hundreds or even thousands of feet away is a huge cloud of steam. This does not come from the rocket at all, but from water used for cooling.

The first sound, the initial shock wave, is as abrupt as a slap in the face, followed by a continuous roar that never lasts more than a few hundred seconds.

The first large contract ever issued by the National Aeronautics and Space Administration was for the F-1 engine, five of which will power the first stage of the Saturn V moon rocket. Developed by Rocketdyne, the F-1 now produces roughly 10 times as much thrust as was indicated by its original design.



Rocketdyne

ROCKY CRAG—Moon rocket engines are tested in stands carved out of the hills in Santa Susana, Calif., by scientists at Rocketdyne, a division of North American Aviation, Inc. Here, a hydrogen-fueled J-2 engine is fired under simulated space conditions. J-2 will supply power in the upper stage of the Saturn 1-B vehicle to launch the first orbital flight of three astronauts.

SPACE

46 Stations May Orbit

See Front Cover

➤ AS MANY AS 46 potential orbiting space stations may be launched by the United States within the next decade.

A pair of do-it-yourself astronauts using hand tools could adapt the stations from the huge fuel tanks of spent rocket stages left in orbit from various orbital, moon-bound and interplanetary missions.

Finding a use for the 10,000-cubic-foot tanks would clearly be worthwhile, since the tanks alone represent an investment of a million dollars each.

The rocket stages, Douglas Aircraft Company S-IVB's, are likely to be among the most common boosters of the Space Age, since they will top both the Saturn V rocket carrying the Apollo moonship and the Saturn 1-B "practice birds" already being used for preliminary flights.

Presently, there are to be 15 Saturn 1-B's and 10 Saturn V's. However, five more Saturn V's are likely, and Dr. George Mueller, director of National Aeronautics and Space Administration's Marshall Space Flight Center, Huntsville, Ala., recently announced NASA's consideration of 16 additional Saturn 1-B's to be used in "follow-on" flights that would get some more use out of existing Apollo designs.

A fuel tank would not provide all the facilities of a complete space station, such as the U.S. Air Force's Manned Orbiting Laboratory (MOL), but it could offer an "enclosed space" for studies in weightlessness.

To make the conversion, two astronauts would be launched into orbit together with a collapsible airlock and a grid-like mounting structure that would fasten to the S-IVB's outer shell. Using tools especially developed for zero gravity, they would open the hydrogen fuel tank at its exposed end, then bolt the airlock in place.

The airlock, measuring 65 inches in diameter and 85 inches in length, could be produced for less than $200,000 if made in quantity.

Many of these fuel tanks topping the Saturn V superboosters can be mated with their lower stages and checked out in only one building in the world: the huge, 52-story Vertical Assembly Building at Merritt Island, Fla., shown on this week's front cover. (Cover photograph by NASA).