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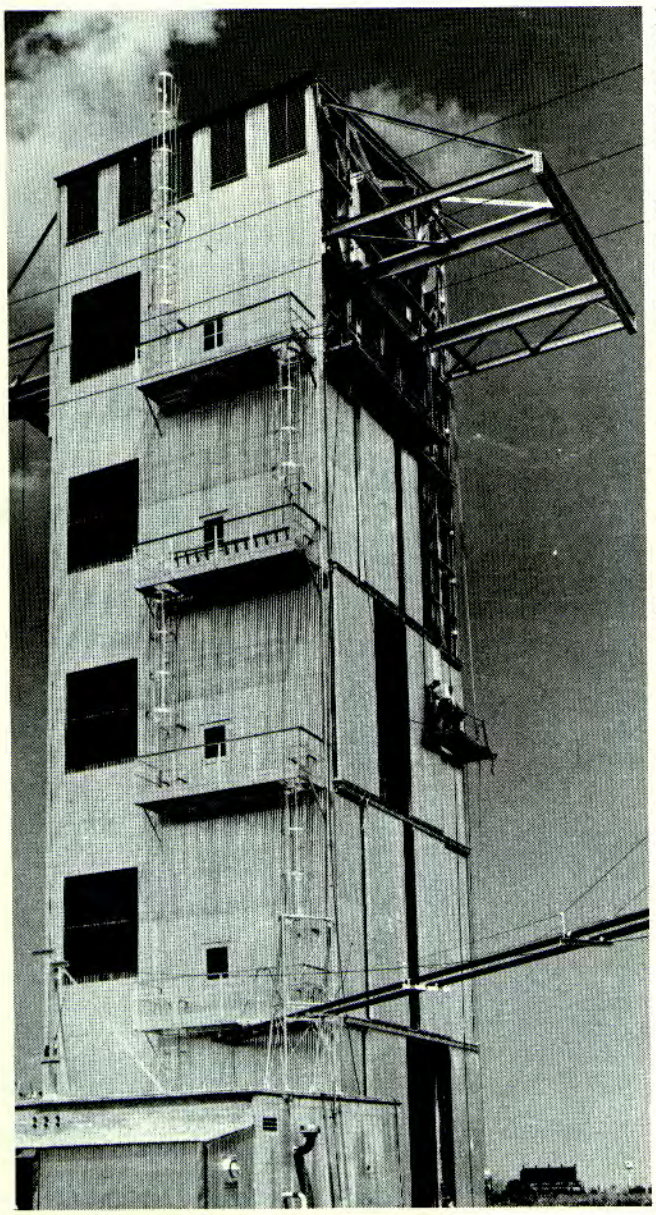
THE PLUM BROOK STORY - A PROGRESS REPORT

(This week ORBIT visited Plum Brook to report on the construction progress of the rocket test facility and the research reactor facility. The first installment is devoted to the rocket project; the second, to appear next month, will cover the reactor. Subsequent stories will be devoted to a number of significant Plum Brook subjects.)



Among the new facilities under construction at Plum Brook is the 117 foot high Dynamics Facility, or "Shake Tower." This silo-like, 30 foot square tower will be used for two types of missile research: structural dynamic testing, and fluid flow investigations.

One of the reasons for failure in missile launchings has been failure of structural components due to compressional and bending vibrations of the missile structure which are excited by the rocket motor. For example, steering control gyros, which measure the vehicle attitude can be misled by bending vibrations of the structure. If these bending vibrations are not properly recognized in the design of the steering control the gimbaling motor will re-enforce the bending motion and result in the destruction of the missile.

These vibrations will be simulated in the Shake Tower (left) for study of the problem. The tower is constructed to hold a missile the size of an Atlas, or scale models of larger missiles. Built of structural steel, the tower doors slide open, the beams are dropped out, and the large crane at the top of the tower lifts the missile into place.

Simulating free flight as nearly as possible, the missile will be supported by cables inside the tower and placed on a "soft spring" - one which provides a big deflection with a small weight. The missile will be connected to a large vibration exciter, producing 15,000 pounds force which will excite, or "shake" the suspended missile in a vertical plane. A smaller, 200-pound force exciter will be used for lateral shaking. A power amplifier housed in a concrete block house next to the tower will accuate the exciters.

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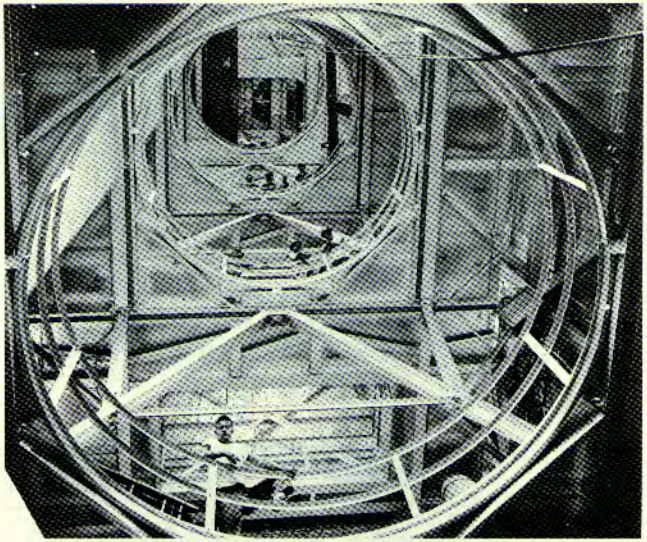
The central control building, which will control all operations, will be located 1000 feet away.

The Dynamics Facility will also be used to study complete rocket systems. The tankage and related pressurization and flow systems, including the turbo pumps, will be investigated. The propellant will not be burned. Combustion chamber pressure will be simulated by a controls device. This will permit studies of the effect of changes of combustion pressures on the flow dynamics. Designed for cryogenic fuels liquid Hydrogen and liquid Oxygen, complete safety features have been incorporated in the design.



Inside the Shake Tower - looking up.