

When it is completed next year, this vertical test stand will permit the testing of high energy nuclear rockets under near-space conditions.

PLUM BROOK AND APOLLO—

Rockets Scrutinized by Remote Control

By **KARL ABRAHAM**

Plain Dealer Science Writer

SANDUSKY, O.—In Plum Brook's new \$10-million Rocket Systems Research Facility, space investigators watch the vital organs of rocket engines in action.

This complex of test cells, each with a highly specialized purpose, is arranged so that by electronic eyes, ears, smell and touch, rocket parts can be put through their paces—at a safe distance.

Operation of test laboratories completed early in the four-year construction program has shown that the quarter-mile

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separation of test cells from the central control building did not have to be that great.

As highly explosive fuels are frequently used, however, special precautions have been taken. Within the cells "sniffers" check the air for possible fuel leaks during operation.

In some instances electronic equipment is in a room that is pressurized with air to prevent fumes from seeping in.

During a test run, with operating personnel in the central control building, the area around the test building is

evacuated and warning lights flash at the approach roads.

Television cameras are set up to peer directly into the heart of the experimentation machinery. Electronic sensors pick up pressures, temperatures, rates of fuel flow, etc., and pour them into computers at the control site at a rate of 4,000 bits of information a second.

Some tests are made under extremely delicate conditions.

For example, experiments with fluorine involve a very cold and highly reactive fluid. It will react more quickly with more different materials than any other element known to man. It can rapidly corrode the pumps that must move it.

If the fluorine can be moved slowly enough, however, it will form a thin coating on metal parts and this coating will protect them from further

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Experts Work at Safe Distances

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damage, according to Melvin J. Hartmann, head of Lewis' pump section.

If the speed of flow is increased slightly, the fluorine will tear the coating away, he said.

Fluorine will ignite hydrogen on contact, without requiring a spark ignition system, and this characteristic—a "hypergolic" reaction—makes it attractive for space use.

Although the rocket area at Plum Brook examines such specialized problems, it is not designed to come up with a specific rocket model for a particular space mission, according to James F. Connors, assistant to the director of Lewis.

Assist to Industry

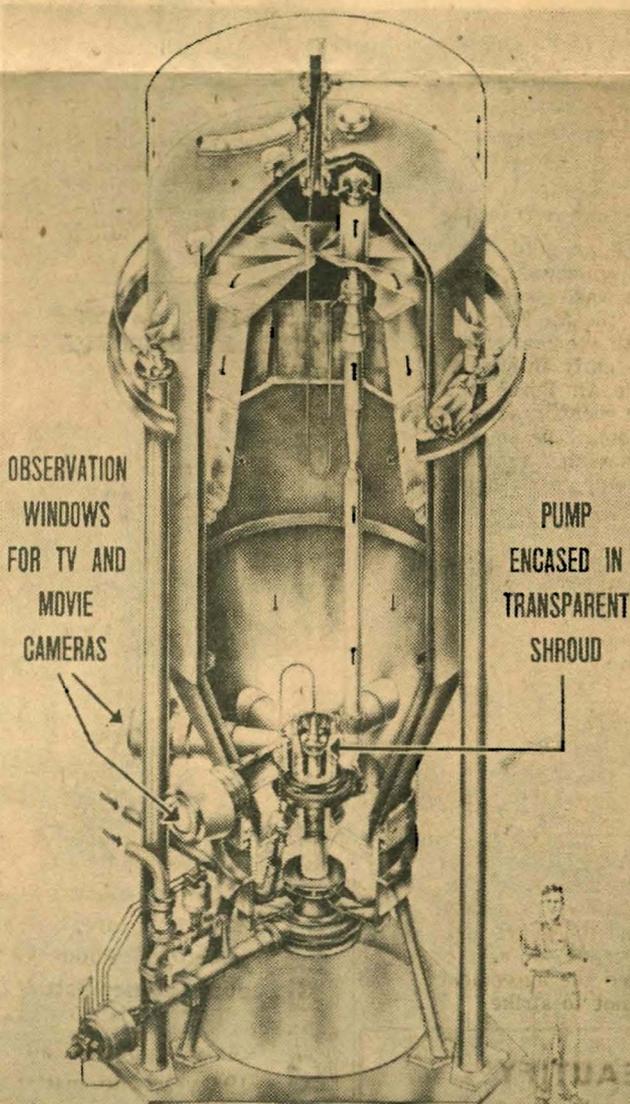
Rather, he said, it is intended to provide a broad experimental study from which industry can draw information when it faces special problems and special applications.

Alan D. (Hap) Johnson, director of Plum Brook—also in charge of the nuclear research effort at the station—added another level of complexity to such rocket research.

In nuclear propulsion systems radiation from the nuclear reactor may cause changes in such things as lubricants. Materials for the reactor itself—to operate at a desired 5,000 degrees Fahrenheit—have yet to be discovered.

In all these problems, he said, "a breakthrough may come by getting around the problem rather than by hacking through it."

He said, in citing an example, that some engine parts that



In studies where no burning takes place, rocket systems are encased in a transparent shield so that closed-circuit TV and movies can be taken during test runs. This stand evaluates pumps. Arrows indicate the flow of liquid hydrogen.

must endure great heat are made hollow and that a cooling fluid is circulated through them to permit use of materials that otherwise would melt.

Piggyback Passengers

Not all the rocket area's facilities look that far to the future.

In recent years Lewis has been making special instrumented capsules to conduct experiments in space. They are launched as "piggyback" passengers on military missiles.

To make sure that they will not break during the shock of launching, they are subjected to strong vibrations in a "shaking tower" at Plum Brook.

As Lewis' new involvement in Project Apollo progresses, the Rocket Systems Research Facility at Plum Brook may be expanded even further. It already plays a big role in the nation's space effort.