SPACE

Fluorine for Rockets

The hazards of the most energetic of all rocket propellants have been overcome, leading to rockets with more lifting power for future space trips to the moon and planets.

➤ THE HAZARDS of using the most energetic of all rocket propellants, fluorine, have now been overcome, leading to rockets with more lifting power for trips to the moon and planets.

Fluorine when mixed with other elements becomes fluoride safe for water and toothpaste, but liquid fluorine is dangerous, hard to handle and must be kept at minus 306 degrees Fahrenheit.

The hazards of handling the propellant on the ground and its loading into the rocket have been solved, Harold Schmidt of Lewis Research Center told SCIENCE SERVICE in an interview.

He said the research with fluorine has also been successfully demonstrated in a practical prototype upper-stage engine. The hydrogen-fluorine combination is now as easy to handle as present combinations of propellants, including liquid oxygen and RP-1 (mainly kerosene) used in the Atlas rocket engines, the F-1 planned for the Nova moon rocket, and hydrogen-oxygen used in the Centaur rocket engine.

Fluorine could replace the oxygen in rocket upper stages as an oxidizer for the liquid fuel, such as hydrogen, increasing the payload in some cases 30% to 50%, he said.

This is because fluorine is more "energetic" than oxygen now used as an oxidizer to make the fuel burn. Therefore fluorine would need less space proportionally and smaller tanks would be needed.

Another advantage of fluorine is that no ignition system is needed to light the fuel as is necessary with oxygen. Fluorine is hypergolic, which means it burns spontaneously with the fuel. This in turn means that a fuel using fluorine can be restarted at will.

He said Lewis, a National Aeronautics and Space Administration research center, has worked with fluorine as an oxidizer for 12 years and explored it to the degree that the upper stage of a rocket could now be developed.

So far, the only solutions in sight for moon or planet flights have been either enormous rockets, difficult to handle, or several smaller rockets sent aloft separately and assembled in space for the long haul. The assembly or rendezvous technique has not even yet been explored.

Using fluorine for upper stages would mean smaller, more efficient rockets for moon and planet missions. It could also fuel the Centaur engine to go into the upper stages of the Saturn, which is scheduled to orbit a manned laboratory around the earth, or for the Atlas, which will orbit the first U. S. space man. In both cases modifications would have to be made, but the resulting systems would be capable of lifting greater payloads or carrying the same payloads farther.

He said the hydrogen-fluorine combination is the most advantageous for sending probes to the planet areas beyond Mars. With the boosters the United States will have during the next five years, greater payloads could be put into the major planet areas if the upper stages of the rockets are oxidized with fluorine.

To build the rocket stages with fluorine as a propellant would require the development of these upper stages since it has never been done before, he said. However, it would not be more costly than building any other new stage of a liquid rocket, and it would give space progress the "mostest with the quickest."

• Science News Letter, 80:331 November 18, 1961

SPACE

Testing Space Metals

➤ METALS for nuclear-powered spacecraft will soon be tested to see how they would stand up under the fierce radiation generated by the power source.

The tests will be the first of their kind ever made on different alloys of titanium, aluminum, and stainless steel at sub-freezing temperatures.

Patrick L. Donoughe, manager of the Plum Brook reactor, Sandusky, Ohio, told SCIENCE SERVICE that testing these metals will be the first experiment to be undertaken when the reactor goes to its full power of 60,000,000 watts.

He said the reactor, a facility of the National Aeronautics and Space Administration's Lewis Research Center, Cleveland, will provide a new tool for studying parts and materials under conditions similar to those anticipated in fully nuclear-powered systems for spacecraft.

Radiation from the reactor will be beamed at the metals at minus 430 degrees Fahrenheit to see if they would be suitable for storage tanks holding liquid hydrogen. Liquid hydrogen must be stored at minus 423 degrees Fahrenheit or less.

The hydrogen might be used as a propellant for spacecraft and kept in a tank close to the nuclear power source on board. It is not now known which metals would stand up under the simultaneous stress of the extremely low temperatures and the radiation from the power generator.

The tools needed for the testing are the reactor and a big refrigeration system, consisting of compressor units, expansion engines and heat exchangers to provide the needed low temperatures.

The reactor will build up power as soon as the Atomic Energy Commission inspects it during a shut-down period. It has recently "gone critical," generating more than enough neutrons to sustain the nuclear fission process. This marks the end of the reactor's test run since its completion last April.

Future experiments with the Plum Brook reactor could include the investigation of how much shielding is required to keep astronauts safe from nuclear radiation from a power source.

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SPACE

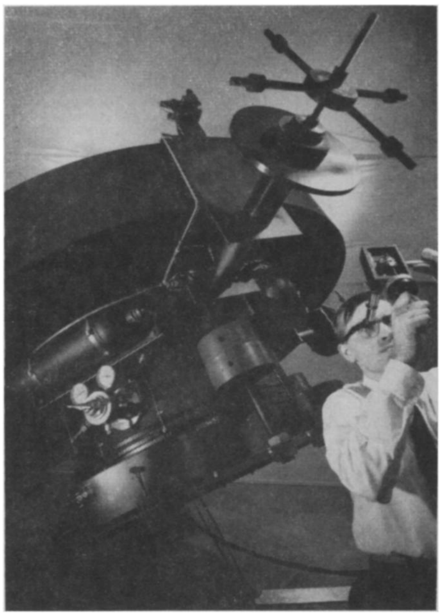
10,000 Tons of Dust Rain on Earth Daily

➤ SOME 10,000 TONS of dust rain down on earth daily, scientists report.

They base this figure on direct measurements of interplanetary dust particles made in the earth's vicinity from U. S. and Russian rockets, satellites and space probes.

The dust particles were measured from the noise they made when striking the space vehicles, Drs. C. W. McCracken, W. M. Alexander and M. Dubin of the National Aeronautics and Space Administration, Washington, D. C., report in Nature, 192:441, 1961.

• Science News Letter, 80:331 November 18, 1961



SPACE SATELLITE SIMULATOR—Weighs two tons yet moves visibly when a fly lands on it. It was built by Minneapolis-Honeywell Regulator Co., Minneapolis, for testing satellite guidance systems.