

High-Speed Wind Tunnel Tests Model Spacecraft

► TINY MODEL spacecraft the size of spools of thread will soon be flying at 20,000 miles per hour into a 10,000 mph headwind.

The combined speed of 30,000 mph is just what space scientists want to simulate space missions returning from other planets.

Reentry speed from the moon will be about 24,500 mph for the three-man Apollo vehicle. Interplanetary flights will return to earth's atmosphere at speeds of from 28,000 to 44,000 mph.

The models tested will be flown in a super wind tunnel that is actually more like a giant BB gun. Located at NASA's Ames Research Center, Mountain View, Calif., the "gun" consists of a long tube with a charge of gunpowder at one end and hydrogen at the other.

The powder is ignited, and drives a piston down the tube, rapidly compressing the hydrogen. The hydrogen is compressed so quickly that it heats to almost 8,000 degrees F. A tiny pinhole allows the hydrogen to escape in a rush, driving the spacecraft model ahead of it, past banks of high-speed cameras, radar and other instruments.

PLANETOLOGY

Canals, Oases on Mars May Be Cracks, Craters

► THE "OASES" on Mars, which mark the intersections of the famous "canals," may actually be huge meteorite craters, while the canals are cracks in the planet's crust radiating out from them.

Mars has never had enough atmosphere to account for any real erosion, reported Dr. Ernst J. Opik of the University of Maryland, College Park. There are many more craters visible than there would be if wind and moisture had been continuously wearing away at them. Erosion on Mars is apparently 30 times slower than that on an earthly desert.

Yet there are traces of craters that have been almost completely worn away. Some of Mariner 4's pictures show several giant "ghost craters" 120 miles or more in diameter. This indicates that the craters were both formed and eroded during the early life of the planet more than four billion years ago, when the changes and upheavals of its birth could have an effect. Previous estimates of the craters' ages were only up to several hundred million years.

The canals, many of them from 60 to 120 miles wide and without "sharp borders," may be ancient cracks radiating out from some of these primordial craters.

If they are not cracks, they may simply be a "systematic alignment" of

the planet's dark areas, Dr. Opik reported in *Science*, 153:255, 1966. The dark areas, he said, are either vegetation or "something specifically Martian." No other hypothesis so far proposed "is able to account for the facts."

Discussing other Martian phenomena, Dr. Opik cited the "sudden explosion-like occurrence of yellow or grey clouds," which has been observed on several occasions. This could be due to small asteroids, 30 to 40 yards across, colliding with the planet. However, there are so few large asteroids in Mars' orbit that it seems unlikely there are enough small ones to produce such clouds. Special observations with large Schmidt telescopes could "settle this crucial question," Dr. Opik said.

OPTICS

New Microscope Based On Astronomers' Method

► A NEW MICROSCOPE uses the same "blinking" technique astronomers have found best for detecting exploding stars.

It is reported to be the first microscope that can either superimpose one image on top of another or rapidly alternate images. Engineers at California Institute of Technology, Pasadena, are using it to spot the small changes in metallic crystals that lead to failure.

Astronomers searching for exploding stars, as well as for comets and asteroids, compare two pictures of portions of the sky photographed at different times. By "blinking" the pictures under a low-power microscope, they can detect small changes in position or size of objects.

Blinking means looking alternately at the two photographs within a second or less. Objects that have changed position seem to jump back and forth as the images alternate, while objects that have changed size seem to pulsate.

The same optical illusion occurs when the new microscope is used to compare a metallic crystal before and after stress is applied for a fraction of a second. The comparison is made with small X-ray negatives or plastic molds of the metal crystal surfaces under a magnification of 50 to 500 times, a higher magnification than astronomers use for blinking.

The new microscope was assembled by David S. Wood, Thad Vreeland Jr. and David P. Pope. They are using it to study the stress-induced movement of dislocation lines in metallic crystals, which show how such tiny motions contribute to metal deformation.

Scientists normally view such samples side by side in a split optical field. The engineers believe the new microscope will have widespread research applications.

IN SCIENCE

ANIMAL PHYSIOLOGY

Protein Given Sheep Increases Wool Yield

► BY INSERTING protein directly into the fourth or last stomach of sheep, Australian scientists believe wool production could be tripled.

New South Wales researchers found that when sheep were fed only enough grass to keep them alive during severe drought conditions, they produced six and a half pounds of wool annually. When a small amount of protein was introduced into the sheep's fourth stomach, wool production increased 15 to 20 pounds. The scientists introduced the protein through a surgically inserted tube into the sheep's flank.

When the same amount of protein was fed to sheep normally so it passed through all stomachs, the increase in wool was negligible. If protein passes through the first three stomachs, bacteria and protozoa use it to break down foodstuffs, Dr. K. Ferguson, assistant chief of the Commonwealth Scientific and Industrial Research Organization's division of animal physiology said.

GENERAL SCIENCE

Time Limit Suggested On Engineering Diplomas

► ENGINEERS should be encouraged to keep up with rapidly advancing technology.

Dr. William C. Spencer, associate dean of the Graduate School of Business of Columbia University, suggested to a group of university professors at a St. Louis meeting sponsored by Monsanto Company, that an expiration date be added to the diplomas of engineering graduates.

"Regularly updating diplomas of engineers and scientists is a practical method, I believe, of cooperatively involving the individual, the university and industry in a practical solution of a problem that is becoming increasingly acute. Our accelerating technology is creating an information lag that can only be solved by a continuing and concurrent educational program for scientists and engineers," he said.

"Generally, it would function in the following manner: Upon graduation, a man or woman would receive the normal B.S., M.S., M.B.A. or Ph.D. degree, dated as usual. However an expiration or renewal date would also appear on the diploma with the implied or stated stipulation that in order to retain its validity, the individual to whom the degree was awarded must have it revalidated."

GENERAL SCIENCE

Undersea Farms Could Use Fish as Sheep Dogs

➤ VAST AREAS beneath the sea may be turned into sea farms where fish, abalone, crabs, shrimp and other animals may be raised and rounded up with "sheep dog" fish and porpoises, bubbles or electricity.

Even though it may be difficult to imagine marine farming in the United States competing successfully with the beef, pork and poultry industries, research may make all this possible, said Frank J. Hester, U.S. Bureau of Commercial Fisheries, at the Tuna Resources Laboratory at La Jolla, Calif.

The day may come when sea farms will be in operation, when porpoises and fish may be trained to act as sheep dogs to tend fish schools and run errands. Mr. Hester said. Perhaps killer whales can be trained to ride herd on the whale bone whales, source of red meat.

There is little reason to doubt that the next few years will see man's occupation of the continental shelves, he told the second annual conference on "Exploiting the Ocean," sponsored by the Marine Technology Society.

The ability of man to live and work in the sea can lead to new or expanded use of bio-marine products. The most promising future seems to lie in large-scale undersea farms.

GEOPHYSICS

Child's Toy May Catch Samples of Moon

➤ AN AGE-OLD child's toy may soon find work in the Space Age. The "Chinese finger trap," which tightens its grip when one tries to pull his fingers out, is being studied as a way of bringing up samples from far below the surface of the moon.

The principle in the finger trap is being used in a lunar drill that the Westinghouse Defense and Space Center, Baltimore, Md., is delivering to the National Aeronautics and Space Administration's Marshall Space Flight Center for evaluation.

The drill is one of two being studied by MSFC for possible use for post-Apollo manned lunar surface exploration missions.

It is designed to enable an astronaut on the moon to pull five-foot long, two-inch diameter core samples to the surface from depths of more than 100 feet. After every five-foot drilling operation, the astronaut pulls up on the outer drill casing, causing

an inside wedge-shaped ring at the bit to tighten.

The tightening action, similar to that in a finger trap, breaks the core sample, and the inside barrel containing the core is then hoisted up on a wire. The wire-line method permits the drill and outer casing to remain in the hole, saving drilling time and preventing possible cave-ins.

The drill, designed for lunar missions in the 1970s after the first Apollo flights, may be attached to a lunar vehicle or shelter.

It will weigh 36 lunar pounds—about 200 earth pounds—and stand about eight feet above the lunar surface.

MILITARY SCIENCE

1970 U.S.-German Tank Has Problems Already

➤ THE MAIN Battle Tank of the 1970s, a joint tank project between the United States and Germany, is having birth pains.

"Almost insurmountable" language difficulties had to be overcome before anything at all could be done. Since then both big problems (who builds what?) and small ones (nut and bolt sizes) have kept administrators working almost as hard as the engineers.

The matter of nuts and bolts has been plaguing international manufacturers for years, and will become more serious for the United States as more countries convert to the metric system, as Japan recently has.

An American standard bolt will not fit a metric-threaded hole and vice versa. After much deliberation, the German Ministry of Defense and the U.S. Department of Defense agreed that although the tank's overall dimensions would be given in both inches and centimeters, each country would use its own system for the fasteners of the parts it builds. The U.S. conceded to let the metric system be used where German and American parts joined.

The U.S. will furnish the main engine, a high-powered job that can run on just about anything, while Germany is continuing to develop an alternate engine along more conventional lines.

Regardless of the engine used, it will run through a German transmission. The tank's suspension is being specially designed for it and will reportedly be the first of its kind to be used in such a vehicle. Both countries have ideas, however, and a decision has yet to be made.

The program is under the direction of a two-man Program Management Board with one member from each country. The U.S. head is Maj. Gen. W. G. Dolvin, and the German chief, Dr. Fritz Englemann of the Federal Republic of Germany.

The tank's big weapon will probably be a U.S. contribution: the Shil- lough missile.

ENTOMOLOGY

'No Females Allowed' In War Planned on Flies

➤ BY BREEDING thousands of flies whose only offspring are male, scientists hope to reduce the number of female flies to zero. And since there will be no females, there will eventually be no flies.

In this new line of attack, scientists of the Australian Commonwealth Scientific and Industrial Research Organization are trying to give the male X chromosome in the fertilizing sperm a better chance of determining the sex of the egg than the female Y chromosome. Normally chances of X and Y chromosomes to give the respective sex characteristics are equal.

To start the process, thousands of male flies will be irradiated. Those that produce only male offspring will be bred until, if the theory works, there are sufficient numbers to dominate a normal fly community. The male-breeding flies will then be released in an effort to produce more males and fewer females.

The experiment will have to be accomplished within two years; otherwise, natural selection of the species will work to neutralize the effect.

The research is aimed chiefly at the sheep blowfly which is causing costly damage to the sheep industry, but if successful, it could be used against other flies and pesty insects.

MILITARY SCIENCE

Viet Cong Footsteps Spotted Like Quakes

➤ NEW DEVICES for finding the enemy in Viet Nam are so badly needed that some of them are going into the field first and being tested state-side later.

One such gadget detects approaching footsteps just as it would tiny earthquakes—by vibrations through the ground. More than 1,000 units are already in service with the U.S. Marines, yet the Army Materiel Command in Washington is just getting around to evaluating its order of 100.

Nicknamed SID, for Seismic Intrusion Detector, the device can detect and pinpoint individuals or groups running, walking or crawling, even in caves, tunnels or buildings; moving vehicles on mountain roads or bridges; and pack animals on mountain or jungle trails.

Vibrations in the earth or water are picked up by concealed seismometers at much lower frequencies than the human ear can hear. The sounds travel by cables to the control unit, which triggers an audible signal in the operator's headphones.

SID is made by Texas Instruments, Inc., Dallas, and is a variation on a monitoring system used in industrial plants and warehouses.