



APOLLO VEHICLE BEFORE TEST
Maybe the itch was evolutionary.

SCIENCE

SPACE

Beyond the Moon

The moon seemed closer than ever last week when the hatch of an Apollo lunar vehicle opened and three smiling astronauts clambered out. In a giant vacuum chamber at Houston's Manned Spacecraft Center, the bearded, bone-tired trio had just spent eight days simulating a trip to the moon and back. Reported Spacecraft Commander Joseph Kerwin: "A prime reason for the mission was to come back and say 'Yes sir, the darned thing works.' We sure are going to be able to report that."

For NASA officials, the mock space voyage had particular significance. To prevent a repeat of last year's tragic Apollo fire, they had spent \$75 million improving and fireproofing the lunar command ship. And apart from some unexpected itching from the astronauts' new flameproof space suits, and a temporary breakdown of the huge vacuum testing chamber, the modified capsule's first full-fledged ground test was an unqualified success.

Jovian Gases. For all its promise, though, the ground-bound lunar voyage failed to stem rising scientific impatience with the U.S. space program. The scheduled Apollo moon mission is only 18 months away, and space specialists are already demanding that the U.S. start looking beyond the moon to more distant and challenging targets. At the Fourth International Symposium on Bioastronautics and the Exploration of Space in San Antonio last week, scientists repeatedly urged NASA to get on with the job of planning trips to the earth's planetary neighbors. Since unmanned probes have all but proved that the moon is devoid of life, Nobel Prizewinning Chemist Harold C. Urey, for one, believes that it may be a "terribly dull object." Urey and many of his colleagues are now leaning more

and more to the once unfashionable notion that life may be found elsewhere in the solar system—even if it is nothing more complicated than simple plants like moss or lichens.

Three planets were nominated as possible havens for such life. Nobel Chemistry Laureate Willard F. Libby speculated that oxygen detected on Venus by a Soviet space probe last October may well be the product of plant photosynthesis. Jupiter, said NASA Chemist Cyril Ponnampurama, has an atmosphere similar to that which enveloped the earth during its first 100 million years; the swirling Jovian gases, he added, may already have combined into basic life-building molecules. But the strongest argument was made on behalf of Mars. Despite its freezing temperatures and apparent lack of oxygen, explained NASA Microbiologist Harold P. Klein, life could have been spawned when the red planet's climate was more favorable. Whatever form that life once had, it may have survived over the ages through evolutionary adaptation.

A practical preliminary step toward planetary voyages, suggested Spacecraft Center Director Robert R. Gilruth, would be to orbit a giant, cigar-shaped capsule around the earth in the mid-1970s. The big space station, said Gilruth, would be 615 ft. long, carry a crew of 100, and rotate end-over-end $3\frac{1}{2}$ times a minute to create an artificial gravity for those on board. Freed from the earth's atmosphere, astronomers on the station could peer through telescopes for an undistorted view of the destination of future space trips. How would this ambitious multimillion-dollar project be financed? An idea by Chemist Libby suggested one possible source of

funds. In the nearly perfect vacuum of space, he said, scientists would finally have available the contamination-free conditions that would allow them to make diamonds out of coal.

TECHNOLOGY

The Twister

It ripples across the roughest terrain like a huge, double-jointed caterpillar. It can cling to 60° slopes, climb over boulders and fallen timber, push its way through water, mud or snow. On less rigorous straightaways, it can whip along at speeds of up to 65 m.p.h. Built by Lockheed engineers as a high-performance, wheel-driven answer to the tank, the curious transport is fittingly called the Twister.

The contraption's extraordinary capability lies in its configuration. Composed of two Jeep-like bodies hitched together by a flexible yoke, it can literally point in two directions at once. As a result, the four wheels on each segment remain firmly planted on the ground, even as the Twister crosses the crest of a small hill. The fore and aft sections are powered by two independent 140-h.p. air-cooled Corvair engines, modified so that they can operate even at a sharp tilt. The driver pilots the eight-wheel-drive vehicle from the rear body. He has at his disposal a steering post for the lead wheels and twin seven-position gear levers for the two automatic transmissions.

Despite its complexity, the Twister is relatively easy to maneuver. Developed to meet the need for a rugged, readily transportable combat machine, it could carry men and weapons on the variety of battlefields likely to be encountered in limited warfare. Not only is it more agile than most tanks, say the engineers, but it can also press on even if one engine fails or several tires are punctured. Lockheed recently negotiated a \$3,000,000 contract with the Pentagon for the production of test vehicles. Though their design is military, Twisters might eventually be used by construction men, explorers, or any other civilians who have the urge and the money for a remarkable ride across roller-coaster terrain.



LOCKHEED VEHICLE TWISTING
Maybe the yoke was fitting.