

## ASTRONOMY

# X-15 for Star Research

► THE HIGH-FLYING research airplane, the X-15, will be used as a platform for studying the stars from above most of the earth's atmosphere.

A new role for the X-15—a base for experiments in aeronautical and space sciences—was announced by the National Aeronautics and Space Administration in Washington, D. C. Work on one of the primary projects, an experiment in ultraviolet and infrared photography of the stars, has already started.

Scientists at the University of Wisconsin are devising instruments for stellar studies from altitudes above 40 miles. Drs. A. D. Code and T. E. Houck plan to test current theories pertaining to the origin and make-up of stars using the ultraviolet and infrared photographs obtained from the high-flying X-15. From the earth's surface, ultraviolet light is obscured by atmospheric ozone, but the X-15 can fly above this layer.

One advantage of the X-15 is that the aircraft can be oriented to face the stars. Another is that it can return and repeat the experiment.

Instruments for the "star tracker" include a gimballed platform containing four cameras, to be mounted in the X-15 instrumentation bay behind the cockpit.

The new program for the X-15 is planned to make use of its capabilities for extremely high speeds and altitudes beyond all but a small fraction of the earth's atmosphere. It adds at least 35 flights to the schedule set originally for X-15 research and may take two years to complete.

There will be a successor to the X-15. No money has yet been allotted in the budget, but plans for this year include completing the study and design of the plane.

The plane, unnamed so far, is expected to have a combination engine such as a turbo-ram-rocket. It will be a non-airbreathing engine that will have some ability to cruise, which the X-15 does not. The plane is expected to be capable of flying higher and faster than the X-15 which once achieved a record height of 217,000 feet and a speed of 4,000 miles an hour.

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## SPACE

# New "Moon Bus" Ready

► A NEW "MOON BUS" is ready to travel the nearly 250,000 miles across the space "highway" to earth's natural satellite.

The "passengers" of this bus, Ranger 4, are a camera for taking close-ups of the moon, and scientific equipment to send back information about moon quakes and meteor hits on the moon. Studies of gamma rays, similar to X-rays, are planned for clues as to the make-up of the moon's surface.

If the experiments show that the lunar surface is similar to that of the earth, the moon must have experienced much volcanic or melting activity and may be partially covered with lava. However, a moon surface consisting of material like that in meteorites (rocks landing on earth from space) indicates that volcanic activity on the moon has been low and subsided long ago. The moon can then be expected to be littered with meteorites continually raining down from the sky.

Information about the moon surface terrain is most important in finding sites favorable for future landings. Shots taken with the television-telescope instrument on Ranger 4 will show land forms and heights and slopes of the surface.

Moon photographs now available do not show objects smaller than six-tenths of a mile. The Ranger pictures will show objects 12 feet in diameter under favorable conditions, the National Aeronautics and Space Administration reported.

A radar altimeter aboard Ranger is designed to gather more information about how well the surface reflects radar signals.

The space agency had built three Ranger probes, 3, 4 and 5, to survey the moon in the hope that at least one would be successful on this difficult mission. The three spacecraft all have the same hexagonal structure called the "bus" that carries the scientific instruments.

Ranger 3 carrying similar instruments was launched on Jan. 26, but a malfunction of the Atlas booster caused the spacecraft to miss the moon by 22,862 miles. No pictures were taken because the cameras pointed away from the moon. It is hoped that the 730-pound chrome- and gold-plated Ranger 4 will complete the 60-hour flight and release an instrument carrying "moon ball" 1,100 feet above the moon for a landing on the surface.

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## SPACE

# Monkeys Should Precede Men to the Moon

► MONKEYS should be sent to the moon before men to determine radiation hazards, a radiation expert reported.

Studies on rats and monkeys by Dr. W. Lynn Brown, professor of psychology at the University of Texas, Austin, Tex., have shown that radiation exposure adversely affects and limits their performance ability. The same damage is likely in man since the effect of radiation on the nervous system of monkeys is so similar to that of man. The studies were conducted at the Balcones Research Institute in Austin.

Experiments with rats have shown that the higher the levels of radiation, the greater the decrease in performance.

A group of rats conditioned to execute 1,800 responses an hour in acquiring food were exposed to X-ray irradiation ranging from 25 roentgens per hour to 125 r per hour. These are levels below a lethal dose for rats or man.

The number of responses decreased in direct relation to exposure levels which were increased in 25 r increments to 125 r per hour. From preliminary observations, it also appears that the rate of recovery varies directly with the exposure dose. The lower the radiation dose, the faster the recovery.

In another experiment, a small group of monkeys was exposed to full body radiation up to 616 rem (roentgen equivalent man) in fractionated doses over a period of 16 weeks. Following this exposure, the monkeys were unable to perform the wide variety of tasks possible before irradiation.

They could, however, perform limited operations within a narrow range rapidly and consistently. The irradiated monkeys also suffered some visual damage.

The behavior of a space monkey may be so badly affected from radiation exposures anticipated in a lunar voyage that it would bar man from such exploration unless adequate shielding could be provided, Dr. Brown observed.

The radiation studies at Balcones are also very important to the development of atomic industries on earth. Both industry and labor are concerned with the possible effects of prolonged radiation exposure, even at low levels, on men and women employed in nuclear development. It is hoped that from these studies, new understanding of the hazards may be achieved so that better protection can be developed.

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**MOON BUS CHECKOUT**—Ranger 4 bangs suspended for the final adjustments of its omni-directional antenna before it is launched from Cape Canaveral, Fla. The probe is scheduled to impact the moon after sending TV pictures of the lunar surface back to earth.