

## SPACE

# Ranger Space Shot Slated

► THE UNITED STATES is almost ready to launch a spacecraft with the same basic design that later will be used in vehicles destined to rough-land instruments on the moon, then to make soft landings on the moon and planets.

Ranger I, however, will not be aimed at the moon. It will zoom off on a long curve into space, probably traveling 685,000 miles from the earth before it gets back into the earth's atmosphere and burns up. The round trip may take 58 days.

There is even a slim chance that the Ranger may reach earth-escape velocity and go into orbit around the sun.

Chief aim of the Ranger I shot, National Aeronautics and Space Administration says, is developing and testing "basic elements of spacecraft technology" needed for follow-up moon and planet missions. Ranger's complex system has 19,520 working electronic parts.

Besides the basic tests, Ranger has another important scientific goal. It will carry instruments for studying cosmic rays, magnetic fields, and radiation and dust particles in space.

The standard, or near-standard, spacecraft design was developed by engineers at Jet Propulsion Laboratory, Pasadena, Calif., operated for NASA by California Institute of Technology.

Ranger is basically hexagonal (six-sided). The hexagon has been termed the bus, be-

cause it will be used as an omnibus for carrying scientific instruments. The nature of the "passengers" will change in succeeding shots, but the basic craft form is believed sufficiently versatile to handle all succeeding unmanned missions.

Using experiments with a prototype proof test model to guide them, Ranger's builders began work on the actual flight model last February. The flight version was shipped from Pasadena to Cape Canaveral in late May. Final ground tests have been completed.

Ranger I is 11 feet long and about five feet in diameter at the base of the hexagon. In cruise position, with solar panels extended, it is 13 feet long and 17 feet wide. It weighs 675 pounds.

Ranger I has two radio transmitters and two antennas, one at the front and the other at the base. The base antenna is aimed at the earth, to assure transmission of data from far out in space.

The 8,680 cells in the two solar panels may pick up enough energy from the sun to generate 210 watts of electricity. If the attempt to collect solar power to keep Ranger operating is not a success, a silver zinc battery inside the hexagon will run the craft for two days.

Ranger will be launched by an Atlas-Agena B rocket, marking the first use of a new combination of two rockets used individually in earlier space shots.

All three Atlas engines will be burning at liftoff from Cape Canaveral's pad 12. Some five minutes later, when the last of the three burns out, Ranger should be up about 80 miles and some 350 miles down the Atlantic Missile Range.

Next, during a 25-second coast phase, explosive charges release the Ranger-carrying Agena from the Atlas. A pneumatically controlled pitch maneuver puts the vehicle into an attitude horizontal to the earth before Agena's single engine starts. When the engine first cuts off after two and one-half minutes, the vehicle should be in a nearly circular "parking" orbit around the earth, 100 miles up.

This coasting stage lasts for about 14 minutes. The Agena's engine then operates for another 90 seconds. Two and one-half minutes after final engine shutdown, and about 25 minutes after liftoff, springs separate the Agena from the spacecraft.

At this point the Ranger should be traveling at 23,800 miles an hour, a speed that will place it in a "highly eccentric" earth orbit. The farthest away the orbiting Ranger will be from the earth is estimated at 685,000 miles, and its nearest approach to the earth is estimated at 37,500 miles.

About one hour after launching, Ranger is expected to be in a position allowing its hinged solar panels to lock onto the sun and feed the craft's power demands.

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## TECHNOLOGY

### Rise in Transistor Sets Seen as Boon to "Voice"

► NATIVES of many remote and underdeveloped areas are hearing radio broadcasts for the first time, thanks to the rapid spread of low-cost receivers requiring only a few cheap batteries and no power lines.

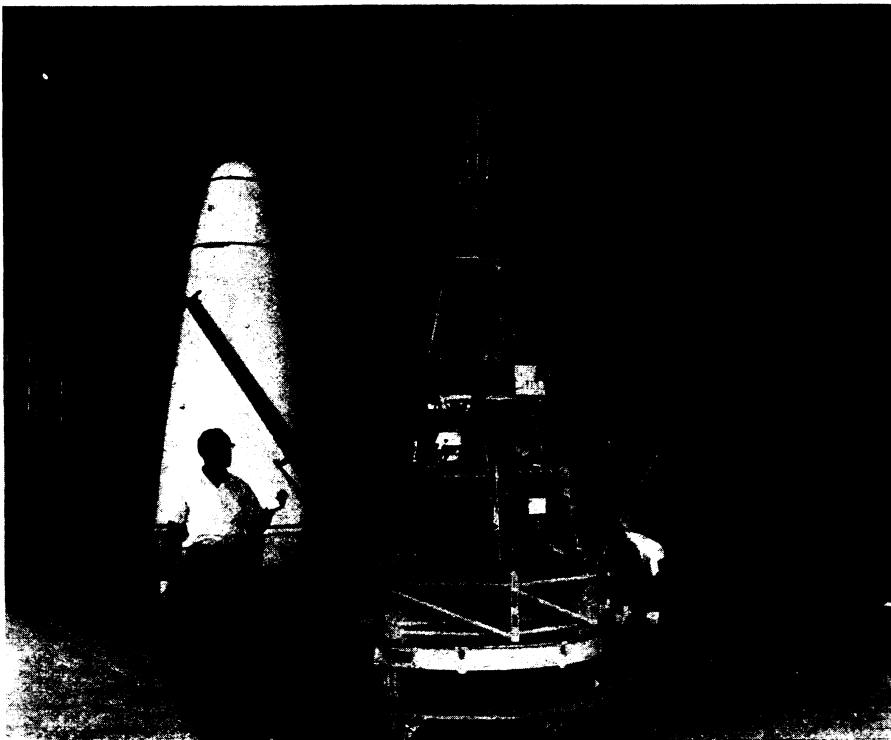
Officials of the Voice of America hail the transistorized sets as a welcome means of acquiring new listeners to America's story to the world via VOA, the U.S. Information Agency's international broadcasting service.

But the rise in receiver sales—and a corresponding 13% rise in shortwave broadcasting throughout the world—has also opened up vast new potential audiences for VOA's major competitors. They are Radio Moscow, Radio Peking, and the United Arab Republic's "Voice of the Arabs."

VOA hopes to meet the challenge through a long-range program that calls for ending current coverage deficiencies and "boosting signal strengths in the more important target areas where competition is greatest."

Recent Congressional action has helped. Legislators approved a \$24,000,000 domestic plant at Greenville, N. C., for better transmission to relay stations in Europe and the Mediterranean area, and a new \$13,000,000 relay station now being built near Monrovia, Liberia, in Africa.

Communists have been jamming VOA Russian-language broadcasts since 1948. United States technicians have fought buzz saw and siren noises with new electronic devices, high-power transmitters, high-gain antennas, simultaneous broadcasts of the



**SUN-POWERED SATELLITE**—The solar panels shown on either side of this Ranger spacecraft will be locked in place facing the sun during flight so that they can continuously deliver solar power to meet the craft's needs during orbit.

same program from different relay points, and around-the-clock broadcasting. In some cases, complete penetration of the jamming barrage has been realized. But jamming is still a key VOA problem.

Conceived during World War II as a means of combating enemy propaganda, the Voice has since developed a \$53,000,000 globe-circling network. VOA broadcasts in 35 different languages, offering newscasts, facts about U.S. policies, and information

on the life and culture of the American people.

The Voice operates 30 shortwave transmitters as a "feeder" link in the continental U.S. and nine overseas relay stations—at Tangier, Morocco; Munich, Germany; Thessaloniki and Rhodes, Greece; Luzon, in the Philippines; Okinawa; Colombo, Ceylon; Woofferton, England; and Honolulu, Hawaii.

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#### GENERAL SCIENCE

## Read Few Journals

► A SURVEY of the reading habits of chemists and physicists shows that almost 50% of their professional reading is devoted to only 17 of the thousands of journals available.

The study was conducted by the Case Institute of Technology, Cleveland, Ohio, under National Science Foundation sponsorship. It was an outgrowth of an earlier (1957) project disclosing that chemists found time to read only about five percent of the wealth of recorded information published annually.

For the second study, researchers used 297 chemists and 404 physicists. Each carried a small electronic Random Alarm Mechanism (RAM) during waking hours for two weeks. When the device sounded alarms at random intervals, the scientist filled out a questionnaire indicating whether or not he was reading at the time, and if so, what. He was asked to maintain normal reading habits during the survey period.

Some of the findings:

Members of both groups read for an average of two hours weekly. Research chemists, however, spent more than twice as much time reading scientific journals as did non-researchers.

A total of 169 different journals (48 chemical, 59 physical and 62 general scientific) were noted as being read at least once. Chemists spent about half their reading time with ten favored journals, and physicists an equal amount of time with nine. Two publications, the *Journal of the American Chemical Society* and *Chemical and Engineering News*, appeared on both "top preference" lists.

Chemists read physical journals more frequently than physicists read chemical journals.

About 64% of the total reading was done at work, and about 24% at home. About 10% was done in libraries maintained by employing companies. None was done in public libraries.

Scientists who had published books or articles during the past five years did about 10% more reading than those who had not published.

Since the reading was "highly concentrated in a very small percentage" of published journals, the survey report suggests that low-usage publications take steps to lower production costs. Additional investigation is recommended.

The report also explores the idea of condensing or abstracting more journal articles to cut both reading time and publishing costs.

In a pilot experiment, 16 graduate students working for operations research degrees read unpublished manuscripts either in their original form, in condensed versions, or in highly shortened abstract form.

They were then given written examinations, based on the major points in the original uncut article, to test their comprehension of the material read. There was "no significant difference" in the answers given by those who read condensations and the answers given by those who read the original articles.

The report, "An Operations Research Study of the Dissemination and Use of Recorded Scientific Information," is available for \$2.00 from the U. S. Department of Commerce, Washington 25, D. C.

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#### PHYSICS

## Ceramics-Resin Mix Used as Heat Shield

► POROUS ceramics mixed with resin may be a highly effective structural material for heat shields to protect spacecraft re-entering the earth's atmosphere, scientists attending the Conference on Aerodynamically Heated Structures in Cambridge, Mass., were told.

Eric L. Strauss of The Martin Company, Baltimore, said resin-impregnated ceramics can withstand surface temperatures generated during re-entry ranging from 3,300 degrees to 4,000 degrees Fahrenheit.

Porous ceramics alone are potential shielding materials, but adding resin increases their strength and resistance to heat shock, Mr. Strauss pointed out. He said the material offers "distinct advantages" over metal shields.

At re-entry heat, the ceramic-resin mix works principally as a radiation shield. A cooling effect also is obtained when the heat causes chemical decomposition of the resin, sending a flow of gases through the ceramic to the surface of the craft.

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*Color*, which is one of the most important factors in the grading of tomatoes, can now be measured accurately by a colorimeter.

#### MEDICINE

## Mosquito Gives Malaria To Monkeys in Nature

► A MOSQUITO that transmits malaria to monkeys in nature has been identified and reported for the first time.

Whether this species, *Anopheles hackeri*, also transfers monkey malaria to man has not yet been proved. The demonstration that *A. hackeri* is a natural carrier of one of the many species of simian malaria is an important link in the chain that may eventually explain what mosquito carriers are involved in the transfer of the disease in monkeys.

Drs. R. H. Wharton, Institute for Medical Research, Kuala Lumpur, Federation of Malaya, and Don E. Eyles, Laboratory of Parasite Chemotherapy of the Public Health Service's National Institute of Allergy and Infectious Diseases, reported the new identification of a Malayan mosquito in *Science* 134:279, 1961.

In the search for the parasite that causes malaria, more than 700 mosquitoes were dissected to find one sporozoite infection, that is, the phase of the developmental cycle when the parasite becomes infective to the mosquito's host.

An uninfected Indian rhesus monkey was inoculated in a vein with the sporozoites. Six days later small ring forms were seen sparsely in the blood. The infection built up so rapidly that the monkey died three days later. The parasites that caused the malaria were identified as *Plasmodium knowlesi*, a common form of simian malaria.

The infection has been transferred to another monkey and infected blood from this animal has been shipped to the U.S. for further study.

The U.S. is vitally concerned in international efforts to eradicate malaria. Approximately one-half of the world's population lives in areas exposed to malaria.

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#### PUBLIC HEALTH

## Water Standards Revised and Improved

► RADIOACTIVITY concentrations in drinking water have been limited by the U.S. Public Health Service for the first time.

Dr. Luther L. Terry, PHS Surgeon General, said the radioactivity limits were three micro microcuries per liter for radium-226; 10 micro microcuries per liter for strontium-90; and 1,000 micro microcuries per liter for gross beta activity.

This is the first time in 15 years (since 1946) that drinking water standards have been revised. The standards, first issued in 1914, form the basis for legally regulating the drinking water used on trains, airplanes, buses and vessels in interstate commerce.

In the revised standards, requirements for water quality were generally raised. Few changes were made in bacteriological standards, but limits for certain chemical pollutants were added for the first time.

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