



**RANGER MANEUVERING**—This sketch shows the Ranger B, second in the National Aeronautics and Space Administration's four-spacecraft series of missions to the moon, in several successive stages of a maneuver enabling it to take a large number of photographs of the moon rapidly, just before impact on its surface.

## ENGINEERING

## Plan Power Inter-Tie

Recommended by the U.S. Department of the Interior, a Pacific Northwest-Southwest power inter-tie would include the world's longest high voltage direct current line.

► THE 830-MILE-LONG main line of the recently proposed Pacific Northwest-Southwest power inter-tie would be the world's longest electrical power transmission link of its type.

The high-voltage direct current (HVDC) line would carry 750,000 volts from The Dalles, county seat of Wasco County, Oreg., on the Columbia River, to Hoover Dam on the Colorado River. Another line, 827 miles long, would run from The Dalles to Los Angeles.

These two lines would be the heart of the \$697 million power inter-tie recommended by the U.S. Department of the Interior.

The inter-tie will be the first HVDC system ever to be built in the United States. To date, all long-distance power links in this country have been of the alternating current (AC) type, although a 17-mile DC line was built in New York in 1936.

AC power lines have been used because AC is both easier to produce and more suited for general use. DC, however, can be "piped" from one location to another more easily.

The ideal solution is to convert AC to DC for transmission, and then back to AC at the end of the line. However, this conversion is costly.

On short-range or low-power links, the cost of conversion is more than the amount saved by using the more efficient DC transmission.

The HVDC system, however, is more economical for high-power links of more than 450 miles.

It was developed by Dr. Uno Lamm of the Swedish electrical power combine

ASEA, and was first used in Sweden in 1954. ASEA has licensed the conversion system to General Electric for use in the United States.

The Pacific Northwest-Southwest inter-tie would link dams, power stations and cities in Oregon, California, Nevada, Colorado and Arizona.

It would be jointly built, owned and operated by the Federal, state and local governments and private firms. Planned date of completion is 1971.

• Science News Letter, 86:85 August 8, 1964

## SPACE TECHNOLOGY

### Ranger VII Moon Camera Is Successful

► TELEVISION has reached the moon. The Ranger VII spacecraft crashed on the moon at about 9:25 a.m. on July 31, after transmitting to earth about 14 minutes of still television pictures of the lunar surface.

Ranger VI, launched last Jan. 30, performed almost perfectly until it landed on the moon within a mere 20 miles of its intended target, the Sea of Tranquility. The systems designed to transmit television pictures back to earth did not then go to full power, so no pictures reached earth, although the cameras were functioning.

The reason for the failure, according to the National Aeronautics and Space Administration and two Ranger contractors, Jet Propulsion Laboratory and Radio Corporation of America, was probably a high voltage arc during launch which destroyed parts of the TV transmitter and cameras.

The TV system might have been acci-

dentally turned on during launch by a short circuit or discharge of static electricity, causing the high voltage arc to take place in a low pressure region of the atmosphere, between 150,000 and 250,000 feet.

Launched on Tuesday, July 28, the Ranger VII was modified in several ways to prevent the television system from turning on too early. Some of the lines connecting the system with the ground checkout equipment was eliminated.

The circuit aboard the Ranger controlling the TV system in flight was "locked out" until after the Ranger separated from the Agena second stage of the launch vehicle.

Finally, the command circuitry was "desensitized," so that a slight stray electric charge would not set off the cameras.

The telemetry system was also changed since the Ranger VI.

In the Ranger VII, the telemetry system started at the moment of launch instead of 310 seconds later at spacecraft separation, as in the Ranger VI.

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## SPACE TECHNOLOGY

### Ranger's Cameras Could See Auto on the Moon

► THE TELEVISION CAMERAS used in the Ranger spacecraft for photographing the moon can pick out an object as small as your car.

Astronomers on earth, looking through earth's blanket of atmosphere, can see nothing smaller than about a mile in diameter. This means that spacecraft on the moon as large as several city blocks would be invisible to observers on earth.

The high resolution, or ability to pick out details, of the Ranger cameras is not enough, however, to insure clear pictures. Since lighting conditions on the moon could not be accurately determined from earth, some of the six cameras were made with greater light-gathering power than others. Radio Corporation of America, which made the cameras, provided three of them with f:1.0 lenses and the rest with f:2.0 lenses. This would enable photographs under lighting conditions similar to those on earth between noon and 3:00 p.m.

The television picture tubes in the Ranger VII are essentially larger versions of the tubes used for weather photography in the Tiros satellites.

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## AERONAUTICS

### Plane Like Helicopter At Take-Off, Landing

► A TRANSPORT PLANE has been developed that can fly at a speed of 430 mph, yet can take off and land vertically like a helicopter.

This aircraft, the XC-142 V/STOL, for vertical and short takeoff and landing, was built by Ling-Temco-Vought, Dallas, for the military, but has many other potential uses, such as rooftop-to-rooftop transportation, supply delivery to disaster areas, rescue operations and exploration in remote regions.

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