



City......Zone.....State.

## Weather Satellite Orbiting

United States launches the first satellite equipped to scan the earth's cloud cover. The battery power for transmitting weather information is expected to last into early March.

## See Front Cover

THE UNITED STATES has launched into orbit the first baby weather station in space. It was hurled into its earth-circling path at 10:55 a.m. Feb. 17, and its predicted lifetime is several decades.

The batteries powering the radio transmitting weather information, however, have only a two-week lifetime. The 20-inch, 21.5-pound satellite was one unit in the Navy's troubled-plagued Project Vanguard, originally scheduled to launch several satellites during the International Geophysical Year that ended last Dec. 31. It is now a National Aeronautics and Space Administration project.

The satellite's scientific equipment consists of two photocells designed to provide the first pictures of earth's cloud cover. The photocells are mounted behind circular, gridded windows that project from opposite sides of the satellite.

The two small optical systems, weighing  $3\frac{1}{2}$  ounces each, are shown in the photograph on the cover of this week's SCIENCE NEWS LETTER. They were developed and built by the Perkin-Elmer Corporation, Norwalk, Conn.

The photoelectric cells project diametrically opposite each other at 45 degrees from the satellite's stable spin axis. Only one photocell sees the cloud's and earth's surface reflectivity at any time.

The experiment represents a first step toward obtaining continuous weather mapping of global scope.

The satellite is tracked and interrogated by NASA's worldwide Minitrack network. The U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N. J., developed the cloud cover instrumentation package in the satellite, the shell of which was prepared by NASA's Vanguard Division.

Clouds, sea and land masses have different qualities of reflection that can be translated into electrical impulses. As the satellite's photocells sweep the sunlit side of the earth, the intensities of sunlight reflected from the cloud areas, about 80%, differ from the land, from 15% to 20%, and sea, some five percent. These reflections, converted to electrical signals, are stored in a tape recorder within the satellite for telemetering to ground stations, once per orbit, in compressed form when the satellite is interrogated.

The satellite criss-crosses the equator between latitudes of 35 degrees north and 35 degrees south.

The satellite's 24-hour sweep reveals cloud cover data over about 25% of the earth's sunlit surface in 600-mile-wide strips.

A 108.03 megacycle transmitter to send

cloud cover data at one watt and a 108.00 megacycle transmitter to send Minitrack tracking information at 10 milliwatts are included in the package. The 108.00 megacycle transmitter carries a temperature-sensitive crystal that reveals the temperature within the scientific payload.

Solar cells, tucked behind the three-inch windows, operate a switch that halts the tape on which cloud cover information is recorded when the satellite is in the shadow of the earth, thus conserving battery power. The tape is reactivated by the same means.

When the satellite passes over the appropriate tracking station, depending upon the satellite's location at the time, it is interrogated from the ground and transmits its data in one 60-second burst.

The data already telemetered to the ground are erased from the tape. A trigger resets the system to begin recording again.

The cloud cover data from each global circuit are stored on a separate tape at the ground station that interrogates the satellite and the tapes then shipped to Fort Monmouth.

The Vanguard 50-pound third-stage rocket casing was also placed in orbit. It has been treated with a special coating for optical tracking.

The satellite's shiny shell consists of micro-thin layers of magnesium, zinc, copper, silver, gold, chromium, silicon-monoxide, aluminum and a final outside coating of silicon-monoxide. Total thickness of the highly-polished, electroplated shell is .0015 of an inch.

The tapes containing the cloud cover data are fed into an electronic complex at Fort Monmouth that transforms them into crude photographs. These film strips, in which one earth circuit is equal to 35 or 40 feet of film, are then fitted together in the manner of aerial photographs.

The system whereby the data are converted to black and white photographic strips includes an FR 100 tape recorder, analogue computer, data reduction unit, oscilloscope and a 35 mm camera.

Initial calculations showed the satellite's perigee was 335 miles, its apogee, 2,050 miles. At speeds ranging from 14,000 to 18,000 miles an hour, the weather station circles the earth once every 126 minutes.

Although its popular name is Vanguard II, the satellite's official designation is 1959 Alpha I.

The second of the three remaining Vanguard satellites still to be launched will also contain weather reporting devices. They will measure the earth's radiation balance, the difference between the amount of the sun's radiation hitting the planet and that re-radiated into space.

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