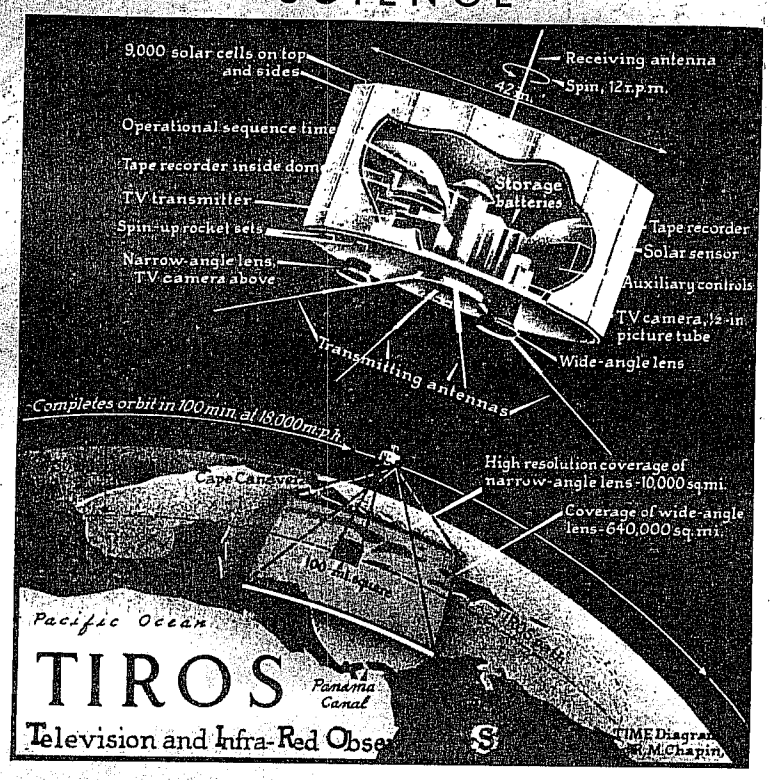
TIME
THE WEEKLY NEWSMAGAZINE

April 11, 1960

SCIENCE



Weather by Satellite

With a huge gush of smoke and flame, the three-stage Thor-Able rocket last week roared from its Cape Canaveral launching pad, soon to swirl its 270-lb. package into orbit around the earth. To the scientific skeptics who claim that satellites are little more than spectacular stunts, that package provided a spectacularly practical answer: looking down from hundreds of miles in space, it could take and transmit pictures of the earth and its cloud-splotched atmosphere. At the very least, it ushered in a new era in meteorological science.

The weather satellite Tiros I (from Television and Infra-Red Observation Satellite) went into an almost perfectly circular orbit that will keep its cameras at an efficient picture-taking distance. Its furthermost point of 468 miles from the earth is only 32 miles higher than the low point. The feat of orbital precision, unequaled by either U.S. or Soviet satellites, was accomplished by a special Bell Telephone Laboratories guidance system in the rocket's second stage.

Cameras & Beacons. Tiros I is drum-shaped (diameter 42 in., height 19 in.), and is spangled on top and sides with 9,000 small solar cells that yield about 19 watts of electricity to keep its storage batteries charged. From its top and bottom jut five radio antennas and the lenses of two TV cameras. The inside is packed with micro-miniaturized electronic equipment that can seemingly perform miracles.

Almost as soon as Tiros was safely in orbit, two small weights swung out from its rim and slowed its spin from 136 to 12 revolutions per minute. This strikingly simple trick, like a whirling skater slowing his spin by raising his arms, made photography possible. Two beacon radios called out the satellite's position, reported its inside temperatures and the condition of the apparatus on board. Solar cells topped off the batteries. Nine small instruments observed the bearing of the sun, and another reported the position of the earth's horizon.

Tiros was now ready for business, and business soon came. At Fort Monmouth, N.J., a 60-ft. dish antenna of the Army Signal Corps picked up the satellite's radio beacon as it came over the curve of the earth. Up from the ground went a coded signal that made the satellite's innards spring into frantic activity. A shutter opened and closed. Electronic pulses flashed through tangles of hair-thin wire. Then down from the satellite over a TV channel came a picture of northeastern North America, spotted with white swirls of cloud. Fort Monmouth experts made hasty versions of the picture (which hurt its quality) and sent them to Washington by messenger. There Dr. Keith Glennan, director of the National Aeronautics and Space Administration, took it to the White House and showed it to President Eisenhower.

Electronic Images. The Tiros' electronic wizardry was accomplished with apparatus designed by the Army's Fort Monmouth scientists, working closely with Radio Corp. of America. Tiros' primary parts are two TV camera tubes, each 1 in. in diameter, that take up to 32 still pictures, one every 30 seconds. The pictures, which are at first electronic images on the tube's screen, can be scanned and transmitted directly, or they can be recorded on magnetic tape. The satellite's masters on earth can tell it what to do. From Fort Monmouth, for example, they can tell it to start taking pictures when it is over Czechoslovakia a few minutes later. They can also select which camera to use. One camera has a wide-angle lens and takes pictures of an 800-mile square of the earth. The other camera has a narrow-angle lens that pictures, in more detail, a smaller area. The narrow lens camera has an obvious potential for military reconnaissance—so some details about it were therefore last week being kept under security wraps.

Steady Axis. Since Tiros I spins like a top, it is gyroscopically stabilized, keeping its axis pointed in a single direction as it circles the earth. This means that its cameras will point away from the earth much of the time. The ground operator, before he sends his signal, must calculate when the cameras will be looking at something interesting. The satellite's orbit shifts slowly around the earth, allowing all parts that do not lie farther north than France to be photographed. On the second day of its orbiting, it sent to Fort Monmouth cloud-pattern pictures of the Mediterranean region.

First originating with the Department of Defense, the Tiros project was turned over last year to NASA, which has understandably high hopes for it. Since clouds are the tattletales about weather and weather-to-come, the world's meteorologists have long been desperate for cloud-pattern pictures of the entire earth. A single Tiros cannot keep watch on all the earth's clouds—but seven, orbiting simultaneously, could do the job. When that happens, man may be within range of controlling the weather, which now controls his life.

Space Director

As Tiros I spun skyward last week, a stocky, dark-thatched man sat in NASA's Washington headquarters, scanning electronic returns and helping nurse the new space baby into orbit. He was Abe Silverstein, NASA's director of space flight programs, and a living answer to the notion that able scientists do not enjoy working for government. Silverstein has been employed by the U.S. government for 30 of his 51 years, and he still likes his job well enough to stay at it for ten or eleven hours a day and for six days a week during peak periods.