SPACE

Looking Afar—From Afar

Strange, Rube-Goldbergian satellites that look like mutated porcupines, but really are orbiting observatories, are appearing in the skies.

By JONATHAN EBERHART

➤ "OSO, OGO, EGO, POGO—" It isn't a skip-rope jingle, but a roll call. The names are those of satellites—Orbiting Solar Observatory, Orbiting Geophysical Observatory, Eccentric-orbiting Geophysical Observatory, Polar-Orbiting Geophysical Observatory....

What are these observatories—have astronomers been secretly sent into orbit?

No, not quite. The satellites are not manned, but their work could scarcely be more important if they were. They are capable of carrying literally dozens of ion traps, radio telescopes, magnetometers and other scientific gadgets, each working independently and automatically on a different experiment.

Two of the OO's (orbiting observatories) have been launched so far, OSO I in 1962 and OGO I this past Sept. 4. Only OGO is still transmitting, but it is more than earning its keep, outperforming whole hoards of IMP's (interplanetary monitoring platforms) and other satellites that have gone before it. Before it was launched, perhaps as a sign of good things to come, OGO I even withstood a bout with Hurricane Cleo.

OGO I is now in orbit, carrying 20 experiments, and this is not even half the capacity for which it was designed. Though only 16½ of the experiments have been sending useful information back to earth (due to a mechanical failure which caused an equipment boom to remain folded in next to the satellite), OGO I has demonstrated that virtually any combination of experiments is possible within one satellite.

"Handle with Care"

The main problem in designing the OO's is that certain experiments require certain conditions in order to work properly. Some, for example, have to be placed at the ends of long booms to keep the relatively large mass of metal in the body of the satellite from interfering with the work of the sensors.

Other experiments must be mounted so as to point always in the same direction, such as parallel to or perpendicular to the plane of the earth's orbit.

Still another problem cropped up during the early orbits of OGO I. The frequency range of the radio transmitter in one of the experiments was found to overlap with the frequency used in sending commands from the ground to control the satellite. This meant that if the experiment transmitter were turned on, the signals from it might confuse the satellite, thereby endangering many other experiments.

The solution found was to restrict the frequency range of the experiment transmitter, which has since been working satisfactorily despite the limitation.

Hero Satellite

Two and a half years before OGO, on March 7, 1962, OSO I was launched to peer at the sun through instruments with names like "spectrophotometer" and "neutron flux monitor." It carried a baker's dozen of experiments, all of which worked perfectly until, on May 22, something went wrong. The satellite started spinning faster and faster until its controls could no longer keep its instruments focused on the sun. OSO had lived through 1,138 orbits, measuring X-rays, gamma rays, ultraviolet rays and even space dust. It was a sad day.

Then, 33 days later, an even stranger thing happened. On June 24, as OSO came within range of the receiving station on earth, scientists at the National Aeronautics and Space Administration, Washington, D.C., discovered that the satellite was sending continuous signals again, and had somehow corrected its own problem—a hero satellite.

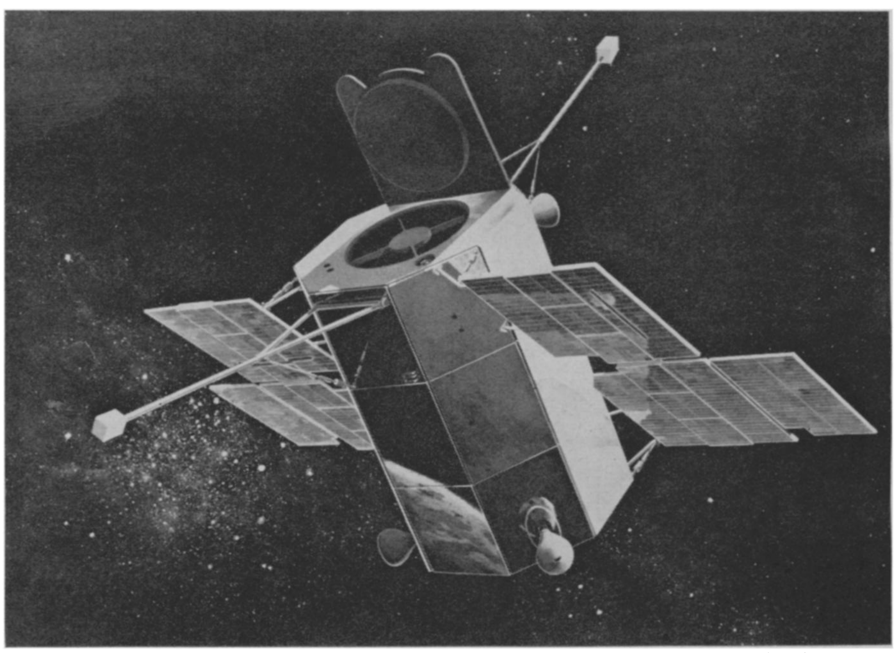
Even today no one is certain just how OSO slowed itself back down to where it could operate properly, but it was probably either friction in the gyroscope bearings or some effect of the position of the satellite in relation to the earth's magnetic field.

Though it was originally expected to work for no more than six months—by which time the satellite's gas-operated attitude control jets would have run out of fuel—OSO hung on, transmitting data until March 11, 1964, when its last six-minute message was received at Goddard Space Flight Center, Greenbelt, Md.

Another OSO was scheduled to be launched in 1963, but a succession of delays have held its back. Pre-launch satellite problems seem to come in groups, and though NASA had hopes of launching OSO II (referred to before launching as OSO-B2) late in 1964, the satellite has not yet gotten off the ground.

From Under the Blanket...

While the various OGO's and OSO's are and will be making observations of direct importance to the Space Age, a third kind of OO is looked on by scientists as primarily a tool to advance research that is already going on on earth.



Grumman Aircraft Engineering Corp.

THE BIGGEST STEP—The Orbiting Astronomical Observatory (OAO) will make possible one of the biggest steps in the history of astronomy. Orbiting outside all but the extreme fringes of earth's atmospheric "blanket," OAO will give scientists their first clear, unobstructed look at the heavens. Grumman Corporation is building the satellite for a predicted launch date in 1965.

The Orbiting Astronomical Observatories (OAO's) will represent just about the greatest advance in astronomy since the star. From Galileo's first experiments to the 200-inch giant on Palomar Mountain and including even the huge radio-telescopes in the United States and Great Britain, all of man's observations have been limited by the all-pervading blanket of the atmosphere.

It is the atmosphere that causes stars to "twinkle." It is the atmosphere that prevents all but a few wavelengths of light from ever reaching man's telescopes at all. As long as the astronomer has the atmosphere between himself and the stars he is as limited as the marine biologist trying to examine the ocean floor without leaving his boat.

OAO-A, presently planned for launching late in 1965, will not take the astronomer anywhere, but it will take his telescopes.

Grumman Aircraft Engineering Corporation is building the eight-sided 3,600-pound aluminum satellite to carry 11 small telescopes out beyond all but the extreme fringes of the atmosphere. The telescopes will relay television pictures of ultraviolet light from the stars back to earth.

Because of the interfering atmosphere, no ultraviolet light from the stars reaches the earth. Scientists, therefore, have obtained ultraviolet spectra from only seven stars, using instruments mounted in high-altitude rockets. The OAO's should provide spectra from as many as 14,000 stars a year.

OAO-B will be equipped with a single 36-inch telescope that can "see" a wider range of wavelengths than just ultraviolet. From its "exalted" position, the telescope will be able to pick out stars more than 100 times fainter than those visible to the Palomar reflector. Whole galaxies may suddenly appear where none had been known before.

Things to Come

Of the other OAO designs that are at present being worked on, perhaps the most extraordinary is a 2000-foot radio-telescope, to orbit some 6,000 miles above the earth. The proposed satellite would have four 1000-foot arms, forming a giant "X." It might conceivably be orbited as early as 1967.

Further in the future is a manned 100-inch telescope in which the man would serve not as an astronomer, but as a repairman-technician. In fact, he would not even be around while observations were going on, since his slightest movement could jar the delicately-balanced instrument out of kilter. His job would be to collect photographic plates, make repairs, and change auxiliary equipment so that different kinds of measurements could be made.

All is not in the distant future, however. Observations have already been made by various satellites, similar to those planned for the OO's. A series of studies of X-ray emissions in space set radio and optical astronomers working together, comparing notes on sources of visible and invisible radiation.

The distances between land masses on the earth are even today being measured by satellite triangulation, or geodesy. These projects will soon be combined with information from the OO's, to give a more complete picture of the shape of the earth, as well as its size, gravitational field and climate.

Despite their alphabet-soup names, the orbiting observatories will be the most useful tools man has yet devised to aid him in his peerings, peekings and pryings at outer space—and earth.

• Science News Letter, 87:10 January 2, 1965

GENERAL SCIENCE

Award for Understanding Meaning of Science

➤ THE MOST OUTSTANDING contribution to "the understanding of the meaning of science to contemporary man" will receive a new $25,000 gold medal award from the Pacific Science Center Foundation, which occupies the U.S. science exhibit building of the Seattle World's Fair. The Arches of Science Award is funded by Pacific Northwest Bell Telephone Company.

• Science News Letter, 87:11 January 2, 1965

Nature Note

White Birch

➤ AS THE DARK SKY of winter overhangs the drab hills and forests of a chill world, the gleaming white trunks of birch trees stand out in graceful beauty.

This eerie radiant whiteness, contrasting to the blacks and greys of the oak, elms and other trees, is caused by a reflecting and scattering of light in all directions from the many microscopic air spaces in the outer layers of bark. This is the same phenomenon that makes snow white.

This white birch, *Betula papyfera,* also called the canoe birch or paper birch, was used in many ways by the Indians before the arrival of settlers from Europe. The bark of the tree is strong, light and repells water. The Indians selected certain trees from which they carefully stripped pieces of bark, flattened them over a fire and formed their canoes. The bark of the birch was also used to cover and waterproof their tepees and to make baskets and other containers.

The fun of stripping off the bark, exposing the beautiful orange-red or pink lining, is often too tempting to children—and too destructive to the trees. For the bark, lined with horizontal black lenticels or breathing pores, is the protective skin of the tree. New white bark can never grow back to cover the ugly scar where it has been stripped. If the bark is stripped all around the trunk of the tree, the tree will die, for the sap, the tree's life fluid, cannot cross the gap.

Of the 30 species of birch found throughout the world, the white birch is the most widely distributed. It likes the cold climate of the northern woods, and is found in northern America from the Atlantic to the Pacific. It is a hardy tree, the tough corky bark acting as insulation to protect the more delicate living cells beneath. The trunk and limbs are very tough and elastic, easily handling the icy blasts of winter winds.

• Science News Letter, 87:11 January 2, 1965