GEOPHYSICS

Satellite To Be Twins

Burned-out hulk of rocket that speeds the satellite into its orbit will trail the moonlet and will also be a satellite, although it will be uninstrumented and will fall sooner.

➤ EARTH'S FIRST SATELLITE will very likely be twins—the instrumented 20-inch sphere and the burned-out hulk of the rocket that boosted it into its orbit.

The third stage of the three-stage vehicle lifting the earth satellite into space is expected to trail the satellite in its orbit until atmospheric drag causes both to slow down gradually and then burn up as meteors do.

This would mean, in a sense, getting two man-made moonlets for the price of one, even though the cost is estimated at more than a million dollars apiece.

Although the true satellite would carry instruments and its "twin" would not, scientists could learn much from observing both. Since the third-stage rocket would have a much higher mass than the satellite, it would spiral to earth much sooner. Comparison of the times taken by the two objects would give a higher accuracy to drag measurements than observations of a single satellite.

Milton Rosen of the Naval Research Laboratory in Washington told the Institute of Radio Engineers meeting in New York the three-stage launching vehicle will be 72 feet long, 45 inches wide at its greatest diameter, and will weigh 11 tons.

Physically, it will resemble a giant rifle shell complete with bullet. It will be finless.

The first satellite will be launched sometime after July 1, 1957, as part of the International Geophysical Year. Twelve are expected to be launched before the IGY ends on Dec. 31, 1958.

The satellite, estimated to weigh 21 and a half pounds, will carry a three-pound transmitter for radio communication with surface stations, John T. Mengel, in charge of radio tracking, told the meeting.

The first stage of the satellite's taxi to space will be a Viking-like rocket propelled by oxygen and gasoline, with tilting motors and jets for control. When the vehicle is about 36 miles up and at a 45-degree angle to the zenith, it will drop off and the second stage rocket will take over immediately. The first stage is expected to hit earth about 230 miles from the Patrick Air Force Base launching site in Florida.

The second stage contains the "brain" for the three stages. It has a cone-shaped nose section and also uses liquid propellants, nitric acid and unsymmetrical dimethyl hydrazine.

The third-stage rocket, with the satellite attached to its nose, will be carried completely enclosed within the second, which will lift the vehicle to the intended orbit, approximately 300 miles above the earth's surface, burning out at about 140 miles and coasting the rest of the way.

There, a spinning movement will be imparted to the third stage rocket to insure directional stability before the second drops off about 700 miles horizontally from the launching site.

When the third stage then fires, the satellite's path is fully determined. The third stage carries no guidance system; its only job is to boost the satellite's speed in the orbit to the approximately 25,000 feet a second needed to overcome earth's gravitational pull.

When the third stage finally separates from the satellite, they will have about the same velocity, the burned-out rocket trailing the satellite.

If the satellite circles the earth in an elliptical orbit that varies between 200 and 1,400 miles from the earth, Mr. Rosen said, the "launching vehicle will have accomplished its mission."

Dr. John Hagen, director of Project Vanguard, the name assigned to the satellite launching program, told the radio engineers the satellite could be expected to stay up for a year if it could be put into a circular orbit at 300 miles.

Since the angle and velocity of firing cannot be controlled exactly, the elliptical orbit varying from 200 to about 1,400 miles and a shorter lifetime will result.

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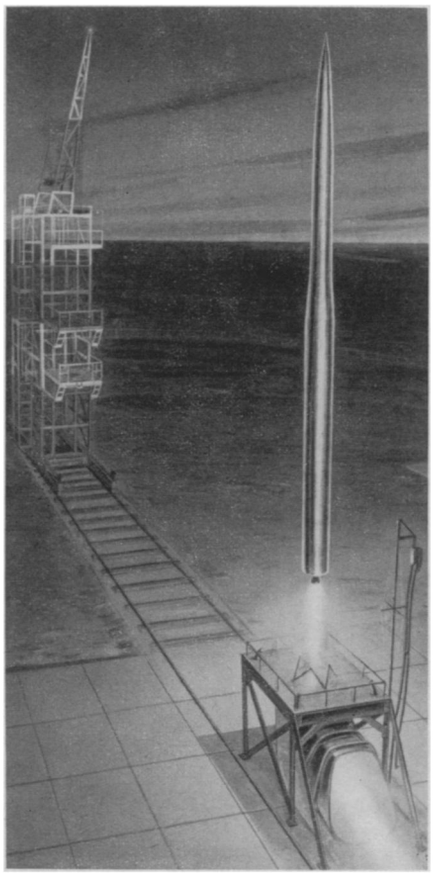

SATELLITE LAUNCHING—An artist's conception of the rocket vehicle that will lift earth's first satellite into an earth-circling path during the International Geophysical Year. In background is the gantry used to place the vehicle on its launching stand.

PHYSICS

Duplicate High Altitudes

➤ MAN-MADE SATELLITES in their earth-girdling paths will meet the very low pressures and some of the materials used by a Bureau of Standards physicist.

Dr. Herbert P. Broida reported to a University of Maryland audience on his experiments duplicating in the laboratory conditions about 50 miles up in the atmosphere, and produced the green glow given off by acetylene under such conditions.

At 50 miles, the air is so thin the sun's energy splits molecules into their atomic parts. When one wandering bit of oxygen, for instance, happens to hit another oxygen atom, the two combine and give off their excess energy as light, causing what is called "sky glow."

In Dr. Broida's experiments, solar energy is replaced by electrical energy to break up molecules into atoms at low pressures.

When oxygen atoms, produced in quantity by the electrical discharge, are mixed with nitric oxide, at very low pressures, a greenish glow is produced.

No one knows, Dr. Broida said, its actual temperature. Its measured temperature varies from many hundreds to many thousands of degrees, depending on the type of thermometer used.

The Air Force recently released nitric oxide from a rocket, then measured the intensity of light from the cloud so formed 60 miles above the desert sands at Holloman Air Development Center, New Mexico.

This experiment was similar to one last fall when a sodium cloud was made by spewing the metal out of a rising rocket. (See SNL, Oct. 22, 1955, p. 259.)

Scientists from the Air Force Cambridge Research Center have also released nitric oxide in the daytime from a rocket.

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