SPACE

'Libration Point' Useful

A pause in flight may be possible at five points on a trip to the moon

➤ IT MAY BE possible to pause in a flight to the moon after 85% of the distance has been covered and then go on from there to land on any portion of the moon, not just near its equator as planned in the Apollo program.

The uses of such a stopping point in space where the gravitational attraction of the moon exactly balances that of the earth—a "libration point"—were explained to a world audience of space experts at the 17th Congress of the International Astronautical Federation in Madrid by Dr. Leo Steg of General Electric's Valley Forge Space Technology Center.

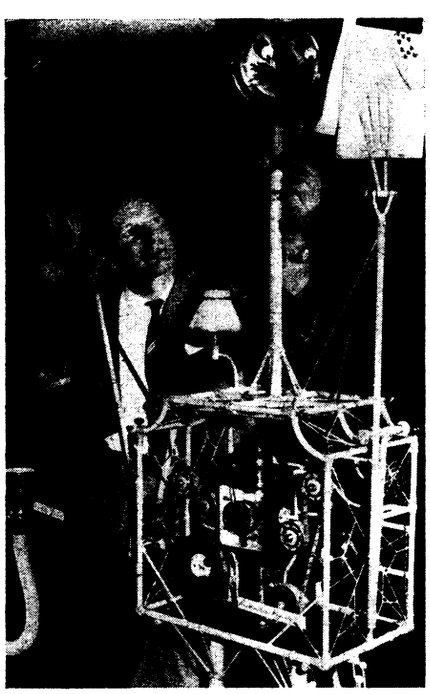
Dr. Steg stated that there are five such libration points in space where a spacecraft would remain stationary with respect to the position of the combined earth-moon system. In effect, these libration points are places in space where the gravity fields of our planet and its satellite cancel each other.

The classical libration points long recognized by astronomers lie in the moon's orbital path in positions 60 degrees ahead of and behind the position of the moon. Another point lies some 40,500 miles directly behind the moon, while a fourth is directly between the earth and the moon about 35,700 miles from the moon. The earth lies in a direct line between the fifth point and the moon, with that libration point some 214,200 miles from earth.

The classical libration points in the moon's orbit would be very useful for gravity studies and for accurate measurement of the moon's mass, Dr. Steg reported.

The libration point on the other side of the moon would be shielded from the earth by the mass of the moon and would therefore offer excellent conditions for radio astronomy. All of the libration points, Dr. Steg said, are outside of the earth's magnetic field making them attractive places for long-term observations of interplanetary radiation and solar flares.

Dr. Steg also pointed out that a communication satellite located at one of the libration points near the moon could solve the knotty problem of astronauts communicating with each other on the surface of the moon. Because of the moon's smaller diameter, the horizon is closer and radio transmissions depending upon line-of-sight would cover a distance of only 15 miles if an antenna 150 feet high were used. A communications satellite located at one of the four libration points around the moon within line of sight of both astronauts would permit them to communicate with each other.



Honeywell

FRED—British cartoonist and way-out inventor Rowland Emett fixes the tie on his friend FRED.

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TECHNOLOGY

Ordinary Aluminum Foil Tests Leaks in Rocket

➤ ORDINARY aluminum foil, the kind housewives use every day, is utilized to test for leaks in the thousands of feet of welds in the gigantic Sl-C booster the first stage of the Saturn V-Apollo lunar landing space vehicle.

Charles W. Musser, supervising engineer at Boeing Company's launch systems branch in New Orleans, reported the system to the Society for Nondestructive Testing in Chicago.

He said strips of water-soluble paper are placed along all welded areas and sealing surface interfaces of the booster tank. A narrower strip of aluminum foil is placed atop the paper.

When a leak occurs, Mr. Musser said, demineralized water in the tank will wet the water-soluble paper. The water becomes an electrolyte causing an effective short between the foil and the tank, thus allowing current to flow through a leak-indicating lamp.

METEOROLOGY

Lightning Greater Hazard Than Believed

See Front Cover

➤ AFTER STUDYING almost 300 lightning bolts since 1960, three engineers have concluded that lightning is a much greater hazard to transmission and power lines than was previously believed.

The electric fields in the vicinity of lightning strokes are much stronger than was thought, according to Edward Beck, S. B. Griscom and D. F. Shankle of Westinghouse.

This means that high voltages can be induced in open-wire conductors even if a stroke does not hit them, the engineers said.

This hazard to "transmission and distribution systems" has been neglected as harmless for many years, the engineers reported.

Most investigators agree that lightning strokes develop from cloud to earth except for high pointed objects, and that the stroke consists essentially of two parts: a "leader," which bridges the gap from cloud to ground and establishes an ionized path; and a return stroke, which reilluminates the leader path with all its zigs and zags, starting at the struck point and traveling upward to the cloud at velocities as high as 0.3 times the speed of light.

The leader is rather weak (500 amperes average) compared to the return stroke, which may have a peak of 10,000 to 250,000 amperes.

The difference between the old and new theories of lightning lies in the physical mechanism by which the stroke gets down to the ground.

Previously, a lightning bolt was thought to progress as a column of uniformly distributed charge. Instead, the engineers said, it actually moves as a succession of large corona bursts, each of which charges an air space perhaps 100 feet in diameter, with most of the charge in its outer boundary.

To find this out, they used an instrument called a klydonograph, in which an electric charge striking a photographic plate produces a permanent image (see cover) whose radius is directly proportional to the voltage of the charge.

During the investigation, 88 klydonographs were mounted on transmission towers and building roofs in Pennsylvania, Illinois, New York and Ohio.

In addition, buried ground wires recorded as high as one million volts from strokes that did not even hit them, but only "landed" nearby. Voltages such as these, "once believed innocuous," need further study, the engineers concluded.

(Cover photograph by Westinghouse.)