GEOPHYSICS

Map Radiation Belts

THE FIRST detailed charts of the natural radiation belts surrounding earth are now being drawn from information broadcast by earth satellites equipped with especially designed instruments.

The patterns of these zones of intense radiation, which could pose a threat to future space travelers, were reported at the opening session of the American Physical Society meeting in Cleveland.

The inner belt, which extends about 600 to 4,000 miles up from the earth's surface at tropical latitudes, is composed mainly of protons. The outer zone, which extends out to beyond 30,000 miles, consists mainly of electrons, five scientists reported.

Many scientists are beginning to believe the radiation belts are not as sharply divided as this. Recent findings from Explorer VI, the paddlewheel satellite launched Aug. 7, indicate there is one large radiation area, with varying zones of intensity for the different kinds of radiation.

At the Physical Society meeting, Dr. Richard Johnson of Lockheed Missiles and Space division, Van Nuys, Calif., and Lt. F. E. Holly of the Air Force Special Weapons Center, reported that the radiation trapped in the earth's magnetic field up to altitudes of about 600 miles consists primarily of low energy electrons.

Dr. James A. Van Allen of the State University of Iowa, who discovered the radiation regions, said that the radiation in the far outer zone showed a great increase last March. This increase, which was not found in the inner zone, was apparently caused by particles thrown out by the sun at a time when it was particularly active.

Drs. C. E. McIlwain and P. Rothwell, also of the State University of Iowa, reported that the radiation intensity in the lower edge of the outer zone showed a marked decrease during the time of a strong magnetic storm, when brilliant auroras were visible. The intensity at the lower fringe of the outer zone recovered within two days, they said.

Charged particles trapped around earth by its magnetic field spiral back and forth between Northern and Southern Hemispheres.

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MEDICINE

Drugs Cause Diseases

PEPTIC ULCER, indigestion, liver damage, diarrhea and abdominal pains are just a few of the ailments that can be caused by some new drugs that have recently become available.

Dr. Jesse D. Rising of the University of Kansas School of Medicine, Kansas City, said that with the advent of some of the newer drugs, doctors have begun to recognize that these potent agents, "even when used properly and with the greatest of care," can cause sickness similar or identical to well-known diseases.

Drug-caused diseases dramatize the fact that, whereas physicians are supposed to cure illness, they can actually cause typical diseases, he told colleagues at the clinical meeting in Dallas, Tex., of the American Medical Association.

All progress is obtained at some cost, he said. But doctors must use therapeutic agents with the full realization of their undesirable potentialities so that the price of progress will not be too high, he added.

He pointed out the use of many drugs is coupled with such predictable reactions as toxicity, allergies and other physiological side effects and a new type of reation that mimics well-known diseases.

He then cited a number of drugs that have caused diseases, among them hydralazine, mechamylamine, hexamethonium, alkaloids of rauwolfia serpentina, and phenothiazine derivatives. Hydralazine has caused a fairly high percentage of Libman-Sacks disease in patients receiving full dosage of the drug on a long-term basis. Initially, the disease resembles rheumatoid arthritis. If it progresses, however, the drug causes a syndrome virtually identical with the disease of the skin and mucous membrane known as lupus erythematosus, or Libman-Sacks disease, he said.

Mechamylamine has caused some patients receiving the medication to develop severe neurotic anxiety or depression, and some to become psychotic.

Mechamylamine and hexamethonium both can cause abdominal ailments, he said. Hexamethonium also has been responsible for lung disease and even death.

Alkaloids of rauwolfia serpentina, which previously had wide acceptance as tranquilizers, are generally believed to cause depression, indigestion, diarrhea, and peptic ulcer. Among the tranquilizers, phenothiazine derivatives probably have resulted in more ailments than all the others combined. They have precipitated Parkinsonism, a disease of the nervous system marked by muscular rigidity, liver damage, jaundice and epileptic seizures, he said.

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GEOPHYSICS

Four Kinds of Changes Found in Satellite Motion

FOUR DISTINCT kinds of changes in the accelerations of satellites as they whirl around the earth have been spotted by Dr. L. G. Jacchia of the Smithsonian Institution Astrophysical Observatory, Cambridge, Mass.

Each of the four is believed related to radiations from the sun. The changes were found by studying how the paths of several satellites varied over a long period of time. When the satellites are closest to earth, they encounter more drag from the earth's atmosphere and this changes their motion slightly.

Dr. Jacchia found that these changes can be distinguished as follows:

1. Fluctuations that follow the rhythm of the sun's radiation as recorded at 2800 megacycles, or a wavelength of about four inches. These fluctuations increase in degree when the satellite's perigee point is highest above the earth, and become smaller or disappear when the perigee is in darkness. Dr. Jacchia believes they reflect variations in atmospheric density caused by changes in short wave solar radiation in the extreme ultraviolet.

2. A slow fluctuation connected with the position of the perigee point relative to its position with respect to the sun. This effect is small at about 120 miles above the earth's surface, but becomes very large at heights above 210 miles. Dr. Jacchia reports the effect is "intimately connected" with the first fluctuation and is probably also due to ultraviolet radiation affecting the earth's high atmosphere.

3. Short-term changes accompanying magnetic storms. These fluctuations are believed due to particles thrown out by the sun, and reflect a heating of the atmosphere through some interaction with the particles.

4. Erratic fluctuations of unexplained origin. Dr. Jacchia suggests a comparison with conditions in the earth's radiation belts may provide a clue to this erratic effect.

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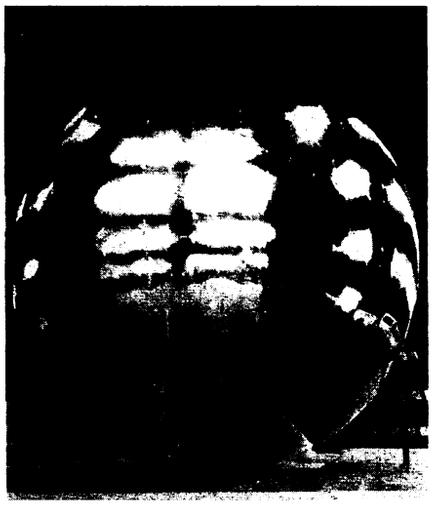

TEN-STORY SATELLITE—As tall as a ten-story building, the aluminum-coated Mylar plastic satellite is similar to the one successfully launched at an altitude of 250 miles over the United States east coast. (See SNL, Nov. 14, p. 318.) The plastic film is 0.0005 inches thick or one-half the thickness of cigarette package cellophane.